Program Proposal  
Form B

<table>
<thead>
<tr>
<th>Academic Group (College): NSM</th>
<th>Date of Submission to College Dean: 15 March 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Organization (Department): Biological Sciences</td>
<td>Requested Effective: Fall X__, Spring __, 2010</td>
</tr>
<tr>
<td>Department Chair: Rose Leigh Vines</td>
<td>Contact if not Department Chair: Tom Peavy</td>
</tr>
<tr>
<td>Title of the Program (Please be specific; indicate minor, undergraduate or graduate degree, etc.): Master of Arts in Biological Sciences: Stem Cell Concentration</td>
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<tr>
<td>Type of Program Proposal:</td>
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<tr>
<td>_____ Modification in Existing Program:</td>
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<td></td>
<td>_____ Substantive Change</td>
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<td>_____ Non-Substantive Change</td>
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<td>_____ Deletion of Existing Program</td>
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<td>_____ X _____ New Programs</td>
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<td>_____ Initiation (Projection) of New Program on to Master Plan</td>
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<td>_____ New Degree Programs</td>
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PLEASE NOTE: Form B is to be used only as a Cover Form. Additional information is requested for each of the above as noted in the corresponding procedure in the Policies and Procedures for Initiation, Modification, Review and Approval of Courses and Academic Programs found at http://www.csus.edu/umanual/acad.htm

Briefly describe the program proposal (new or change) and provide a justification. The Master of Arts in Biological Sciences was recently approved by the CSU system as a new graduate program in the Department of Biological Sciences to complement the existing Master of Sciences thesis program. The culminating experience of the MA program is a non-thesis project which requires a written project report. The proposed Stem Cell Concentration is a twenty-month program of study which consists of 22 units of graduate courses and 8 units of internship at a UC Davis stem cell research laboratory. The culminating experience is still a written report based on the research performed by the student during the internship program. A core of 8 courses in research methods and cellular and molecular biology will be taken at Sacramento State. These courses already exist at Sacramento State and are integrated with and designed to provide a foundation for the advanced laboratory internship.

Approvals:

<table>
<thead>
<tr>
<th>Department Chair: Rose Leigh Vines</th>
<th>Date: 3-26-10</th>
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<tbody>
<tr>
<td>College Dean: Laura Jefferson</td>
<td>Date: 4/20/10</td>
</tr>
<tr>
<td>University Committee:</td>
<td>Date:</td>
</tr>
<tr>
<td>Associate Vice President and Dean for Academic Affairs:</td>
<td>Date:</td>
</tr>
</tbody>
</table>

09/10/2008
1. Form B is attached.

2. Name of the campus submitting the request, the full and exact title of the proposed aggregate of courses, and whether it is an option, concentration, special emphasis, or minor.
   California State University, Sacramento
   Department of Biological Sciences
   Degree: Master of Arts in Biological Sciences
   Concentration: Stem Cell Concentration

3. Full and exact title of the degree major program under which the aggregate of courses will be offered.
   A student will satisfy the requirements for the Master of Arts in Biological Sciences.

4. Options, concentrations, or special emphases already existing under the degree major program for which the new aggregate of courses is proposed.
   The default option for the Master of Arts in Biological Sciences is the grant proposal track. The culminating project for the default option is that the students write a Grant Proposal instead of an Internship Project Report for the Stem Cell Concentration. However, both are interconnected by being project-based (rather than thesis) and requiring a written document detailing their project.

5. Department(s) to offer the aggregate of courses and name of contact person.
   Department of Biological Sciences
   Contact: Rose Leigh Vines, Chair
           Tom Peavy, Academic Coordinator for the Stem Cell program

6. Purpose of the proposed aggregate of courses.
   The rapid progress in stem cell research (California in particular) has created a need for graduates with training and skills specific to this field. We have developed an aggregate of courses that concentrates on these particular learning skills. Foundational course work in cellular and molecular biology will be complimented with practical hands-on training in stem cell techniques, coursework in regulatory issues and clinical trials, training in Good Manufacturing Practices specific to stem cell research, team-based laboratory research, and a culminating report based on their research internship at a UC Davis stem cell laboratory. In essence, the goal of the program is to prepare students to be laboratory scientists and laboratory managers in the stem cell field. The program also will be excellent preparation for students wishing to pursue doctoral programs, especially those involving the translation of basic research into application.
7. Need for the proposed aggregate of courses.

As stated above, there is a need for graduates to fill the future demand for stem cell scientists, managers and other research-support professionals in a growing number of laboratories devoted to stem cell research. The proposed curriculum addresses this need as evidenced by the support provided by a $1.3M California Institute for Regenerative Medicine (CIRM) Bridges to Stem Cell Research Award (grant # TB1-01184; start date Oct 1, 2009 with an end date Sept 30, 2012). In the grant proposal submitted to CIRM, the same curriculum was proposed. It should be noted that it is not essential to have additional funding to continue this program after the 3 year grant period since the courses included in the curriculum are already in existence. Jan Nolta, Director of the UC Davis Stem Cell Program, stated that she will assist us in placement of students in labs that have funding at the end of the grant period.

8. List of the courses, by catalog number, title, and units of credit, as well as total units to be required under the proposed aggregate of courses.

A. Required core courses:

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 220</td>
<td>Introduction to Scientific Inquiry</td>
<td>2</td>
</tr>
<tr>
<td>BIO 221A</td>
<td>Cell and Molecular Methods and Techniques</td>
<td>2</td>
</tr>
<tr>
<td>BIO 222</td>
<td>Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 224</td>
<td>Genomics, Proteomics &amp; Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 225</td>
<td>Stem Cell Biology &amp; Manufacturing Practices</td>
<td>1</td>
</tr>
<tr>
<td>BIO 293</td>
<td>Research Conference</td>
<td>2</td>
</tr>
<tr>
<td>BIO 294A</td>
<td>Seminar in Molecular and Cellular Biology</td>
<td>1</td>
</tr>
<tr>
<td>BIO 299</td>
<td>Problems in Biological Sciences</td>
<td>8</td>
</tr>
<tr>
<td>BIO 502</td>
<td>Master's Project</td>
<td>2</td>
</tr>
<tr>
<td>Total units</td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

B. Elective units: (select 6 units from the following list)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 223</td>
<td>Human Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 245</td>
<td>Host Pathogen Interactions</td>
<td>3</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
<td>Units</td>
</tr>
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<td>--------------------------------------------</td>
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</tr>
<tr>
<td>BIO 247</td>
<td>Contemporary Topics in Immunobiology</td>
<td>2</td>
</tr>
<tr>
<td>BIO 282</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 230</td>
<td>Separation Methods in Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 240</td>
<td>Advanced Instrumentation Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 245</td>
<td>Computational Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 260</td>
<td>Protein Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 261</td>
<td>Nucleic Acid Biochemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

C. Total number of units required for the concentration: 30 units

9. New courses to be developed. Include proposed catalog descriptions and course classifications.

None.

10. List of courses, by catalog number, title, course classification, and units of credit as well as total units to be required for the major in which the proposed aggregate of courses is to be included. Show a two-year scheduling pattern of these courses and indicate the number of additional courses and sections of classes that will be required to implement the program.

The list of required courses and electives is provided above in question 8.

Two-year schedule:

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>BIO 220 (2 Units)</td>
<td>BIO 221A (2 Units)</td>
<td>BIO 225 (1 Unit)</td>
</tr>
<tr>
<td></td>
<td>BIO 222 (3 Units)</td>
<td>BIO 294A (1 Unit)</td>
<td>BIO 299 (4 Units)</td>
</tr>
<tr>
<td></td>
<td>BIO 224 (3 Units)</td>
<td>BIO 245 (3 Units) [elective]</td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>BIO 299 (4 Units)</td>
<td>BIO 502 (2 Units)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIO 293 (2 Unit)</td>
<td>BIO 223 (3 Units) [elective]</td>
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</tr>
</tbody>
</table>

Schedule is based on current catalog as to when specific courses are offered.

11. List of all present faculty members, with rank, appointment status, highest degree earned, date and field of highest degree, and professional experience, who would teach in the proposed aggregate of courses.
Avery, William, Ph.D.  
*Expertise:* Community ecology, marine ecology, invertebrates and paleontology  
*Associate Professor*

Ballard, Ruth, Ph.D.  
*Expertise:* Human molecular genetics and DNA forensics  
*Professor*

Baxter, Jim, Ph.D.  
*Expertise:* Plant-mycorrhizal interactions, community ecology, and biodiversity  
*Associate Professor*

Coleman, Ron, Ph.D.  
*Expertise:* Evolutionary ecology, behavioral biology, and conservation  
*Associate Professor*

Datwyler, Shannon, Ph.D.  
*Expertise:* Reproductive biology of plants  
*Assistant Professor*

Ewing, Nick, Ph.D.  
*Expertise:* Cellular and molecular biology  
*Professor*

Gonzalez, Enid, Ph.D.  
*Expertise:* Microbial genetics  
*Assistant Professor*

Holland, Brett, Ph.D.  
*Expertise:* Evolutionary genetics and sexual selection.  
*Associate Professor*

Kirvan, Christine, Ph.D.  
*Expertise:* Infectious disease, autoimmunity, and molecular mimicry  
*Associate Professor*

Kneitel, Jamie, Ph.D.  
*Expertise:* Community ecology, food webs, metacommunities, and conservation biology  
*Assistant Professor*

Lancaster, Winston  
*Expertise:* Human anatomy, bats, functional morphology  
*Associate Professor*

Landerholm, Thomas, Ph.D.  
*Expertise:* Molecular cell biology and developmental biology.  
*Associate Professor*

Lindgren, Susanne, Ph.D.  
*Expertise:* Microbiology and pathogenic bacteria  
*Professor*

McDonald, Kelly, Ph.D.  
*Expertise:* Biology education, molecular cell biology, biotechnology & bioinformatics  
*Assistant Professor*

Nguyen, Hao, Ph.D.  
*Expertise:* Molecular cell biology and cancer biology.  
*Associate Professor*
12. Indicate according to the questions below the resources needed to implement the program change.

a) How will the above changes be accommodated within the department/College existing fiscal resources?
The projected size of this program concentration is 10 students in each cohort over the grant period (three cohorts of students), but could increase or decrease based on the number of spaces available for internship placements at the end of the grant period. Since the courses listed above can accommodate at least 16 individuals, it is projected that no additional resources are necessary to maintain an average of 10 students per incoming year since our classes have not been up to full capacity for several years (driven primarily by the relatively modest admission rate of students in the MS Molecular and Cellular Biology Concentration). Although the overlap would be 20 students potentially in the program at one time, each cohort of 10 students would be taking different set courses as noted in the two-year schedule.

b) If the proposed changes will require additional resources, describe the level and nature of additional funding the College will seek.
None requested.

c) What additional space, equipment, operating expenses, library, computer, or media resources, clerical/technical support, or other resources will be needed?
Estimate the cost and indicate how these resource needs will be accommodated.
No additional space, facilities, or support would be required.

13. Provide catalog copy for the proposed new concentration, emphasis, option or minor, using the standard catalog copy format.

Graduate Program

The graduate program in Biological Sciences leads to either a Master of Arts (MA) or a Master of Science (MS) degree and provides an opportunity for students to receive advanced training and to pursue independent investigations in particular fields of biology. It allows students to upgrade their qualifications for educational advancement to doctoral programs or for professional advancement in teaching, laboratory work, or fieldwork. The MA degree requires the completion of a project which is a Grant Proposal, unless the student is in the Stem Cell Concentration which requires an Internship Project Report. The MS degree requires completion of a thesis which has concentrations in Biological Conservation and in Molecular and Cellular Biology so as to provide advanced training and research experience in these fields.
All students are required to complete a project or thesis involving field, laboratory, or literature research. The project or thesis research may be conducted on campus with a biology faculty member or at an off-campus location. In either case, the student’s research must make a new contribution to the field of biology. If the research is conducted off campus, a biology faculty member must be identified as the student’s graduate advisor. Following admission to the program, students are advised by a temporary graduate advisor or by the faculty member who has agreed to supervise the student in their project/thesis research. Students should plan their academic program in consultation with their graduate advisor as early as possible, preferably prior to enrollment in the program.

For additional information regarding the Biological Sciences Graduate Program, students may contact the Biological Sciences Department Office, Biological Sciences website (http://www.csus.edu/bios/), or consult the Biological Sciences Graduate Program Handbook, available through the Department’s website.

**Graduate Admission Requirements**

Admission as a classified graduate student to the MA or MS degree program in Biological Sciences requires:

- a baccalaureate degree;
- completion of a major in biological sciences or closely related field; or completion of 24 units of upper division biological sciences courses or courses in closely related fields, each of which must be passed with a grade of C- or better;
- a minimum GPA of 2.75 in all biology courses and a minimum GPA of 3.0 in upper division biology courses;
- GRE General Test scores;
- a faculty member who has agreed to serve as their graduate advisor;
- two letters of recommendation from persons qualified to judge the applicant’s potential for successful graduate study; and
- a statement of purpose.

It is important to note that meeting all admission requirements does not guarantee acceptance into the graduate program. Students who have deficiencies in admission requirements that can be removed by specified additional preparation, or who have not been accepted by a graduate advisor, may be admitted with conditionally classified graduate status. Admission as a conditionally classified graduate student does not guarantee fully classified status. Fully classified graduate status is conferred when all deficiencies identified at the time of admission are removed and a biology faculty member has agreed to serve as their graduate advisor. Any deficiencies in admissions requirements will be noted on a written response to the admission application.

**Graduate Admission Procedures**

All prospective classified graduate students, including Sacramento State graduates, must file the following application materials with the Office of Graduate Studies, River Front Center 206, (916) 278-6470:

- an online application for admission; and
two sets of official transcripts from all colleges and universities attended, other than Sacramento State.

In addition, all prospective graduate students must submit the following application materials directly to the Department of Biological Sciences:

- an online departmental application for admission;
- one set of unofficial transcripts from all colleges and universities attended, other than Sacramento State;
- GRE General Test scores (NOTE: GRE General Test scores will be accepted after the application deadline but only if the test was taken prior to the deadline);
- two letters of recommendation; and
- a statement of purpose.

Applications for admission are due November 30 for full consideration, but accepted up to March 10. There is currently no general call for admission for students to begin in the spring semester. However, a student may petition the department to begin in the spring. Please contact your potential graduate advisor (i.e., a faculty member in your area of interest) to discuss this option. Approximately eight to ten weeks after receipt of all items listed above, a decision regarding admission will be mailed to the applicant.

14. Requirements - Master of Arts Degree

Units required for MA: 30 includes units required in areas of concentration.
Minimum GPA: 3.0

The MA degree requires completion of 30 units of coursework with a minimum 3.0 GPA. The 30 units must include a minimum of 18 units of 200-level courses. No units from BIO 106, BIO 194, BIO 195, BIO 197A, BIO 197B, BIO 197C, BIO 198A, BIO 198B, BIO 199A or BIO 199B are acceptable toward the master's degree. No more than 2 units of BIO 502 may be applied toward the 30 unit requirement.

Each student who receives a Master of Arts degree from the Department of Biological Sciences must submit a written project based on a research problem in biology under the supervision of a graduate advisor. A project can be based on either of the following:

- Grant Proposal: a research proposal in the format required by a state or federal granting agency (e.g., National Science Foundation, National Institutes of Health) based on a novel hypothesis that addresses a biological problem; OR
- Internship Project Report: a project report on the student’s internship experience.

All requirements for the Master of Arts degree must be completed within seven (7) years starting from the time the first course is used to meet the master’s degree requirements.

No Concentration

Courses in parentheses are prerequisites.

A. Required Core Courses (7 units)
Proposal for New Concentration

MA Stem Cell Concentration

Department of Biological Sciences
California State University, Sacramento

(2) BIO 220  Introduction to Scientific Inquiry

BIO 294  Seminar

(1) series
course

(2) BIO 299  Problems in Biological Sciences

(2-3) Select one of the following:

(2) BIO 221A  Cell & Molecular Methods and Techniques (BIO 220; may be taken concurrently) OR

(2) BIO 221B  Methods in Ecology, Evolution and Conservation (BIO 167; BIO 220 may be taken concurrently) OR

(3) BIO 221C  Exploration of Biological Methodology (BIO 220; may be taken concurrently)

B. Culminating Requirement (2 units)

(2) BIO 502  Master's Project (Advancement to candidacy and chair permission of his/her committee)

C. Additional Requirements (20-21 units)

Approved electives in Biological Sciences or supporting fields. Electives must be selected in consultation with the graduate advisor and approved at the Advancement to Candidacy meeting. Up to six units of upper division (100-level) coursework taken as a graduate student in the program may be applied to the MA degree. Up to an additional 2 units of BIO 299 may be applied to meet coursework requirements.

Stem Cell Concentration

Courses in parentheses are prerequisites.

A. Required Core Courses (22 units)

(2) BIO 220  Introduction to Scientific Inquiry

(2) BIO 221A  Cell & Molecular Methods and Techniques (BIO 220; may be taken concurrently)

(3) BIO 222  Molecular Biology (BIO 184, CHEM 161)

(3) BIO 224  Genomics, Proteomics, and Bioinformatics (BIO 184, BIO 222 and graduate status or instructor permission)
(1) BIO 225   Stem Cell Biology & Manufacturing Practices
(2) BIO 293   Research Conference
(1) BIO 294A  Seminar in Cell Biology
(8) BIO 299   Problems in Biological Sciences

B. Culminating Requirement (2 units)

(2) BIO 502   Master's Project (Advancement to candidacy and chair permission of his/her committee)

C. Additional Requirements (6 units)

Select one of the following:

(3) BIO 223   Human Molecular Genetics
(3) BIO 245   Host Pathogen Interactions
(2) BIO 247   Contemporary Topics in Immunobiology
(3) BIO 282   Evolution
(3) CHEM 230  Separation Methods in Chemistry
(3) CHEM 240  Advanced Instrumentation Laboratory (CHEM 24, CHEM 25, CHEM 124 or instructor permission
(3) CHEM 245  Computational Chemistry
(3) CHEM 260  Protein Biochemistry (one semester of Biochemistry)
(3) CHEM 261  Nucleic Acid Biochemistry (one semester of Biochemistry)