



SACRAMENTO STATE

# Program Proposal Form B



Academic Group (College): Natural Sciences and Mathematics	Date of Submission to College Dean: 10/18/06
Academic Organization (Department): Biological Sciences	Requested Effective: Fall X, Spring __, 2007.
Department Chair: Nicholas Ewing	Contact if not Department Chair:

Title of the Program: Concentration in Forensic Biology

Type of Program Proposal:

Modification in Existing Program:

- Substantive Change
- Non-Substantive Change
- Deletion of Existing Program

New Programs

- Initiation (Projection) of New Program on to Master Plan
- New Degree Programs
  - Regular Process
  - Fast Track Process
  - Pilot Process
- New Minor, Concentration, Option, Specialization, Emphasis
- New Certificate Program

**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/acaf/univmanual/index.htm>

**Briefly describe the program proposal (new or change) and provide a justification.**

The US Dept of Labor predicts that jobs for forensic technicians are expected to increase much more rapidly than average for all occupations through the year 2014, and reports that the earning power of forensic biologists has risen higher than for almost all other entry-level (B.S.) jobs in the science and technology ([www.bls.gov](http://www.bls.gov)). In response to these trends, the Dept. of Biological Sciences has seen an increased interest and demand in its majors for coursework and training in this area. Currently, our major is not preparing students well to compete for jobs in forensic biology. Our Dept. offers no courses in forensics (BIO 150, Forensic Biology, has been approved for 2007) and no concentration that adequately prepares students to sit for the criminalist examinations and job interviews. To date, our faculty has advised students to concentrate in molecular biology; however, this concentration does not provide students with training in key areas of criminal justice. The new minor in Criminal Justice (in place since last year), while providing students an opportunity to get this training, places an undue burden of additional units on our students and includes coursework that is not necessary for adequate preparation in the forensic biology specialty. The concentration proposed here would include 9 units of CRJ courses, carefully chosen to meet the needs of forensic biologists, of which 6 would be counted toward the B.S in Biological Sciences. In addition, it would include all of the Chemistry and Biological Sciences courses needed by entry-level forensic biology technicians.

**Approvals:**

Department Chair:  Date: 11/1/06

College Dean:  Date: 11/6/06

University Committee: \_\_\_\_\_ Date: \_\_\_\_\_

Associate Vice President and Dean for Academic Affairs: \_\_\_\_\_ Date: \_\_\_\_\_

**PROGRAM PROPOSAL**

**Date of Submission: 10/18/06**

**NAME OF CAMPUS SUBMITTING REQUEST:** Sacramento

**SPECIFIC REQUEST:** Form a new concentration in "Forensic Biology" under the B.S. degree in Biological Sciences

**OTHER B.S. CONCENTRATIONS CURRENTLY OFFERED BY THE CSUS DEPARTMENT OF BIOLOGICAL SCIENCES:** Biological Conservation, Clinical Laboratory Technology, Microbiology, Molecular Biology. Students can also opt for "No Concentration." The Department also offers a B.A. and a minor in Biological Sciences.

**DEPARTMENT TO OFFER THE NEW "FORENSIC BIOLOGY" CONCENTRATION:** Biological Sciences  
**CONTACT PERSON:** Nicholas Ewing, Chair

**PURPOSE:** To better prepare CSUS Biological Sciences majors to compete for positions in the rapidly growing entry-level forensic biology job market.

**NEED/RATIONALE:**

**1. The job market for forensic biologists is expanding unusually rapidly.**

The U.S Department of Labor Bureau of Labor Statistics ([www.bls.gov](http://www.bls.gov)) predicts that:

- Overall employment of science technicians is expected to increase about as fast as average for all occupations through the year 2014.
- However, jobs for forensic technicians are expected to increase much faster than average.
- Jobseekers with a 4-year degree in a forensic science will enjoy much better opportunities than those with only a 2-year degree.

**2. The earning power of forensic biologists is higher than for almost all other entry-level (B.S.) jobs in the science technology industry.**

Median hourly earnings of science technicians in May 2004 were as follows ([www.bls.gov](http://www.bls.gov)):

Nuclear technicians	\$28.46
Forensic science technicians	21.16
Geological and petroleum technicians	19.35
Chemical technicians	18.35
Environmental science and protection technicians, including health	16.99
Biological technicians	15.97
Agricultural and food science technicians	14.29
Forest and conservation technicians	13.14

**3. Our program is currently not preparing students well to compete for jobs in forensic biology.**

Currently, the Department of Biological Sciences at CSUS offers no courses in forensic biology (BIO 150, Forensic Biology has been approved and will be offered for the first time in 2007) and no concentration that prepares students in all the ways necessary to compete successfully for entry-level jobs as criminalists.

To date, our faculty has advised students to complete the B.S. with a concentration in molecular biology. However, this concentration does not provide the students any training in key areas of criminal justice.

The examination required for applying for local, state, and federal jobs in forensic biology (see attached California Department of Justice announcement) tests students on their knowledge of many techniques that they have no exposure to in our current curriculum. These include:

- Scientific methods and techniques used in examining crime scenes
- Tests for identity and comparison of blood and physiological fluids
- Tests for explosives and flammable materials
- Toxicological analyses
- Tests of hair and fibers, glass, soil, paint, and similar materials and equipment necessary to conduct these tests
- Modern methods and techniques in investigations of major crimes
- Modern types of small arms and the techniques of conducting all types of firearms, bullet, and toolmark comparisons
- Methods used in the examination of documents in criminal cases
- Photographic and photo micrographic principles and practices as applied to Criminalists

Some of these techniques will be included in the new BIO 150 course. However, many are beyond the scope of a Biological Sciences course and are taught in CRJ courses.

Dr. Bob Jarzen, who runs the Sacramento County Laboratory of Forensic Services, also prefers to hire graduates who have a working knowledge of the court system at the state and federal levels. Criminalists spend a great deal of time defending their work in court and need to understand the role of the criminalist in the courtroom and within the justice system in general.

**4. The new minor in Criminal Justice will not fill the needs of our students without placing an undue burden of additional units.**

The new CRJ minor consists of 18 units of coursework, which Biological Sciences majors would have to take *in addition* to the already high unit molecular biology concentration in the major. This places an unreasonable load on our students that could be alleviated by a Forensic Biology concentration that allows 6 units of upper division CRJ units to be counted toward the Biological Sciences major.

**5. The CRJ courses included in the proposed forensics biology concentration were carefully chosen to meet our students' needs and help them compete for employment after graduation.**

All three CRJ courses included in the proposal were chosen after discussions with Wil Vizzard (Chair of the Criminal Justice Department at CSUS) and Bob Jarzen (Director of the Sacramento County Laboratory of Forensic Services).

Biological Sciences faculty member Ruth Ballard audited CRJ 146 while she was on sabbatical in Fall 2005 and it covered many of the topics on criminalist examinations that will not be covered in BIO 150 and are not currently covered in any courses in the Biological Sciences major. CRJ 146 also includes a section on biological evidence that is quite extensive, covering both serology and DNA in a forensic context.

CRJ 004 is a prerequisite for CRJ 146.

CRJ 175 covers the structure and function of the American courts and addresses the deficiencies our students have in that area.

**6. The new forensic biology concentration is still heavily weighted toward biology.**

Students in the new Forensic Biology concentration will be required to take the same core curriculum as all other Biological Sciences majors. In addition, they will be required to take CHEM 31 and CRJ 004, which they cannot

count toward upper division credits. The only difference between this concentration and the Molecular Biology concentration is that students will be required to take 6 units of upper division CRJ courses as upper division course in the major and will be released from the requirement to take BIO 146A (Immunology lecture) and BIO 143 (Virology).

To maintain a strong biology emphasis, students in the Forensic Biology concentration will also be required to take all of their upper division elective units in Biological Sciences (not Chemistry, as is allowed in the Molecular Biology concentration).

#### 7. Forensic technicians are no longer generalists

Prior to the DNA revolution in the mid-1990s, forensic technicians tended to be generalists. When a criminalist was hired, he/she would typically rotate through several areas of the crime lab, learning forensic chemistry, physics, and biology, before being assigned to a particular unit. Now, most forensic technicians are hired in their area of specialty and remain in that area.

Thus, training forensic biologists today requires a primary focus on molecular biology, with supplementary training in chemistry and criminal justice, while training forensic chemists requires a primary focus on chemistry (particularly physical chemistry) with supplementary training in biology and criminal justice. In the modern crime lab, forensic chemists work in areas such as arson investigations and analysis of evidence seized from illegal (primarily methamphetamine) drug labs, whereas forensic biologists focus on the identification of biological stains and DNA extraction, quantification, and analysis.

It is therefore very appropriate that both the Department of Biological Sciences and the Department of Chemistry have separate concentrations in forensics and that the training for students within those programs be tailored to the specific areas of expertise that will be required of them.

#### SUMMARY:

In summary, the proposed Forensic Biology concentration will prepare our students exceptionally well for entry-level jobs in the rapidly expanding forensic biology job market while still maintaining a strong and broad training in Biological Sciences.

In addition, it will allow students to complete their degree in a reasonable number of units compatible with those of students in other concentrations in the major.

#### LIST OF COURSES:

Course Number	Course Title	Units
CHEM 31	Quantitative Analysis	4
CHEM 162*	Biochemistry Laboratory	3
BIO 180*	Molecular Biology (lecture)	2
BIO 181*	Molecular Biology (lab)	2
CRJ 004	General Investigative Techniques	3
CRJ 146*	Introduction to Physical Evidence	3
CRJ 175*	The Structure and Function of the American Courts	3
BIO 150*	Forensic Biology	3
UD electives in BIO only from approved list* or with approval of advisor	* BIO 122, BIO 124, BIO 125, BIO 130 (strongly recommended), BIO 131, BIO 149A, BIO 149B, BIO 186, BIO 199	7
Total Units in Concentration		30
Total UD units in Concentration		23
*Total UD units in BIO or CRJ for major		36

Total LD courses (required of all Biological Sciences majors):	37-38
Total UD core courses (required of all Biological Sciences majors):	16
Total units in the Forensic Biology concentration:	<u>30</u>
Total units, B.S. in Biological Sciences with conc. in Forensic Biology:	73-74

Comparison of total units for concentrations in the major:	
No concentration	23
Conservation	23
Molecular Biology	27
Microbiology	28
Clinical Laboratory Technology	30
Forensic Biology	30

**NEW COURSES TO BE DEVELOPED:** None

**ADDITIONAL COURSES/SECTIONS REQUIRED TO IMPLEMENT FORENSIC BIOLOGY CONCENTRATION:**

None. All courses proposed for the new concentration are already included in the curriculum of the Biological Sciences, Criminal Justice, and Chemistry Departments at CSUS. There may be a slightly higher demand for the CRJ courses included in the concentration (CRJ 004, CRJ 146, and CRJ 175); however, the impact is projected to be minimal as many of the students interested in careers in Forensic Biology are already taking these courses.

**LIST OF ALL 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:**

Because the concentration in Forensic Biology constitutes a reorganization of courses currently being offered in the departments of Biological Sciences, Chemistry, and Criminal Justice, the entire faculties of those three departments may be involved in teaching courses within this concentration. Therefore, please see the attached list of current full-time faculty members in these departments (**Appendix A**).

**RESOURCES NEEDED TO IMPLEMENT THE PROGRAM:**

As stated above, the impact of the Forensic Biology concentration is expected to be minimal. The concentration allows students to count a specific aggregate of existing courses for the concentration but does not propose that any additional courses or sections of courses be added.

**CATALOG COPY**

**Forensic Biology (30 units)**

The curriculum in Forensic Biology is designed to prepare students for careers as criminalists specializing in the analysis and interpretation of serological and DNA evidence. This curriculum meets the educational requirements for entry level career positions with city, county, state, and federal agencies. Students selecting this concentration are urged to pursue internship opportunities (BIO 195), such as those available through the Sacramento County Coroner's Office, and/or directed research (BIO 199) with a faculty member in Biological Sciences or Chemistry who utilizes molecular biology techniques and instrumentation.

- (4) CHEM 031      Quantitative Analysis (CHEM 001B)
- (3) CHEM 162      General Biochemistry Laboratory (CHEM 031; CHEM 160A or CHEM 161 either may be taken concurrently; ENGL 020 or an equivalent second semester composition course)

- (3) BIO 149A      Immunology Lecture (BIO 139, CHEM 161)
- (2) BIO 180      Molecular Biology Lecture (BIO 184)
- (2) BIO 181      Molecular Biology Laboratory (BIO 139, BIO 184)
- (3) CRJ 004      General Investigative Techniques
- (3) CRJ 146      Introduction to Physical Evidence (CRJ 004)
- (3) CRJ 175      Structure and Function of the American Courts (CRJ 004)
- (3) BIO 150      Forensic Biology (BIO 001, BIO 002, CHEM 20)
- (7) Upper division  
    electives in  
    Biological      Approved list: BIO 122, BIO 124, BIO 125, BIO 130 (strongly  
    Sciences from    recommended), BIO 131, BIO 149A, BIO 149B, BIO 186, BIO 195, BIO  
    approved list or   199  
    with approval  
    of advisor

**Note:** CHEM 162 can be included in the 36 upper division unit requirement for this concentration.

**APPENDIX A:**

**BIOLOGICAL SCIENCES:**

**Ruth E. Ballard, Ph.D.** (Genetics, 1997); Associate Professor and Assistant Department Chair  
Research expertise in DNA forensics and paternity testing.  
BIO 180, 181, 150, 186, 199

**Rosalee Carter, Ph.D.** Professor  
Research expertise in human anatomy, electron microscopy, and neuroscience  
BIO 125

**Nicholas Ewing, Ph.D.** Professor and Department Chair  
Research expertise in cellular and molecular biology  
BIO 180, 181, 186, 199

**Brett Holland, Ph.D.** Assistant Professor  
Research expertise in evolutionary genetics, social evolution, and sexual selection  
BIO 186

**Christine Kirvan, Ph.D.** Assistant Professor  
Research expertise in infectious disease, autoimmunity, and molecular mimicry  
BIO 131, 149A, 149B, 180, 181, 199

**Winston Lancaster, Ph.D.** Assistant Professor  
Research expertise in human anatomy, bats, functional morphology  
BIO 122

**Tom Landerholm, Ph.D.** Assistant Professor  
Research expertise in cell and developmental biology  
BIO 131, 180, 181, 186, 199

**Susanne Lindgren, Ph.D.** Associate Professor  
Research expertise in microbiology, prevalence and pathogenic mechanisms of *Salmonella* and *E. coli*, and biosource tracking of bacterial contaminants in water  
BIO 180, 181, 186, 199

**Hao Nguyen, Ph.D.** Assistant Professor  
Research expertise in cell and molecular biology, carcinogenesis  
BIO 130, 131, 180, 181, 186, 199

**Tom Peavy, Ph.D.** Assistant Professor  
Research expertise in molecular genetics  
BIO 180, 181, 186, 199

**Rose Leigh Vines, Ph.D.** Professor  
Research expertise in human anatomy, clinical hematology, clinical laboratory technology  
BIO 124, 125

**CHEMISTRY:**

**Roy Dixon, Ph.D.** (Environmental Chemistry, 1991) ; Associate Professor  
Research expertise in analytical separations and atmospheric chemistry  
CHEM 31

**Tom Savage, Ph.D.** (Biochemistry and Biophysics, 1992); Assistant Professor  
Research expertise in genetic engineering of plants  
CHEM 162

**Mary McCarthy-Hinz, Ph.D.** (Biochemistry); Associate Professor  
Research expertise in breast cancer and ethnopharmacognosy  
CHEM 162

**CRIMINAL JUSTICE:**

Currently, all courses for the Forensic Biology concentration are being taught by part-time faculty members.