

University of Idaho
College of Graduate Studies

M.S. and Ph.D. in Bioinformatics and Computational Biology
Fall 2002

1 Abstract

As Dr. Mary E. Clutter, Assistant Director for Biological Sciences of the National Sciences Foundation has said in testimony to the Senate Subcommittee on Science, Technology and Space:

“The biological sciences are poised to become to the 21st Century what physics has been to the 20th Century. Just as the knowledge about the structure of DNA in the 1950's led to a profound revolution in biological understanding, today we are poised to make a similar leap, in which advanced computational tools will be used to understand biological systems in all their complexity while preserving and exploiting those systems in a sustainable fashion.”

Idaho will be an active part of this revolution. We already have the research faculty and facilities in place. This proposal will create necessary educational capability by establishing a new graduate program.

We propose to create a new, interdisciplinary degree program at the University of Idaho to offer M.S. and Ph.D. degrees in Bioinformatics and Computational Biology (BCB). Bioinformatics and computational biology are new disciplines emerging from the application of mathematics, statistics, and computer science. They explain the vast quantities of biological data that modern molecular techniques have made available. For example, the recent sequencing of the human genome provides far more data than analyzed with current computational or mathematical techniques. Yet this is only one of over 800 complete genomes that have been sequenced to date. To mine this mountain of data, we need experts who know biology, computer science, and mathematics. The students who graduate with our proposed BCB degree from the University of Idaho will have this expertise.

The University of Idaho is in a good position to offer this degree. As part of the Initiative for Bioinformatics and Evolutionary Studies (IBEST), faculty in the biological sciences, computer sciences, and mathematics have been collaborating for years. We have benefited from significant NSF and NIH funding, including (in part): \$10.4 million from NIH for a Center for Biomedical Research Excellence (COBRE) that focuses on evolutionary processes; \$6 million from NIH to establish a Biomedical Research Infrastructure Network (BRIN) focused on cell signaling; \$9 million from NSF supporting (in part) an integrated, multidisciplinary investigation into the biocomplexity of environmental systems with a significant computational biology component; and \$500,000 from NSF for interdisciplinary studies in bioinformatics and evolutionary studies.

The BCB degree will enhance this active research effort, and educate tomorrow's researchers, practitioners, and educators. It will bring highly qualified graduate students to campus, and will enhance our ability to recruit and retain high quality faculty members. The emphasis of the BCB degree will be on active, interdisciplinary collaborations such as those we already have in place.

The two degrees, M.S. and Ph.D. in Bioinformatics and Computational Biology, will be delivered on-campus in Moscow at the University of Idaho, and will be administered by the College of Graduate Studies. Participating faculty will be drawn from current faculty, and from anticipated new hires. There are 17 current faculty participants, from eight departments spanning four colleges and one institute. The coursework will be drawn primarily from current offerings, with a few supplements. This request does not duplicate any programs in Idaho or in the Pacific Northwest.

2 Nature of the Request

The advent of high throughput data acquisition in the biological sciences, an example of which is the recent completion of a draft of the entire human genome, has created far more data than can be analyzed with current techniques. In order to understand and use these data to improve human health, natural and agricultural resource management, and to simply understand the natural world better—will require new techniques and tools. Moreover, industries dependent on that understanding, such as health, pharmaceuticals, agriculture, and forestry will require workers who understand this new knowledge.

This request is for the creation of a new interdisciplinary graduate program to grant M.S. and Ph.D. degrees in Bioinformatics and Computational Biology (BCB). The BCB program will be delivered on-campus in Moscow at the University of Idaho, and will be administered by the College of Graduate Studies at the University of Idaho in collaboration with a Program Chair selected from among the participating faculty.

A degree in BCB will require coursework and practical experience in biology, mathematics, statistics, and computer science. The focus of the degree will be on learning to develop and use computational and mathematical tools to analyze biological data.

BCB will be a highly interdisciplinary program. It will require bridging of biological, computational, and mathematics disciplines that is not available through existing academic programs. Initial participants include faculty members from eight departments or divisions: Biological Sciences, Plant Soils and Entomological Sciences, Fish and Wildlife, Forrest Resources, Mathematics, Statistics, and Computer Science. These academic units span four colleges and one institute: Letters and Science, Natural Resource, Agricultural and Life Sciences, Engineering, and WWAMI. Each participant has agreed to be a core BCB faculty member. Please see attached letters of support from the relevant department chairs.

This broad representation makes it appropriate for the BCB program to be administered by the College of Graduate Studies. Precedents for this administrative plan for interdisciplinary studies include the Program in Interdisciplinary Studies at the University of Idaho and the Individual Interdisciplinary Doctoral Program at Washington State University.

3 Quality of the Program

There is no formal accreditation procedure for graduate programs such as BCB.

The proposed curriculum was designed to maximize integration of biological and analytical subjects and skills. It was designed using recommendations from “A Curriculum in Bioinformatics: The Time is Ripe”, R. Altman, *Bioinformatics* 14(7):549-550, 1998 (a very influential outline of the necessary curriculum); “Training for Bioinformatics and Computational Biology”, W. Pearson, *Bioinformatics* 17(9):761-762, 2001; after surveying current programs at University of Southern California, Washington University in Saint Louis, U.C. Santa Cruz, and Iowa State; and after reviewing the recommendations of the Education Working Group of the International Society on Computational Biology.

The main assurance of a high quality program is the personal commitment to quality of the participants. The current list of faculty participants (see section **Error! Reference source not found.**) includes six full Professors, and the group as a whole has a very impressive record of research and educational accomplishment. For example, several of these faculty participants are associated with the Initiative for Bioinformatics and Evolutionary Studies (IBEST), which has been awarded over \$20 million in federal research grants since its inception in 1999, and whose members have produced hundreds of peer review publications and won numerous awards for teaching excellence. This group is also heavily involved in the recent \$9 million NSF EPSCoR grant on biocomplexity. Also, this group has already offered several interdisciplinary courses relevant to this program, and these courses have received very high student evaluations.

4 Budget for state assisted funds

The faculty members participating in this program have been awarded over \$20 million in competitive research funding from NSF and NIH in the last 18 months. This provides a great deal of F&A which we propose the URO use to support this program. In particular, the recent NIH COBRE grant (for \$10.4 million) will generate \$2,834,946 (est.) in indirect cost returns over the next five years, of which \$1,417,473 (est.) will be returned to URO, or approximately \$283,495 per year for the next five years. We anticipate that federal grant activity will increase as a result of this program, so that continued funding after five years will be sustainable from F&A. In short, this program is self sustaining from year one, and the proposed URO expenditure of \$73K-\$90K per year is supported by indirect costs.

I. PLANNED STUDENT ENROLLMENT

	FY03	FY04	FY05
A. New enrollments	3	4	4
B. Shifting enrollments	3	0	0
C. New Students in FY	6	4	4
D. Total Enrollment	6	10	14

II. EXPENDITURES

A. Personnel Costs	FTE	FY03	FY04	FY05	
1. Faculty					
	14 Faculty; ave. 0.1 FTE each	1.4	\$0	\$0	\$0
2. Administrators	Program Director	0.25	\$18,000	\$18,900	\$19,845
3. Adjunct Faculty	None	0	\$0	\$0	\$0
4. Graduate Teaching Assistants			\$9,409	\$20,512	\$22,358
5. Graduate Research Assistants		0	0	0	0
6. Research personnel	None	0	\$0	\$0	\$0
7. Support personnel	Administrative Asst.	0.5	\$14,000	\$14,700	\$15,435
8. Fringe Benefits			<u>\$4,760</u>	<u>\$4,998</u>	<u>\$5,248</u>
Total FTE Personnel Costs		2.15	\$46,169	\$59,110	\$62,886
B. Operating Expenditures			FY03	FY04	FY05
1. Travel	Grad student recruitment		\$4,500	\$6,000	\$6,000
2. Communications	Program advertising costs		\$1,500	\$1,500	\$1,500

3. Materials & supplies	General office supplies	\$1,000	\$1,000	\$1,000
4. Miscellaneous	Library Journals ⁴	\$20,000	\$20,000	\$20,000
TOTAL OPERATING EXP		\$27,000	\$28,500	\$28,500

GRAND TOTAL		\$73,169	\$87,610	\$91,386
--------------------	--	-----------------	-----------------	-----------------

III. REVENUES

A. Source of funds		FY03	FY04	FY05
1. Appropriated funds – reallocation of URO return on indirect expenses				
	0.25 FTE Program Director salary	\$18,000	\$18,900	\$19,845
	.5 FTE Administrative Assistant, salary and fringe benefits	\$18,760	\$19,698	\$20,683
	Other operating expenses	\$27,000	\$28,500	\$28,500
	Graduate student fees for <u>teaching assistants</u> paid by <u>indirect</u> cost funding from extramural grants (not in this budget) ²	\$9,409	\$20,512	\$22,358
2. Appropriated funds – new above MCO				
	None	\$0	\$0	\$0
3. Federal funds				
	Research assistantship stipends paid by extramural grants (not listed in this budget) ³	\$0	\$0	\$0
4. Other grants		\$0	\$0	\$0
	None	\$0	\$0	\$0
5. Fees		\$0	\$0	\$0
6. Other		\$0	\$0	\$0
GRAND TOTAL REVENUES:		\$73,169	\$87,610	\$91,386

B. Nature of Funds		FY03	FY04	FY05
1. Recurring		\$73,169	\$87,610	\$91,386
2. Non-recurring		\$0	\$0	\$0
TOTAL REVENUES:		\$73,169	\$87,610	\$91,386