

**DATE:** July 14, 2005

**SUBJECT:** University of Memphis, Masters of Science in Bioinformatics

**ACTION RECOMMENDED:** Approval

**BACKGROUND INFORMATION:** Bioinformatics, the science of organizing and analyzing biological data and interpreting biological information obtained from such data, has become a major area of interdisciplinary study of crucial importance in medical and biological research. Among the chief interests in bioinformatics research is the problem of turning genome sequence data into useful information about gene function, protein structure, molecular evolution, disease mechanisms, and drug targets. These research problems demand a new generation of scientists with the ability to address the issues of study design, modeling, analysis and interpretation of genome information in interdisciplinary ways. Within the last five years, the number of universities with programs in bioinformatics-related disciplines has significantly increased.

In the Mid-South, biotechnology and other health-related programs have been identified as key attributes of community strengths and focus for continued growth. As the only comprehensive educational institution in the community, UoM plays a central role in developing a technologically capable workforce and providing research expertise. The UoM is in a position to provide this expertise, based on existing curriculum, university and partner research, and physical infrastructure.

**PROPOSED START-UP DATE:** Fall 2005

Commission staff has reviewed program proposals according to the academic standards adopted by the Commission on November 14, 2002. Each standard is referenced below.

**1.1.20A MISSION:** The proposed program is consistent with the role and score of the university mission “to provide a stimulating academic environment for its students in an urban setting.” The university, “through its research, teaching and outreach roles responds to individual needs, such as the support of health care and preventive health services.”

**1.1.20B CURRICULUM:** The proposed program requires the development of four new courses (12 hrs) to complete the curriculum. The required curriculum of 37 hours is distributed as follows:

<u>Curriculum Components</u>	<u>Hours Required</u>
Major Field Core	19
Electives	12-15
Thesis	<u>3 - 6</u>
TOTAL	37

**1.1.20C ACADEMIC STANDARDS:** Admission and Retention requirements include GRE scores, two letters of recommendation, a minimum score of 550 on the TOEFL or 210 on the computer-based TOEFL (for students whose native language is not English), an undergraduate degree in the Biological Sciences or related field including courses in Biochemistry (I and II) and Molecular Genetics (or their equivalent). To graduate, a student must maintain a minimum GPA of 3.0 and successfully complete and defend a thesis.

Student Projections	<b>Projected Program Productivity</b>		
	Full-time Enrollment	Part-time	Graduates
Year 1	4	4	0
Year 2	8	6	3
Year 3	10	6	6
Year 4	12	6	7
Year 5	12	6	8

**1.1.20D FACULTY:** There are currently six full-time faculty associated with the program. In addition to these, there are also three currently funded open positions that will enhance the support of this program when filled.

**1.1.20E LIBRARY RESOURCES:** The current library resources are appropriate to support the proposed program. Internet resources and also the main library and branch libraries in Mathematical Sciences and Chemistry contain subject area books and journals to support the program.

**1.1.20F ADMINISTRATION/ORGANIZATION:** This program will be housed within the College of Arts & Science. Administrative support will be through the Office of Interdisciplinary Studies.

**1.1.20G SUPPORT RESOURCES:** St Jude Children's Research Hospital, through its Hartwell Center for Bioinformatics and Biotechnology, is supportive and plans to be a key participant in this program. The Director of The Hartwell Center has expressed interest in having the program train several of his staff research scientists and masters level technicians who were trained as biologists or engineers. Several graduates from the Bioinformatics concentration have found employment at these places, and graduates have internships at St. Jude. Some of the members of the Hartwell Center are interested in serving as adjunct faculty.

**1.1.20H FACILITIES/INSTRUCTIONAL EQUIPMENT:** No new instructional facilities are required, nor will any be renovated. Existing space will be made available in the FedEx Institute of Technology building to house the director and any staff funded by

the external foundation. No new specialized instructional equipment is required to support this degree.

**1.1.20I STUDENT/EMPLOYER DEMANDS:** The current Bioinformatics concentration in Mathematical Sciences experience a high level of demand. Since 2000 this concentration has produced 14 theses and currently has six students enrolled. These numbers can be expected to grow significantly with the recent and anticipated faculty members hired to support the program in Biology, Computer Science, and Mathematical Sciences. A degree with the official title of M.S. in Bioinformatics will also have greater market value for students.

Further evidence that the student demand already exists is based on the large number of enquiries received about the program (about 50 per semester) and the large number of applicants for the concentration (about 25 per semester).

The primary employers of graduates in Bioinformatics include industrial and academic jobs, including St. Jude's Children's Research Hospital a major employer in Memphis.

**1.1.20J NO UNNECESSARY DUPLICATION:** In Tennessee, there are currently no graduate degree programs or certificate programs in Bioinformatics or Computational Biology at the public or private institutions. The closest effort is a Biomedical Informatics program in the Medical Center of Vanderbilt University, which deals with the acquisition, processing, and use of biomedical information. Other universities in the South offer programs that are ancillary to Bioinformatics: George Mason offers a doctorate program in computational sciences, Washington University at St. Louis offers a doctorate program in genetics, and the W.M. Keck Center in Houston, Texas, has a program in computational biology with Rice, Baylor College of Medicine, and the University of Houston as participating institutions. The University of North Carolina at Chapel Hill has many faculty members whose research is related to Bioinformatics. Only Duke University offers a degree in Bioinformatics.

**1.1.20K COOPERATIVE INSTITUTIONS:** The University of Memphis currently has a concentration in Bioinformatics within the M.S. in Mathematical Sciences which will be replaced by this degree program. The University of Tennessee Health Science Center has a Center for Genomics and Bioinformatics within its Molecular Biology Program. Effort is under way to coordinate educational programs with the research agenda of UT's Center for Genomics and Bioinformatics. Several students from the University of Tennessee program are presently enrolled in the existing concentration in Bioinformatics.

With the establishment of an interdisciplinary degree in Bioinformatics, UoM expects an increase in enrollment from the University of Tennessee Medical Center.

**1.1.20L DESEGREGATION:** The program will not impede the state's effort to achieve racial diversity.

**1.1.20 ASSESSMENT/EVALUATION AND ACCREDITATION:** The program will be evaluated based on actual and projected enrollment, graduation rates, alumni follow-up surveys, student satisfaction surveys, local area employer satisfaction surveys. A

university review of the program will be performed in the fifth year of the program with an external reviewer. No accrediting body exists for graduate programs in Bioinformatics and there are no SACS implications.

**1.1.20N ARTICULATION:** N/A

**1.1.20O EXTERNAL JUDGMENT** (Graduate Programs): Dr. Bruce S. Weir, Director of the Bioinformatics Research Center and Professor of Statistics and Genetics from North Carolina State University, provided an expert external review of the proposal and conducted a site visit, along with TBR and THEC staff. Dr. Weir recommended approval of the proposed program stating that it “has a solid academic and administrative foundation.” Specific strengths cited included strong administrative support and a nucleus of faculty with interest and expertise in bioinformatics. He suggested that the projected enrollment should easily be met and is likely to exceed projections due to the national demand. Dr. Weir reported that “the proposed program will provide graduates with a valuable skill set for employment as bioinformaticians.”

**1.1.20P COST/BENEFIT/SOURCE:** The University of Memphis is uniquely positioned to take advantage of the growing global focus on bioinformatics based on existing curriculum, university and partner research expertise, and physical infrastructure. In the midsouth, biotechnology and other health-related programs have been identified as key attributes of community strengths and focus for continued growth. As the only comprehensive educational institution in the community, the University of Memphis plays a central role in developing a technologically capable workforce and provides research expertise.

The new program will have synergistic interaction with several programs at the university, particularly the Feinstone Center for Genomic Research and the Ph.D. programs in Biology, Chemistry, and Mathematical Sciences. Largely inspired by the Human Genome Project, the explosion in related research activities has created a gold mine of databases whose volume and structure pose challenging computational, statistical, and mathematical research problems. A local charitable foundation with the primary goal of supporting health care in Memphis is planning to provide a significant endowment to the University of Memphis for support of this program. This external support should be about \$2M and would generate about \$100,000 per year for program support.

**FINANCIAL PROJECTIONS**

	Year 1	Year 2	Year 3	Year 4	Year 5
1. Expenditures					
A. One – time:					
New/renovated space					
Equipment					
Library					
Consultants	\$4,000				\$4,000
Other					
Total for One-time Expenditures					
B. Recurring:					
Administration					

Faculty**	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Graduate Students	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000
Staff	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
Benefits**	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
Equipment	\$5,000	\$7,000	\$7,000	\$7,000	\$7,000
Library					
Travel	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000
Other	\$10,000	\$11,000	\$11,000	\$11,000	\$7,000
Total for Recurring Expenditures	\$230,000	\$230,000	\$230,000	\$230,000	\$230,000
<b>TOTAL (A + B)</b>					
2. Revenues					
State appropriations (new, FTE)					
*State appropriations (old)	\$21,800	\$10,900			
Tuition/Fees	\$10,900	\$49,950	\$70,850	\$81,750	\$81,750
Institutional Resources**	\$130,000	\$130,000	\$130,000	\$130,000	\$130,000
Grants/Contracts					
Gifts	\$100,000	\$100,000	\$100,000	100,000	\$100,000
Other (in-kind donations, etc.)					
<b>TOTAL REVENUES</b>	<b>\$262,700</b>	<b>\$290,800</b>	<b>\$300,850</b>	<b>\$311,750</b>	<b>\$311,750</b>

**\*Please explain whether the state appropriations are new or if “old,” identify the source from which the funds are being reallocated to support the proposed program.**

**Fiscal Note:**

None of the \$230,000 involved new appropriates. This total is covered by \$100,000 already allocated in the base budget by the Provost in this fiscal year plus benefits for the director’s salary and are shown above with an \*\* in both expenses and revenue. The additional \$100,000 per year from the Assisi Foundation of Memphis, a local charitable foundation with a focus on healthcare, is also noted. These two already existing budget items cover the full expenses for the proposed program.

**1.1.30 POST APPROVAL MONITORING:** An annual performance review of the proposed program will be conducted for the first five years following approval. The review will be based on goals established in the approved program proposal. At the end of this period, campus, governing board, and Commission staff will perform a summative evaluation. These goals include, but are not limited to enrollment and graduation numbers, program costs, progress toward accreditation, library acquisitions, student performance and other goals set by the institution and agreed upon by governing board and Commission staff. As a result of this evaluation, if the program is found to be deficient, the Commission may recommend that the governing board terminate the program. Copies of such recommendation will be forwarded to the Education Committees of the General Assembly. The Commission may also choose to extend this period if additional time is needed and requested by the governing board.