

**Key Goals:**

1. The Faculty of the Department of Biological Sciences will be the University and Community leader in procurement of external health-related and basic life science funding, while maintaining strong credentials in undergraduate and graduate education and service.
2. Biological Sciences is without question the most diverse Department within the CSA in terms of research and teaching loads, with programs in fish and aquatic biology, ecology and ecosystems characterization, plant sciences, environmental toxicology, biochemistry and molecular biology, immunology and microbiology, and training in clinical laboratory and pre-health sciences. We seek to expand this diversity even further in the next 5 years in order to enhance opportunities for external funding and offer our undergraduate and graduate students unparalleled opportunities in education and research.
3. Biological Sciences will serve as the focal point for multidisciplinary bioscience research on the MTU campus.

**Departmental Strategic Plan (numbering match items in the University Strategic Plan)**

**GOAL 1: Attract, retain, and support a world-class and diverse faculty, staff, and student population.**

- 1.1 Recruit and retain new tenure-track faculty in Biological Sciences who will replace retiring faculty and bring a high emphasis on garnering extramural research grants while balancing the Department's long-time commitment to effective and active undergraduate and graduate education. ***Our objective is to grow the faculty of Biological Sciences to 21 tenure-track faculty, and to increase the number of undergraduate majors to 400 and the number of graduate students to 40-50 in the next five years.*** (See appendix 8 for department enrollment projections.)

Attract and graduate high quality students in our graduate programs by recruiting and retaining the best junior-level faculty with active, externally-funded research programs. External funding is essential to supporting graduate students and professional development programs.

Our reputation and central Lake Superior location positions us to be a leader in Great Lakes research, and will be substantively strengthened with the opening of the Great Lakes Research Center in Summer 2011. The Center will provide new possibilities for life science investigations and enhanced visibility for the Department, which will foster new opportunities for undergraduate, graduate and junior-faculty recruitment both through Departmental and Strategic Faculty Hiring Initiatives.

Currently >60% of Biological Sciences undergraduate majors are female, and the International diversity of our Graduate students is strong (> 50%). Efforts are underway to expand gender diversity in our graduate population. The department also supports university efforts to increase gender diversity among undergraduate majors. Key steps

will include outreach opportunities to community colleges and urban school districts (including ongoing High School outreach in Houghton, L'Anse, Baraga, Hancock, Negaunee, as well as Gogebic Community College and KBOCC (Keweenaw Bay Ojibwa Community College). Appendix 3 describes student demographics in the department, while the worksheets in appendix 4 describe steps planned by the department in pursuit of this effort.

Faculty gender distribution has been affected by the retirement of several female faculty. Active efforts are underway to recruit and retain additional female faculty members through all existing searches, seeking candidates who will hold positions of leadership within the Department. Appendices 1 and 2 portray the demographic mix of the department and the results of recent faculty searches; the worksheets in appendix 4 describe the steps planned to diversify the faculty.

- 1.2 Provide outstanding research facilities to attract high-caliber faculty in Biological Sciences. It is imperative that high quality research space be available for Biological Sciences faculty and students if recruitment and retention efforts are to succeed.

Work closely with the School and Administrative entities to insure ongoing progress in the development and activities of the Animal Care Facility and in operation of both IACUC and IRB committees.

Work to ensure that equipment necessary for high caliber health-related studies is available either within the Department or elsewhere on the MTU campus.

**GOAL 2: Deliver a distinctive and rigorous discovery-based learning experience grounded in science, engineering, technology, sustainability, the business of innovation, and an understanding of the social and cultural contexts of our contemporary world.**

Provide dynamic discovery-based learning while cultivating a worldview adapted to the needs and challenges of the 21<sup>st</sup> century. Yearly review of course offerings and status of such offerings within the focus of the global community will position the department at the forefront of knowledge transfer.

The life sciences are pivotal to new discoveries in basic human and animal biology, improving ecosystem health and understanding global change. The Department remains a leader in the study of disease dynamics through ongoing characterization of plant-microbial interactions and fish migration patterns. Students in the life sciences will experience multiple lecture, laboratory and field research opportunities with growing use of inquiry-based learning and technological developments at both undergraduate and graduate levels. Significant attention will be given to expanding research experiences for undergraduates in both field and laboratory research. A key advantage in relation to the size of MTU is the low ratio of faculty to students. This offers excellent opportunities for undergraduate research in Biological Sciences Faculty laboratories. In academic year 2009-2010, 22 undergraduates were engaged in research in 6 faculty laboratories, and we project this number to grow to more than 50 undergraduates in essentially all Faculty laboratories.

The department will continue to develop our strengths in educating students in clinical laboratory sciences and pre-professional health sciences (fully 70% of undergraduate

pre-medical majors gain entrance to Medical School with an MTU undergraduate degree), and our pre-health programs prepare students to enter numerous other health-related fields, including dentistry, pharmacy, physician-assistance, chiropractic and others.

As we grow, we will preserve the synergy between research and professional development, for Faculty, Graduate and Undergraduate students by striving to foster an interactive community of scholars.

**GOAL 3: Establish world-class research, scholarship, innovation, and creative work that promotes sustainable economic and social development in Michigan, the nation, and the world.**

- 3.1 Implement an externally-funded undergraduate research program in Biological Sciences. The role of biological science is the discovery and integration of basic knowledge from multiple fields of study as they apply to living systems. Advances in basic and applied knowledge provide a nexus from which theory, technology, and policy arise. Biological Sciences will increase collaboration, in conjunction with Chemistry, Biomedical Engineering, Exercise Science, Physics and other Departments on campus to seek NSF support for enhanced undergraduate research opportunities in the Biological and Life Sciences.

In particular, the department will foster interdisciplinary research and graduate training partnerships in human health related fields and work to expand research efforts in human health-related research. While not forgetting our core strengths in plant and aquatic sciences and biochemistry, we will seek to develop strong programs in developmental biology and genetics and gene regulation, which will be a springboard to understanding a variety of human disorders such as cancer, diabetes, and malformation disorders. A goal in the Department is expand external research funding from various agencies (NSF, NIH and others) from the current level of \$1.4 million to \$3.0 million within the next five years. (Appendix 9 shows the existing pattern of external funding).

As long term goals, the Department recognizes valuable opportunities for synergy at the borders of the disciplines described above. For example, the interactions between environmental toxicity and disease dynamics, animal migration patterns as universal models for disease dispersal, and the effects of global change on human and animal health are certain to become major foci of the Department in future years. As a department, not only do we plan to build core strengths, but to also interact to leverage our respective research strengths into collaborations that can address cross-disciplinary questions within the broad field of biological sciences.

- 3.3 Address societal needs through global partnerships

Implement the Peace Corps MS program in Environmental Education and Clinical Laboratory Technology, in order to provide trained post-graduate level individuals to fill important needs in the global community.

**Activities Related to MTU Strategic Plan**

Much like other Departments in the CSA at MTU, Biological Sciences serves the mission of the entire University by attracting students who might not otherwise attend a technological university, adding diversity of viewpoint and outlook to the student body, as well as Faculty and Staff. We educate all members of the student body, and support all missions in relation to science, technology, engineering and mathematics.

### **Donor Opportunities:**

#### Focus areas:

Perhaps more than any other single opportunity, the key need for donor opportunity is in the arena of beginning support (laboratory, personnel, supplies) for junior faculty in the Department (e.g., start-up). Donors must be kept aware of the critical links between research and education. The ability to recruit and retain outstanding researchers serves the undergraduate and graduate missions of both the Department of Biological Sciences and the Campus as a whole. Excellent researchers offer the best opportunity for creative and independent laboratory experiences for undergraduate and graduate students. At the same time, cutting-edge research keeps principal investigators at the forefront of activities in their respective area of research, which can be actively translated into the classroom.

Start-up funds allow junior level investigators a year to two of focused time to write and submit multiple grant applications, to get their laboratory into a competitive position, and to recruit and train both undergraduate and graduate students.

While start-up funds are important, they are by definition short-lived. Nonetheless, early career faculty must maintain long-term productivity and graduate student support. We hope to identify further mechanisms to support junior faculty, e.g., endowed graduate student fellowships, post-doctoral research funds, endowed equipment grants and other approaches of support that are not necessarily grant-related.

#### Opportunities:

Support for ongoing scholarships for students to study biological sciences at MTU and establishment of graduate fellowships to compete for outstanding students.