September 6, 2011

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Handouts of the Graduate Faculty Council

Michigan Tech
Responsible Conduct of Research (RCR)
The Law

- The America COMPETES Act of 2007 requires institutions applying for awards to include “a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduate students, graduate students, and postdoctoral researchers participating in the proposed research project.”
NSF Requirements for RCR Training

- Certification Regarding Responsible Conduct of Research (RCR): Require certification that the institution has a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students, and postdoctoral researchers who will be supported by NSF to conduct research.

- While training plans are not required to be included in proposals submitted to NSF, institutions are advised that they are subject to review upon request.

- The following language specifies NSF’s implementation of Section 7009.
Institutional Responsibilities

• An institution must have a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students, and postdoctoral researchers who will be supported by NSF to conduct research. As noted in GPG Chapter II.C.1e, institutional certification to this effect is required for each proposal.

• While training plans are not required to be included in proposals submitted to NSF, institutions are advised that they are subject to review, upon request.

• An institution must designate one or more persons to oversee compliance with the RCR training requirement.

• Institutions are responsible for verifying that undergraduate students, graduate students, and postdoctoral researchers supported by NSF to conduct research have received training in the responsible and ethical conduct of research.
Sponsor Requirements

• The University certifies that students, faculty, and staff participating in projects funded by NSF are receiving training in the responsible conduct of research (RCR).

• Some NIH mechanisms require a plan for training in RCR to be included in the proposal. NIH study sections evaluate the plans. This training may not be completed entirely online. Applications with unacceptable plans will not be funded.

• Both NIH and NSF indicate that contact hours must be substantive (e.g. 8 contact hours) and training must occur at least once during each career stage (not less than every 4 years).

• Other sponsors of research may have additional or different requirements.

• The definition of “funded by” could include personnel who use equipment purchased by funds provided by a sponsor.
Sponsor Requirements (cont)

- RCR training includes
  - Data acquisition, management, sharing and ownership
  - Conflict of interest and commitment
  - Human subjects
  - Animal welfare
  - Research misconduct
  - Publication practices and responsible authorship
  - Mentor/trainee responsibilities
  - Peer review
  - Collaborative science
  - Implications on society
Observed need for training

• Students express interest in more training in feedback obtained by the Graduate School at its seminars and orientation program. They express a desire to know how to conduct research according to the “rules of the road.”

• RCR training for graduate students has been inconsistent across campus. Some students obtain substantial training, but others receive little. This has caused problems for students, including research misconduct cases, and delays in completing research.

• It is unreasonable to expect that every faculty mentor provide and track training in Banner for each student performing research, and to certify that every student supported by a federal grant has been trained before they do any research.

• Therefore, the best option is to have training tracked centrally, and initially offer University-wide program that satisfy sponsor requirements. This will ensure compliance with sponsor requirements, and establish a framework for more flexible options in the future.
University Response

- Since fall semester 2008, the Graduate School has incorporated basic aspects of RCR training into its orientation program. Since 2008, all graduate students have been required to attend orientation. Post-docs and others are welcome to attend whenever space is available. Post-docs, faculty, and staff are invited to volunteer as co-presenters and facilitators.

- Beginning spring semester 2012, all post docs and supported graduate students will be required to complete basic and advanced RCR training. Beginning spring semester 2013, all unsupported graduate students will be required to complete basic and advanced training. The training will be tracked by the Graduate School as a service to these scholars and their advisors:
University response (cont)

– Basic RCR training requirements will be satisfied by:
  • Attendance at graduate student orientation (post-docs may serve as facilitators, or participate in facilitator training to receive credit for the training).
  • Completion of an online CITI course. (This has been a requirement for graduate students since fall 2008.)
University Response (cont)

– Advanced RCR training requirements will be satisfied by:

  • Successful completion of UN0500 – Effective Scholarship. This one credit course has a fee associated with it, but tuition will not be assessed.

  • Completion of a series of courses or modules that in combination address at least six out the eight learning objectives that make up the Advanced RCR training program.

  • Completion of advanced training modules through CITI or other online source.
University response (cont)

• Programs may submit a form (not yet available) to the Graduate School to exempt graduate students from participating in advanced RCR training for one of two reasons:
  – s/he is not in a research degree program and the department/school/college does not feel that the student will benefit from the training program and the student is not supported by either internal or external funds and the student will not ultimately complete a thesis or dissertation at Michigan Tech,

• or
  – the department/school/college offers an equivalent training program and tracks students’ attendance and documents students’ completion of the program in Banner.
University Response (cont)

• The Graduate School hosts a web page that describes the learning objectives of for the basic and advanced programs and provides language that can be used to aid in proposal preparation.

• Additional training must be handled by the departments and programs that house students or by another training method. For example, human subjects training can be satisfied through completion of an advanced part of the online CITI course. This training is only required of scholars who will be conducting human subjects research.
Rationale for including all students

• All students are being required to complete basic and advanced RCR training unless an exemption is requested as described in the previous section, based on the following reasons:
  • Faculty will be able to immediately have students begin work on sponsored projects, will not need to wait to determine if they are properly trained, and will know what training the students have received.
  • Additional training will reduce the number of students with academic integrity and research misconduct issues, which will help students make better progress toward their degrees and be more productive in their research.
  • Additional training will reduce the likelihood that a student’s thesis or dissertation research will be unacceptable.
  • The training is a key component of professional preparation of students that falls outside of most disciplinary faculty members’ teaching interests.
Proposing substitute courses and workshops

- A committee of faculty and staff will be appointed by the Vice President for Research and the Dean of the Graduate School to consider courses and workshops as possible substitutions for UN0500. Approved courses/workshops will be listed on a website. Until such time as there are courses/workshops that satisfy all of the possible learning objectives, students who take a pre-approved course or workshop will be exempted from the part of UN0500 that covers the same content. In the future, students may be able to satisfy all of the advanced requirements by taking a series of courses and workshops.
Recommended schedule for completion

• Graduate students
  – Basic training (Orientation) completed within first two semesters of initial matriculation.
  – Advanced training (UN0500 or other) completed within second or third semesters of enrollment. Enrollment in UN0500 will not be allowed in most cases during the first semester of enrollment.

• Post docs
  – Complete both segments of the training within the first two semesters of employment
Consequences for not completing training

- Graduate students who do not complete training will have a registration hold placed on their account and will be unable to register for classes until the training is complete.

- Post docs and graduate students who do not complete the full training within the specified time frame will not be eligible to be paid from a sponsored programs account until the training is completed.
Faculty Member Unsuccessfully Passes Blame to Students for Plagiarism

A faculty member at a university in Michigan knowingly copied plagiarized material from his students into his NSF proposal and when questioned, deflected the blame for his misconduct to them. The university's investigation concluded that the faculty member committed research misconduct by plagiarizing 60% of the copied text from a student's thesis.

With respect to the remaining copied text, we learned that a second student provided the faculty member (who was also his mentor) with the plagiarized text, knowing the material would be used in a proposal requesting support for his dissertation. Like the first student, this student is a non-native English speaker with little or no training in presenting scientific material in English. The university concluded that the student lacked sufficient knowledge of the need for and mechanics of proper attribution, thus making him incapable of having the minimal level of intent for a finding of misconduct. Noting that as a university it did not provide the student with sufficient training, the university has taken steps to educate its students about appropriate citation. We agreed that under the circumstances of this case, this student did not have the requisite intent for a finding of research misconduct.

We forwarded our recommendation to NSF for a finding of research misconduct against the faculty member for knowingly plagiarizing material from his student's thesis and recommended that NSF send a letter of reprimand to the faculty member, ban the faculty member from serving NSF in an advisory capacity for 2 years, and require the faculty member to: 1) for 1 year, submit a description of his plans for training his students and postdoctoral associates in conjunction with any proposal he submits to NSF; 2) for 1 year, submit certifications by him and assurances by a responsible official at his employer each time he submits proposal or reports to NSF stating the documents do not contain plagiarism, falsification, or fabrication; 3) submit within 1 year a certification of completion of a course in research ethics; and 4) certify retraction of a proceedings paper also containing the unattributed plagiarized text.
Proposal for a non-departmental Ph.D. Program in Biochemistry and Molecular Biology (BMB)
Submitted by the Biochemistry and Molecular Biology Doctoral Planning Group

Contacts: P. Murthy (Chemistry), R. Wusirika (Biological Sciences), C.P. Joshi (Forestry and Environmental Sciences)

March 21, 2011

There is a growing world-wide demand for scientists and engineers with advanced training in biochemistry and molecular biology. In particular, there is a recognized need for society to understand and respond to problems associated with human health, medicine, forestry and agriculture at the biochemical and molecular levels. Powerful new research tools for understanding these complex processes, such as complete genomes (of humans, animals, crop plants and trees), multi-scale computer models, and applications of “omics” technologies including pharmacogenomics (designing specific therapies based on individual genomes) are being rapidly developed. To successfully participate in these advanced research and development endeavors students need graduate-level training in biochemistry and molecular biology. Furthermore, these research problems and the techniques used to address them are inherently interdisciplinary in nature, and therefore span traditional departmental boundaries.

Michigan Tech has a long and rich history of research in the exciting field of biochemistry and molecular biology. Recent conceptual and technological advancements have widened the scope of what is possible to study in these fields and correspondingly, many recent faculty hires in individual departments and through the Strategic Faculty Hiring Initiative have increased the ranks of those around campus (Biological Sciences, Chemistry, Forest resources and Environmental Sciences, Chemical Engineering, Biomedical Engineering, Mathematics) engaged in biomedical research, plant genomics and other health-related biochemistry and molecular biology studies. Our ability to carry out cutting edge research in these areas will strongly benefit from greater coherence and integrated graduate training. Here, we propose a new doctoral degree program in Biochemistry and Molecular Biology (BMB) which would consolidate our dispersed resources and expertise. This would provide a more appropriate degree program for some of our current and future graduate students as well as a stronger and more focused educational experience for all students involved in molecular level investigations of life processes. Items required by the University Senate for proposing new academic programs (Proposal 108.1.1) are detailed in this proposal.

This program would be categorized within the one or both of the following two CIP codes:
- 26.0210  Biochemistry/Biophysics and Molecular Biology
- 26.0299  Biochemistry, Biophysics and Molecular Biology, Other

1. General description and characteristics of the program

A growing number of faculty and graduate students at Michigan Tech are working in the area of biochemistry and molecular biology. These include members of the Departments of Chemistry, Biological Sciences, Chemical Engineering, Biomedical Engineering and the School of Forest Resources and Environmental Sciences. Active research programs, courses, and a growing number of graduate degrees based on work in this area already exist. The current initiative is to build on the established and emerging research programs by developing a new,
coherent, non-departmental Ph.D. program whose primary focus is the graduate education of students in the interdisciplinary areas of biochemistry and molecular Biology (BMB).

A core group of 14 graduate faculty members will be involved in the BMB Ph.D. program (Table 1). The BMB Core Faculty are those who likely would advise Ph.D. students in the program, teach relevant lecture and laboratory courses, serve on qualifying exam committees, be elected to serve on the steering committee and otherwise perform programmatic duties of graduate faculty. Current members are from the Departments of Biological Sciences, Chemistry, and the School of Forest Resources and Environmental Sciences.

The BMB program is open to faculty and students with overlapping research and academic interests. Michigan Tech faculty with close research interests include Drs. S. Bagley (BL), M.H. Song (BL), D. Shonnard (CM), C.-A. Peng (CM), A. Minerick (CM), C. Heldt (CM), T. H. Donahue (MEEM), S. Donahue (BE), M. Frost (BE), R. Rajachar (BE) and others. We expect that some of these faculty members will be interested in participating in the BMB Ph.D. program by joining the BMB Core Faculty group and participating in associated teaching and service duties. Other faculty members advise graduate students who will benefit from the new course offerings and other educational activities resulting from this program as their research focus needs a detailed understanding of biochemistry and molecular biology.

We anticipate that a coherent program in BMB will help to attract future faculty with diverse expertise in this area into the above departments as well as other department such as the Departments of Chemical Engineering and Biomedical Engineering.

**Table 1. BMB Core Faculty**

**Department of Biological Sciences**

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Department of Chemistry

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Pushpalatha Murthy, Ph.D.
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Martin Thompson, Ph.D.
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Protein-protein interactions and design of small peptide-based inhibitors of protein-interactions
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Ashutosh Tiwari, Ph.D.
Assistant Professor
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School of Forest Resources and Environmental Sciences

Victor Busov, Ph.D.
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Organizational Structure and Administration

The Biochemistry Ph.D. program, as an interdisciplinary, cross-department program, will be administered through the Graduate School. Participating faculty will elect a three-member steering committee. The committee will elect a Graduate Program Director who will work closely with the Dean of the Graduate School and will be assisted by a staff member. Most biochemistry and molecular biology grants are affiliated with the Biotechnology Research Center (BRC) so the staff member of BRC will provide some assistance.

The Graduate Program Director and the Steering Committee, with the help of BMB Core faculty, will review applications, make admission decisions, determine whether or not changes to the program need to be made (e.g., changing the “approved” curriculum or adding or removing faculty from participation). The home departments of the core courses are committed to offering them on a regular basis. Students enrolled in the program will be housed within the home department of their advisors. The home departments will provide office space, computational resources, and necessary supplies and infrastructure support, and will consider the students for departmental teaching assistantships when appropriate and available. All such students will be counted as members of their home departments for the purposes of internal university accounting.

2. Rationale

The new program responds to a national and international need for more researchers to address problems in the areas of human health, disease treatment and sustainable environment at a molecular level. Advanced education in biochemistry, molecular biology and related fields is essential for creative and productive approaches to these problems. This initiative is motivated by the following:

• This program provides a mechanism for recruiting more highly qualified graduate students by providing a degree that encompasses the interdisciplinary nature of biochemical research better than existing programs within individual academic departments. Currently, students interested in BMB must apply to programs in Biological Sciences, Chemistry, or the School of Forest Resources and Environmental Studies, which have their own curriculum and culture. This new BMB program would attract additional Ph.D. students who wish to have a broader interdisciplinary academic experience focused on biochemistry and molecular biology.

• The new program builds on current strengths with a core group of 14 faculty in three different departments committed to the BMB program. The program could be offered as soon as it is approved. Several existing students are already interested in entering the program.
Many graduate-level biochemistry and molecular biology courses are currently offered at Michigan Tech in separate departments and this program would streamline existing faculty effort by helping to identify and eliminate redundancies and increase enrollments in courses that are currently undersubscribed. New graduate courses will be added to address existing deficiencies and serve the needs of students in several disciplines. The new courses along with existing courses will be organized into a coherent program.

The Ph.D. in BMB is attractive to students as they will have a degree in their area of interest. In addition, the area of expertise of students will be obvious to academic and private sector employers because it is not currently apparent to employers that Michigan Tech students educated in Chemistry, Biological Sciences, or Forest Resources and Environmental Studies have specialized Ph.D. level training in biochemistry and molecular biology.

The new program would enhance interdisciplinary research at Michigan Tech by bringing together graduate students and faculty housed in different departments who are conducting related research.

The new BMB program will be housed in the Graduate School. It will be overseen by a Steering Committee made up of BMB Core Faculty.

Research in biochemistry and molecular biology is well funded and the new program could help with efforts to increase external funding.

3. Discussion of related programs within the institution and at other schools

There are currently three biochemistry Ph.D. programs (The University of Michigan, Ph.D. in Biological Chemistry; Michigan State University, Ph.D. in Biochemistry and Molecular Biology; Wayne State University, Ph.D. in Biochemistry and Molecular Biology) in the State of Michigan. The character of the biochemistry degree programs vary depending on the research emphasis of the faculty. The faculty involved in this program at Michigan Tech form a unique and broad mix involving biological chemistry, molecular and cellular biology, chemical biology, plant physiology, biomedical science and engineering, biochemical engineering, biomechanical engineering, forest molecular biology and genomic sciences. This combination of subject areas spans the major sub-disciplines of biochemistry and molecular biology. Job opportunities for Ph.D. graduates in BMB are excellent and are expected to remain so as a result of national and international priorities in medicine, health, agriculture, forestry and bioenergy fields.

4. Projected enrollment

We anticipate that 2-5 students will enter the program immediately and that within five years the program will have between 15-20 students.

5. Scheduling plans

We are aiming for implementation by Fall Semester 2011. Participating departments have committed to offer core courses on a regular basis.
6. Curriculum design

Course requirements are designed to ensure that all students have a firm understanding of the fundamentals of biochemistry and molecular biology, including the principles underlying biochemical structure, biochemical dynamics, molecular biology, genomics and biotechnology. These principles will be covered in three core courses BMB5010, BMB5020 and BMB5030. The set of core courses will be offered annually. This ensures that students will be able to complete the core courses and be prepared to take the qualifying examinations during their second year.

6.1 Required Core Courses

Three 5000-level courses (three credits each), a seminar course (BMB5040; one credit), and doctoral research (BMB 6990) will form the core of the curriculum for the BMB doctoral program. The courses are BMB 5010: Advanced Biochemistry, BMB 5020: Advanced Molecular Biology, and BMB5030: Modern BMB techniques, descriptions in Section 7 below). These courses cover the fundamentals of biochemistry and molecular biology. The three core courses will be developed and team taught by the BMB core faculty from the departments of Biological Sciences, Chemistry, and the School of Forest Resources and Environmental Sciences. These courses will provide the necessary background in the areas of biochemistry and molecular biology including genomics and biotechnology. The Departments of Chemistry and Biological Sciences and the School of Forest Resources and Environmental Sciences have agreed to support the creation of these new courses.

In addition to the nine core course credits above, students, depending on their academic background, may be required to take additional courses to provide the breadth and depth necessary for graduate research. The necessary courses will be suggested by the student’s Advisor in consultation with the Advisory Committee. The courses may be at the 3000-, 4000- or 5000- level. A partial listing of 5000 level courses is included below (7.2). Courses used to satisfy the requirements for a degree will conform to Graduate School policies regarding required grades, overall GPA, and academic level.

Students will be required to complete a seminar course (BMB5040, 1 credit). Instead of duplicating seminar courses offered by other departments, BMB5040 may include elements of graduate level seminar courses currently offered by other departments such as Biological Sciences (BL5503), Chemistry (CH5900) and the School of Forest Resources and Environmental Sciences (FW5800) and others.

Students conducting research will enroll in (BMB6990).

Students will need a total of 60 credits beyond a Bachelor degree or 30 credits beyond a Master degree, per Graduate School requirements.

6.2 Qualifying Examination

Each student must pass a written qualifying exam followed by an oral exam no later than the end of the second year of graduate study (Spring semester of second year). This examination will cover topics covered in the core courses BMB 5010, BMB 5020 and BMB 5030. The purpose of the examination is to determine the student’s mastery of knowledge in biochemistry and molecular biology and the ability to apply this knowledge. Each examination will be written by a committee of four faculty members who have been involved in teaching BMB5010, BMB5020 and BMB5030. All students in the program will take the same qualifying exam. The committee will grade the qualifying exam and conduct the oral examination. On the basis of the student’s
performance, the committee will decide whether or not each student passes; a student will pass if a majority of committee members vote in the affirmative. Students who do not pass the examination will be allowed a second attempt. Failure to pass the Qualifying examination in two attempts will result in dismissal from the Ph.D. program; both attempts must be completed by the end of the second year.

6.3 Proposal defense

The student will present a proposal followed by an oral defense of the research plan to his/her Advisory Committee. The proposal should be submitted within one year of successfully completing the qualifying examinations above (6.2) and no later than the completion of the third year in the Ph.D. program. The student's advisory committee must unanimously agree that the research plan is acceptable. The oral proposal is open to the University community.

6.4 Doctoral dissertation and final oral examination

The research conducted by the student will be presented to the Advisory Committee as a written dissertation. An oral presentation of that dissertation will be made following the completion of the written work. The committee will consist of at least four members of the graduate faculty. At least one of these will be from outside the student's administrative home department or school. The dissertation is acceptable if the advisor and at least two of the remaining three members of the Advisory Committee concur on its acceptance. The oral defense is open to the University community.

7. New course descriptions

**BMB5010 Advanced Biochemistry**  This course will focus on the relationships between structure and function of proteins, nucleic acids lipids and carbohydrates. Specific topics include enzyme catalysis, binding and allosterism, protein-protein interaction and protein-nucleic acid interaction, membrane function and signal transduction. Classic and current papers may accompany the lecture material. Foundations in basic biochemistry and molecular biology are required for this course. Credits: 3.0. Lec-Rec-Lab: (3-0-0). Semesters Offered: Fall.

**BMB5020 Advanced Molecular Biology**  This course will focus on the gene structure, gene duplication gene expression, gene regulation, DNA recombination, DNA repair and transposition. Comparison between prokaryotes and eukaryotes will be drawn. Genomics and modern biotechnology methods will be discussed. Classic and current papers may accompany the lecture material. Foundations in basic biochemistry and molecular biology are required for this course. Credits: 3.0. Lec-Rec-Lab: (3-0-0). Semesters Offered: Fall.

**BMB5030 Modern BMB Laboratory**  This is an intensive laboratory course that focuses on protein chemistry, nucleic acid chemistry, genomics and biotechnology. Students will rotate between research labs of four faculty where they will gain in-depth laboratory experience in modern biochemistry and molecular biology. Credits: 3.0. Lec-Rec-Lab: (0-0-3). Semesters Offered: Spring.

**BMB6990 Doctoral Research**  Original research that culminates in a PhD dissertation. Credits: Variable to 12.0. May be repeated; Graded Pass/fail only. Semesters offered: Fall/Spring. Restrictions: Permission of instructor required. Must be enrolled in one of the following level(s): Graduate
7.1 Courses currently offered in Biochemistry and Molecular Biology at the 5000 level

- **BL5030 - Molecular Biology**  Molecular biology of gene structure, expression and regulation. Molecular techniques and their application to biotechnology and genomes are covered. Credits: 3.0. Lec-Rec-Lab: (3-0-0). Semesters Offered: Fall; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

- **BL 5035 – Bioimaging**  Current concepts in light and electron microscopy and scanning probe techniques. Theory and practice of fluorescence (including confocal and multi-photon), atomic force, scanning and transmission electron, and video microscopy as applied to biological specimens with an emphasis on sample preparation. Emphasis will be placed on application of advanced techniques. Half semester course. Credits: 2.0. Lec-Rec-Lab: (0-4-0). Semesters Offered: Fall - Offered alternate years beginning with the 2010-2011 academic year. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior.

- **BL 5042 - Scanning Electron Microscopy of Biological Specimens**  Hands-on training in operation of the scanning electron microscope (SEM). Students prepare biological specimens of their choice for observation. Emphasis will be placed on application of advanced techniques. Successful completion of course is prerequisite to becoming a certified SEM operator in the ACMAL. Half semester course. Credits: 2.0 Lec-Rec-Lab: (0-2-6). Semesters Offered: Spring - Offered alternate years. Pre-Requisite(s): BL 5035

- **BL 5052 - Fluorescence and Video Microscopy of Biological Sciences**  Hands-on training in fluorescence microscopy and video microscopy. Students prepare biological specimens of their choice for observation. Emphasis will be placed on application of advanced techniques. Half semester course. Credits: 2.0 Lec-Rec-Lab: (0-2-6). Semesters Offered: Spring - Offered alternate years. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior. Pre-Requisite(s): BL 5035

- **BL 5062 - Transmission Electron Microscopy of Biological Specimens**  Hands-on training in operation of the transmission electron microscope (TEM). Students prepare biological specimens of their choice for observation. Emphasis will be placed on application of advanced techniques. Successful completion of course is prerequisite to becoming a certified TEM operator in the ACMAL. Half semester course. Credits: 2.0 Lec-Rec-Lab: (0-2-6). Semesters Offered: Spring - Offered alternate years. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior. Pre-Requisite(s): BL 5035

- **BL 5145 - Plant-Microbe Interactions**  Interactions between plants and microorganisms in the environment. Topics include microbial virulence, signaling, gene expression, beneficial interactions and disease resistance in plants. Laboratory will focus on plant biochemical and microbiological methods as they relate to environmental problems. Credits: 3.0 Lec-Rec-Lab: (2-0-2) Semesters Offered: Fall Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

- **BL 5503 - Graduate Research Seminar**  Seminar is designed to facilitate critical discussions of student research projects at various stages of their development. The presenter will provide a seminar on their project and research goals, which will establish the foundation for the discussion thereafter. Credits: 1.0; May be repeated. Lec-Rec-Lab: (0-1-0). Semesters Offered: Fall

- **CH 5110 - Pharmaceutical Chemistry: Drug Action**  Focuses on structural and mechanistic approaches to pharmaceuticals and drug action. General principles of absorption, distribution, action, metabolism, and toxicity of drugs will be presented followed by action of drug classes such as antibiotics, cardiovascular, and anti-inflammatory drugs. Credits: 3.0. Lec-Rec-Lab: (3-0-0). Semesters Offered: Spring. Restrictions: Must be enrolled in one of the following Level(s): Graduate

- **CH 5120 - Pharmaceutical Chemistry: Drug Design**  Focuses on the important concepts in the design and synthesis of drugs. Rational basis for drug design including synthetic, computational, and biochemical concepts will be
discussed. Topics include structure-activity relationships, synthesis and reaction mechanism, and case studies of drugs. Credits: 3.0  Lec-Rec-Lab: (3-0-0) Semesters Offered: Fall  Restrictions: Must be enrolled in one of the following Level(s): Graduate

- **CH 5210 - Analytical Separations**  Covers theory and applications of modern gas chromatography, high performance liquid chromatography, and ion chromatography as well as instrumentation for these techniques. Studies trace organic analysis and environmental problems. Credits: 3.0  Lec-Rec-Lab: (3-0-0) Semesters Offered: Spring. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

- **CH 5230 - Mass Spectrometry and Fluorescence**  Fundamentals and applications of gas chromatography-mass spectrometry, liquid chromatography-mass spectrometry and fluorescence spectroscopy. Credits: 3.0. Lec -Rec-Lab: (3-0-0). Semesters Offered: On Demand  Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

- **CH 5570 - Advanced Biophysical Chemistry**  A discussion of experimental techniques and applications of physical chemistry principles to the study of the structure, dynamics, and chemical reactions of proteins, nucleic acids, and other biopolymers. Credits: 3.0. Lec-Rec-Lab: (3-0-0). Semesters Offered: On Demand. Pre-Requisite(s): CH 3520

- **FW 5070 - Developmental and Ecological Genetics**  Course will provide current knowledge on signal perception, transduction and response pathways in higher eukaryotes with most examples primarily from but not limited to plants in a lecture and colloquium format. Topics will cover major developmental pathways, and molecular bases of adaptation to biotic and abiotic factors. Credits: 3.0  Lec-Rec-Lab: (1-2-0) Semesters Offered: Fall Pre-Requisite(s): BL 5030

- **FW 5076 - Molecular Techniques in Ecology**  The course provides knowledge on molecular techniques used in ecology, population biology, and evolutionary studies. Credits: 3.0; Graded Pass/Fail Only Lec-Rec-Lab: (3-0-0) Semesters Offered: Fall - Offered alternate years beginning with the 2010-2011 academic year

- **FW 5082 – Gene Expression Data Analysis**  Students will learn statistical methods and skills for analyzing large-scale gene expression data resulting from high-throughput technologies, become familiar with various bioinformatics tools and resources, and develop useful working knowledge of how to analyze genetic data. Credits: 3.0  Lec-Rec-Lab: (3-0-0) Semesters Offered: Spring - Offered alternate years beginning with the 2010-2011 academic year

- **FW 5089 - Tools of Bioinformatics**  Computer applications in molecular biology. Hands-on experience with using popular computer programs for DNA, RNA and protein sequence analysis, database management, data editing, assembly, and organization, multiple sequence comparisons, protein structural analysis, evolutionary relationships of genes, use of Internet for data retrieval, comparison and analysis. Credits: 4.0  Lec-Rec-Lab: (2-1-2) Semesters Offered: Fall - Offered alternate years beginning with the 2011-2012 academic year

- **FW 5413 - Sustainable Biomass**  Production and management systems involving biomass for bioenergy and biofuels applications in native forests and energy plantations. Emphasis on integration across systems and values in the context of environmental sustainability. Credits: 3.0  Lec-Rec-Lab: (2-1-0) Semesters Offered: Fall - Offered alternate years beginning with the 2010-2011 academic year Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

- **FW 5413 - Sustainable Biomass**  Production and management systems involving biomass for bioenergy and biofuels applications in native forests and energy plantations. Emphasis on integration across systems and values in the context of environmental sustainability. Credits: 3.0  Lec-Rec-Lab: (2-1-0) Semesters Offered: Fall - Offered alternate years beginning with the 2010-2011 academic year Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
• **FW 5800 - Master’s Graduate Seminar** Presentation by students of current forest resource-related problems and research. Some instruction on presentation skills. **Credits:** 1.0 **Lec-Rec-Lab:** (0-1-0) **Semesters Offered:** Fall, Spring **Restrictions:** Must be enrolled in one of the following Level(s): Graduate

• **FW 5850 - Effective Grantsmanship Workshop** Ability to write successful grant application is an important part of graduate education. Students will learn basic techniques of grant writing for federal, industrial, and international funding agencies and will submit a well-organized proposal for peer review in the class. **Credits:** 2.0 **Lec-Rec-Lab:** (1-1-0) **Semesters Offered:** Spring **Restrictions:** May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

### 7.2 Potential additional courses

New courses will be offered based on the needs of graduate students and the expertise and availability of affiliated faculty. Potential new courses include, Bioremediation; Cancer/tumor metabolism; and Metabolic impact of pollutants.

### 8. Library and other learning resources

The program builds on existing resources, so it is not anticipated that new library or other learning resources will be required.

### 9. Computing Access Fee

Initially each student will pay the Computing Access Fee appropriate to the advisor’s home department. The program will revisit this issue as circumstances dictate.

### 10. Faculty resumes

Attached below.

### 11. Description of available/needed equipment

Faculty listed in Table 1 have fully functioning laboratories with the necessary equipment and computers. No new equipment is required to startup this program.

### 12. Program costs

No new resources are requested, and costs associated with recruiting and other program administration will be handled through the Graduate School and the departments of Biological Sciences, Chemistry, and Forest resources and environmental sciences and the BRC.

### 13. Space

No new space is required
14. Policies, regulations and rules

Described in Section 1 (faculty participation) and Section 6 (curriculum requirements) above.

15. Accreditation requirements

Not applicable

16. Internal status of the proposal

Approved by the Department Chairs and the Deans of the College of Sciences and Arts and the School of Forest Resources and Environmental Sciences (See attached signature sheet). Preliminary review by the Dean of the Graduate School completed. Reviews by the Provost, Dean’s Council, Graduate Faculty Council, and University Senate are pending.

17. Planned implementation date

There are students currently attending Michigan Tech who are interested in the BMB PhD program so we are aiming for implementation by Fall Semester 2011.
Biographical Sketch

Victor B. Busov
Associate Professor
Michigan Technological University
School of Forest Resource Environmental Science
185 Horner Hall
Phone: 906-487-1728
Fax: 906-487-2915
Houghton, MI 49931
E-mail: vbusov@mtu.edu

Education
Oregon State University  Molecular biology  Post-doc., 2004
North Carolina State University  Genetics  Ph.D., 2001
Southern Illinois University  Forestry  M.S., 1996
Bulgarian Higher Forestry Institute  Forestry  B.S., 1990

Appointments
05/08-present  Associate Professor, Michigan Technological University.  Functional genomics of adaptation and development in trees.
03/04–05/08  Assistant Professor, Michigan Technological University.  Functional genomics of adaptation and development in trees.
12/01–01/04  Post-doctoral Research Associate, Oregon State University
Activation tagging for gene discovery in poplar.
08/96–12/01  Graduate Research Assistant, North Carolina State University.
Microarray analysis of auxin-regulated gene expression in loblolly pine.
08/94–01/96  Graduate Research Assistant, Southern Illinois University
Allozyme analysis of diversity and genetic structure of black walnut in central U.S.
01/96–06/96  Intern (during M.S. work), Westvaco Corporation (now MeadWestvaco)
Clonal propagation of loblolly pine and cottonwoods.
11/90–08/94  Research Associate, Bulgarian Academy of Sciences
Breeding, propagation and conservation of Fagus species in southeastern Europe.

Selected Publications

**Synergistic Activities**
1) Member of IUFRO Working Party S3. 02-03
2) Member of American Society of Plant Biologist
3) American Association for the Advancement of Science (AAAS)
4) Namkoong’s Family Fellowship for Academic and Teaching Excellence, 2000
6) Ad Hoc reviewer: NSF Multiple Directorates and Programs, USDA-NRI Competitive Grants Program.
7) Ad Hoc manuscript reviewer: *Transgenic Research, Plant Science, Tree Physiology, Plant Molecular Biology, New Phytologist*.
8) Invited participant in the *Populus* genome sequence annotation jamboree. Dec 6-10, 2004, Joint Genome Institute, Walnut Creek, CA

**Collaborators**
Allen, N., NCSU; Brunner, A.M., OR State U; Davis, J., DOE; DiFazio, S.P., DOE, ORNL; Garcia, C., NCSU; Goldfarb, B., NCSU; Johannes, E., NCSU; Kung, F., S. Illinois U.; LeBude, A., NCSU; Pearce, D., U. of Lethbridge, CAN; Pregitzer, K., MTU; Rink, G., U.S. Forest Service; Rood, S.B., U. of Lethbridge, CAN; Sambeek, J.V., U.S. Forest Service; Sederoff, R.R., NCSU; Spiker, S.L., NCSU; Strauss, S.H., Oregon State U.; Sun, Y., NCSU; Swain, S., CSIRD, Australia; Tsai, C.-J., MTU; Tschaplinski, T.J., ORNL Oakridge, TN; Tuskan, G.A., ORNL, Oakridge; Whetten, R.W., NCSU; Woeste, K.E., Purdue University

**Graduate and Post-Doctoral Advisors**
M.S. Advisor: Kung, F., Southern Illinois University
Ph.D. Advisor: Goldfarb, B., NC State University; Spiker, S.L., NC State University
Post-doctoral Advisor: Strauss, S.H., Oregon State University

**Advisor and Postgraduate-Scholar Sponsor**
Hao Wei (OSU); Rewati Potkar (MTU); Zhan Ye (MTU); Trisha Colling (MTU); Chamini Geethenjalee (MTU); Shiv Thammanagowda (MTU); Fuyu Xu (Ph.D., MTU); Christine Zawaski (MTU); Elizabeth Etherington (OSU); Rama Joshi (MTU); Mahita Kadmiel (MTU); Rajinikanth Mohan (MTU)
Biographical Sketch

Tarun K. Dam
Assistant Professor
Department of Chemistry
Michigan Technological University
1400 Townsend Drive, Houghton, MI 49931
Phone: 906 487 2940
Email: tkdam@mtu.edu

Education
University of Calcutta, Calcutta, India  Protein Biochemistry  Ph. D. 1994
Indian Institute of Science, India  Protein Biochemistry  Trainee, 1993-1995
Albert Einstein College of Medicine, NY  Protein Biophysics     Postdoc, 1996-2000

Appointments
2010- Assistant Professor, Michigan Technological University, MI
2000-2010 Instructor (Full time Faculty), Albert Einstein College of Medicine, NY

Selected publications


Synergistic Activities

1) Received Young Scientist Award for “outstanding accomplishments and contributions in the field of microcalorimetry” given at ‘Biocalorimetry 2001 Conference: Philadelphia, PA.

2) Developed educational materials, which have been published in several books, such as Animal Lectins: A Functional View, (Vasta and Ahmed ed., Taylor and Francis); Comprehensive Glycoscience, (Kamerling, J. P., ed., Elsevier Ltd) and Lectins: Analytical Technologies, (Nilsson, C., ed., Elsevier B.V. Elsevier B.V).


5) Received invitation to deliver oral presentation at national scientific meetings and universities.

Collaborators

Thomas Gerken (Case Western Reserve University, Ohio)
Arturo Casadevall, John Blanchard (Albert Einstein College of Medicine, New York)
Benildo Cavada (Federal University of Ceará, Brazil)
Marit Sletmoen (The Norwegian University of Science and Technology, Norway)
Hans-J Gabius (Ludwig-Maximilians-University, Germany)
René Roy (Université du Quebec à Montréal, Canada)
Stefan Oscarson (Stockholm University, Sweden)

Membership

Society for Glycobiology
American Chemical Society
American Society for Biochemistry and Molecular Biology
Biographical Sketch

Rupali Datta
Assistant professor
Department of Biological Sciences
Michigan Technological University
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Education
Osmania University, India    Biology and Chemistry   B.S., 1987
University of Hyderabad, India  Life Sciences   M.S. 1989
University of Hyderabad, India, Life Sciences   Ph.D. 1997

Appointments
2008-present  Associate Professor, Department of Biological Sciences, Michigan Technological University, Houghton, Michigan
2004-2008  Assistant Professor, Department of Earth and Environmental Sciences, University of Texas at San Antonio, San Antonio, Texas
2003-2004  Research Assistant Professor and Senior Lecturer, Earth and Environmental Science Department, University of Texas at San Antonio,
2002-2003  Post-doctoral Fellow and Lecturer-I, Earth and Environmental Science Department, University of Texas at San Antonio, San Antonio, Texas
1998-2001  Post-doctoral Associate, Plant Pathology Department, University of Florida, Gainesville, Florida
1997-1998  Visiting Research Fellow, Japanese Society for Promotion of Science Fellowship) Niigata University, Niigata, Japan

Honors
1991-96  Junior and Senior Research Fellowships from the University Grants Commission, Govt. of India
1992  American Society for Plant Physiologists (ASPP) fellowship for Plant Biochemistry course at the University of California, San Diego
1994  Young Scientist Fellowship by 16th International Union of Biochemistry and Plant Molecular Biology Congress
1996-97  Senior Research Fellowship in project funded by Department of Science and Technology (Govt. of India)
1997-98  JSPS Research Fellowship by the Japanese Society for Promotion of Science
2004  Outstanding Young Scientist Award, 2004 Association of Agricultural Scientists of Indian Origin (AASIO)
2005  University of Texas at San Antonio Faculty Research Award.
2005  Early Career Award in Research. Southern Branch of the American Society of Agronomy

Selected Research Support
United States Environmental Protection Agency, 2002, $391,473/2y (Total): Biogeochemistry of arsenic in contaminated soils of Superfund sites

National Institutes of Health
Selected Refereed Publications (out of >160 refereed publications):


Biographical Sketch

Oliver Gailing
Assistant Professor of Ecological Genomics
School of Forest Resources and Environmental Science
Michigan Technological University, Houghton, MI 49931
Tel: 906-487-1615, email: ogailing@mtu.edu
Web Page: http://forest.mtu.edu/faculty/gailing/

Professional preparation
M. Sc. (Botany), University of Bochum, Germany, 1994
Ph.D. (Genetics), University of Halle, Germany, 2000
PostDoc (Genetics), Leibniz Institute IPK-Gatersleben, Germany, 2002-2002
Post lecturer qualification (Habilitation, Forest Genetics), University of Goettingen, Germany, 2009

Appointments
2009-present  Assistant Professor, Michigan Tech University
2008-2009  Research Scientist, Goettingen University, Germany
2002-2008  Assistant Professor ("Wiss. Assistent"), Goettingen University
2000-2002  Research Scientist (PostDoc), Leibniz Institute IPK-Gatersleben, Germany
1996-2000  Research Scientist (Ph.D), Leibniz Institute IPK-Gatersleben, Germany
1994-1996  Research Scientist, Bochum University, Germany

Five recent publications most closely related to the proposed project:


Five additional significant publications:


Synergistic activities

1) Ad hoc reviewer for international Journals (e.g. BMC Plant Biology, BMC genomics, Conservation Genetics, Molecular Ecology, New Phytologist, Plant Biology, Physiologia Plantarum, Plant Cell and Environment, Plant Systematics and Evolution)

2) Ad hoc reviewer for Agence Nationale de la Recherche (France); ERANET, European Union’s 6th Framework Program for Research

3) Session Chair in international conferences, (AOX symposium, 2009, Evora, Portugal, Fagaceae Genomic conference (Raleigh November 10 -13, North Carolina)

4) Ph.D. Committees: Klaus Richter (University Kassel, 2009), Jerome Durand (University of Bordeaux, December 2009)

5) Developed a new class in Ecological Genomics

Honors and Awards

1/2009: Habilitation (Post Lecturer Qualification) for Forest Genetics and Forest Tree Breeding at the Georg-August University of Göttingen

7/2000 Luther certificate of the University Halle / Wittenberg for the PhD thesis

Graduate and Postdoctoral advisors:

Prof. Dr. Reiner Finkeldey, Prof. Dr. Konrad Bachmann, Prof. Dr. Thomas Stuetzel

Thesis Advisees:


Biographical Sketch

Gibson, K. Michael
Professor and Chair
Department of Biological Sciences
Michigan Technological University
1400 Townsend Drive, Houghton, MI-49931
Phone: (906) 487-2025
Email: kmgibson@mtu.edu

Education
University of California, Riverside, CA     Biochemistry     B.S. 1977
University of Colorado, Boulder, CO  Chemistry   M.S. 1979
University of California, San Diego, CA  Chemistry   Ph.D. 1983

Appointments, Honors, Awards
1984 - 1986  Postdoctoral Fellow, Dept. Pediatrics, University of California, San Diego, La Jolla, CA
1985 - 1986  Bank of America-Giannini Foundation Fellow
1986 - 1988  Assistant Research Biochemist, Dept. Pediatrics, Univ. of California, San Diego, La Jolla, CA
1988 - 1998  Senior Research Scientist, Institute for Metabolic Disorders, Baylor University Medical Center and Baylor Research Institute, Dallas, Texas
1991 - 1992  Alexander von Humboldt Foundation Research Fellow, Heidelberg, Germany
1989 - 1994  Assistant Professor of Biomedical Studies, Baylor University, Waco, Texas
1989 - 1995  Adjunct Assistant Professor of Biological Sciences, Southern Methodist University, Dallas, TX
1994 - 1998  Associate Professor of Biomedical Studies, Baylor University, Waco, TX
1995 - 1998  Adjunct Associate Professor of Biological Sciences, Southern Methodist University, Dallas, TX
1995 - 1998  Adjunct Associate Professor/Neurology, Univ. Texas Southwestern Medical School, Dallas, TX
1998 - 2001  Associate Professor, Depts. of Molecular and Medical Genetics and Pediatrics, Oregon Health & Science University, Portland, Oregon
1998 - 2005  Director, Biochemical Genetics Laboratory, Oregon Health & Science University, Portland, OR
1999 - 2009  Board Certified Clinical Biochemical Geneticist, American College of Medical Genetics
2001 - 2005  Professor, Dept. Molecular and Medical Genetics, Oregon Health & Science University
2004-   Komrower Memorial Lecturer, Annual Meeting, Society for Study of Inborn Errors of Metabolism, Amsterdam August 31 - September 4, 2004
2005- 2009  Director, Biochemical Genetics Laboratory, Children’s Hospital of Pittsburgh of UPMC
2005 - 2009  Professor, Pediatrics, Pathology, Human Genetics, University of Pittsburgh School of Medicine
2009-    Pres Professor and Chair, Biological Sciences, Michigan Technological University
2008    NIH Site Visit, PDEGEN (Program in Developmental Endocrinology/Genetics), March 26-28.

Selected Publications (from 258)


Biographical Sketch

Michael R. Gretz
Biotechnology Research Center
Department of Biological Sciences
Michigan Technological University
Houghton, MI 49931-1295
Telephone: (906)487-3175,
Email: mrgretz@mtu.edu
www.desmids.mtu.edu

A. Professional Preparation:
Ph.D. 1981, Arizona State University; Botany (Plant Biochemistry)
B.Sc., 1977, Central Michigan University; Chemistry & Biology

B. Appointments:
2010-present: Director, Biotechnology Research Center, Michigan Technological University
2007-2008: Visiting Scholar, Scripps Institution of Oceanography, UCSD
1999-present: Professor of Biological Sciences, Michigan Technological University
1993-1999: Associate Professor of Biological Sciences, MTU
1992-1993: Associate Professor of Biology (Tenured), George Mason University
1989-1992: Director, Shared Research Instrumentation Facility, GMU
1988-1989: Co-Director, Center for Basic and Applied Research, GMU
1986-1991: Assistant Professor of Biology, GMU
1984-1986: Postdoctoral Research Assoc., Univ. of Texas, Austin with R. Malcolm Brown
1981-1984: Postdoctoral Research Fellow, Mcmaster University with E. L. McCandless

C. Publications:
FIVE SELECTED PUBLICATIONS RELATED TO PROPOSED PROJECT:


OTHER PUBLICATIONS (last five years):

D. Synergistic Activities:
Elected Treasurer, Phycological Society of America 2004-2006
AAAS Section G Committee representative 2006-2008
Organized NSF funded "Modern Methods" workshop at International Botanical Society meeting 2002

Patents:

E. Collaborators (last 48 mo.):
Ziegler, Sue. Memorial University of Newfoundland, Canada
Liepman, Aaron. Eastern Michigan University
Hildebrand, Mark. Scripps Institution of Oceanography
Roberts, Alison, University of Rhode Island
Delwiche, Chuck, University of Maryland
Domozych, David. Skidmore College
Willats, William, University of Copenhagen
Hagerthey, Scot. South Florida Water Management District
Hotchkiss, Arland. USDA ERRC Wyndmoor
Pauly, Markus, Michigan State University. – DOE Lab
Spaulding, Sarah. EPA, Colorado
Underwood, Graham. University of Essex, UK
Handler, Robert. Michigan Technological University

Graduate and Post-doctoral Advisors of M. Gretz:
Aronson, Jerome. Arizona State University
Sommerfeld, Milton. Arizona State University
Brown, R. Malcolm, Jr. University of Texas, Austin
McCandless, Esther. McMaster University, Ontario, Canada

Graduate Students:
Erin McKenney, M.S. expected 2012.
Sarah Kiemle, Ph.D. 2010.
Melba Apoya, Ph.D. 2006.
Brent Bellinger, Ph.D. 2006.
Abass Abdullahi, Ph.D. 2006.
Yan Wang, Ph.D. 2000
Jingjie Lu, Ph.D. 1999
Brandon Wustman, Ph.D. 1998
Yalin Wu, Ph.D. 1993
Carla Kinslow, M.S. 1999

Postdoctoral Fellows Hosted:
Sarah Kiemle, 2010-11, MTU
Utpal Adhikari, 2009-10, University of Burdwan, India
Ash Haeger, 2008-10, University of Leeds, UK
Eric Koh, 1998-99, University of Otago, NZ
Jean-Claude Mollet, 1993-95, UC Riverside
Biographical Sketch

Wan Jin Jahng
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Education
Korea University, Seoul, Korea Agricultural Chemistry B.S. 1986-1990
Korea University, Seoul, Korea Organic Chemistry M.S. 1990-1992
University of Nebraska, Lincoln, NE Organic Chemistry Ph.D. 1995-2000
Harvard Medical School, Boston, MA Biochemistry, Proteomics Postdoc 2001-2003
Harvard Medical School, Boston, MA Biochemistry, Proteomics Research Associate 2004-2005

Appointments
Professional Experience
2009-present Assistant Professor, Department of Biological Sciences, Michigan Technological University
2006-2009 Assistant Professor, Department of Ophthalmology, Adjunct Assistant Professor, Department of Pathology, Microbiology, and Immunology, School of Medicine, University of South Carolina
2001-2005 Research Fellow, Research Associate, Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School
1995-2000 Research and teaching assistant, Department of Chemistry, University of Nebraska-Lincoln
1994 Instructor, Department of Chemistry, Korea University
1990-1992 Research and teaching assistant, Department of Chemistry, Korea University
2010- Institutional Animal Care and Use Committee, Michigan Technological University
2009- Graduate Committee, Biology Department, Michigan Technological University
2007-9 Proteomics Committee, University of South Carolina
2007- Scientific Advisory Board, Center for Molecular Dynamics-Nepal (Nonprofit NGO)
2006- Principal Organizer, Nepal Trauma Center Project
2003 Symposium Organization: Principal Organizer, U.S.-Korea Bioscience-Biotechnology Conference
2003 President, New England Bioscience Society (NEBS)
2003- Member, Association for Research in Vision and Ophthalmology (ARVO)
2001 Editor-in-Chief, New England Bioscience Society (NEBS)
1998 Nebraska Chapter President, Korean-American Scientists and Engineers Association (KSEA)
1996- Member, American Chemical Society (ACS)
1992-4 Republic of Korea Navy
1992- Life member, Korean Chemical Society (KCS)

Honors
2010 Research Excellent Fund, Michigan Technological University, MI
2007 New Investigator Award, International Foundation, Korea
2003 Appreciation Award for the service of the 20th President, New England Bioscience Society, Boston, MA
2001 Appreciation Award for Annual Conference Editor-in-Chief. New England Bioscience Society, Boston, MA
2000 Outstanding Research Award. Department of Chemistry, University of Nebraska-Lincoln
1999 Outstanding Teaching Award. Department of Chemistry, University of Nebraska-Lincoln
1997 Distinguished Teaching Award. College of Arts and Sciences, University of Nebraska-Lincoln
1992 Seok Lim Korea University Alumni Faculty Scholarship, Graduate School, Korea University

Publications
Five related

Five others:

Synergistic Activities
2) 2007-9 Proteomics Center Committee member, Development of Differential 2D Electrophoresis, USC
3) 2006- Principal Organizer, Nepal Trauma Center Project
4) 2006 Director, Science Summer Camp for middle and high school students in South Carolina
5) 2003 Principal Organizer, U.S.-Korea Bioscience-Biotechnology Conference, Harvard Medical School

Selected Collaborators & Other Affiliations
Dr. Heywon Chung, Department of Ophthalmology, Asan Medical Center, Seoul, Korea. Project: Retina Degeneration-Apoptosis
Prof. Donald M. Coen, Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School, Boston, MA 02115. Project: Human Cytomegalovirus Phosphorylation Signal Transduction

Graduate Advisors and Postdoctoral Mentor
M.S.: Prof. Bong Rae Cho, Department of Chemistry, Korea University, Seoul, Korea
Ph.D.: Prof. David B. Berkowitz, Department of Chemistry, University of Nebraska, Lincoln, NE
Postdoc.: Prof. Robert R. Rando, Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School
Biographical Sketch

Chandrashekhar P. Joshi
Professor of Plant Molecular Genetics
Biotechnology Research Center
School of Forest Resources and Environmental Science
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Tel: 906-487-3480 Fax: 906-487-2915
e-mail: cpjoshi@mtu.edu
Web page: http://forest.mtu.edu/faculty/joshi/

Current Research Interests:
Biotechnological improvement of lignocellulosic materials in poplars for better bioenergy production

Education
Ph.D. University of Poona, India Biochemistry 1982
M.Sc. University of Poona, India Botany 1977
B.Sc. University of Poona, India Botany 1975

Appointments:
2010-present WCU Visiting Professor, Chonnam National University, Gwangju, S. Korea
2008-present Professor, Michigan Tech University, Houghton, MI
2007-2009 Director, Biotechnology Research Center, Michigan Tech University
2004-2009 Director, SFRES graduate programs, Michigan Tech University
2004-2008 Associate Professor, Michigan Tech University, Houghton
1999-2004 Assistant Professor, Michigan Tech University, Houghton
1996-1999 Research Assistant Professor, Michigan Tech University, Houghton
1990-1996 Research Scientist, Texas Tech University, Lubbock
1988-1990 Research Associate, Ohio State University, Columbus
1985-1988 Scientist, National Chemical Laboratory, Pune, India
1983-1985 Visiting Scientist, Max Planck Institute, Cologne, Germany
1980-1983 Scientist, National Chemical Laboratory, Pune, India
1979-1980 Research Student, National Chemical Laboratory, Pune, India
1977-1979 Lecturer in Botany, S.P. College, Pune, India

Some selected recent and significant publications:

**Synergistic activities**
1) Spearheaded establishment of M. S. and PhD degrees in Forest Molecular Genetics at Michigan Tech
2) Currently editing two books on poplar genomics and bioenergy; author of three approved US patents
3) Director of Biotechnology Research Center 2007-2009, MTU
4) Current member of Research Advisory Council and Chair of the Institutional Biosafety Committee, MTU
5) Graduate Program Director, 2004-2009, SFRES, MTU
6) Faculty judge: Western Upper Peninsula Science Fair (Grades 4-9) and Graduate Poster competitions
7) Ad hoc reviewer for numerous International journals and NSF, USDA and DOE proposals;
9) Distinguished Teaching Award Finalist, Assistant Professor Category, MTU, 2004; fellow of SFI, 2010
10) PI on a successful US Department of Education grant for establishing transatlantic dual degree program in Forest Resources and Biotechnology
11) PI or Co-PI on over $6 million grants from national and international agencies at Michigan Tech

**Collaborators**

*Coauthors and Collaborators (Last 48 months) (Our Science 2006 paper has over 100 coauthors)*

**Graduate and Postdoctoral Advisors**
Dr. P.K. Ranjekar, Late Prof. Otto Schieder, Prof. Desh Pal Verma, Prof. Henry Nguyen
Thesis and Postdoc Advisees
Postdocs and other staff: Xiaoe Liang, Shanfa Lu, Yihua Zhou, Takeshi Fujino, Suchita Bhadari, Dongyan Zhang, Yunxia Liu, Ramesh Thakur, Xiaohong Zhu

**Undergraduate Research Advisors**
Marie Wilkening, Hwee Chi Tay, James Wee, Katherine Kieckhafer, Laura Kluskens, Katie Kruger, Ellen Brenna, Ashley Sharp, Megan McQuillan, Jill Recla, Kristina Flesher, Eric Korona, Ayushi Kawatra, Ian Bonner, Sandra Orlowski, Nathan Fettinger, Eric Hollender, Justeen Beaune, and Josh Papacek
Biographical Sketch

**Pushpalatha P. N. Murthy**

**Professor**

**Department of Chemistry**

**Michigan Technological University**

**Houghton, MI-49931**

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E-mail: ppmurthy@mtu.edu

**Education**

- **Miranda House, Delhi University, Delhi, India** Chemistry  B.Sc. (Hons) 1972
- **Indian Institute of Technology, Kanpur, India** Chemistry  M.Sc. 1974
- **Brown University, Providence, RI** Bioorganic Chemistry  Ph.D. 1979
- **The Univ. of Mich., Ann Arbor, MI** Bioorganic Chemistry  1979-1980
- **The Univ of Michigan, Ann Arbor, MI** Neuroscience  1980-1982

**Appointments**

- **Sept.99 - present:** Professor, Dept. of Chemistry, Michigan Technological University, Houghton, MI
- **Feb. 06 - May 06:** Sabbatical leave at CSIRO Canberra, and CAMBIA, Canberra, Australia
- **Aug. 01 - July 04:** Chair, Dept. of Chemistry, Michigan Technological University, Houghton
- **Aug. 00 - Aug.01:** Interim Chair, Dept. of Chemistry, Michigan Tech. University, Houghton, MI
- **Sep. 91 - Aug. 99:** Associate Professor, Dept.of Chemistry, Michigan Tech. Univ., Houghton, MI
- **Mar. 93 - May 93:** Visiting Assoc. Prof (on sabbatical leave), Biotechnology Dept., Cornell University, Ithaca, NY
- **Aug. 92 - Dec. 92:** Visiting Assoc. Prof (on sabbatical leave), Michigan State University, East Lansing, MI
- **Sept. 86 - Aug. 91:** Assistant Professor, Department of Chemistry, Michigan Technological University, Houghton, MI
- **Sept. 85 - Aug. 86:** Visiting Asst. Professor, Department of Chemistry and Chemical Engineering, Michigan Technological University, Houghton, MI
- **Aug. 82 - Jan. 85:** Research Chemist, Stauffer Chemical Company, Dobbs Ferry, NY.

**Selected Publications**


*Undergrad student

### Synergistic Activities
1) Developing a new inquire-based lab course “Research methods in Biomolecular Chemistry”. This project is funded by the NSF-CCLI program.
2) Developed a new course for chemistry majors interested in teaching high school chemistry: Design and Operation of a High School Chemistry Laboratory. I worked with local high schools to develop this course. The aim of the course is to address topics necessary for the design and introduction of a chemistry laboratory in high schools including ordering, storage, tracking, and disposal of chemicals, safety issues, developing new lab experiments and demonstrations, preparation of reagents on large scale, and internships in local high schools. The need for such a course was identified by a workshop organized by the American Chemical Society on Secondary Chemical Education curriculum and our own alumni. This course is now offered every other year.
3) Worked on a curriculum for two new degree programs now offered in the Department – BS in Biochemistry and Molecular Biology and BS in Pharmaceutical Chemistry.
4) Developed a new course for the BS in Pharmaceutical Chemistry program - Pharmaceutical Chemistry I – Mechanism of Drug Action. This course is now offered every year.
5) Finalist for Outstanding Teacher of the Year award for 1989-90 in Assistant Professor category.

### Collaborators and Other Affiliations
Dr. Richard Brown, Dept. of Chemistry, Michigan Technological University
Dr. Haiying Liu, Dept of Chemistry, Michigan Technological University
Dr. Victor Raboy, USDA, Aberdeen, Idaho

### Graduate Advisors and Postdoctoral Sponsors
Ph.D. Advisor: Prof. David Cane, Brown University
Postdoctoral sponsor: Prof. Masato Koreeda, Univ of Michigan, Ann Arbor, MI
Postdoctoral sponsor: Prof. Bernard Agranoff, Univ of Michigan, Ann Arbor, MI

### Thesis Advisor (Ph.D.)
Dr. Laura Barrientos, Center for Disease Control, Atlanta; Dr. Bhuvraha Murthy, Ohio State University, Columbus, Ohio; Dr. Barry Garchow, Univ of Pennsylvania; Dr. Sonali Jog, Univ of Southern California; Dr. Bakul Dhagat Mehta, Univ of Missouri, Columbia; Dr. Gay Pliska-Matyshak, Henry Ford Hospital, Detroit; Dr. Steven Johnson, Univ of Illinois, Urbana-Champaign
Biographical Sketch

Ashutosh Tiwari
Assistant Professor
Department of Chemistry,
Michigan Technological University,
1400 Townsend Drive, Houghton, MI 49931
Phone: (906) 487-1840 (Work)
Fax: (906) 487-2061
Email: tiwari@mtu.edu
Web page: http://www.chemistry.mtu.edu/pages/faculty/faculty.php?fac=tiwari

Current research interests
'Protein misfolding diseases' with special focus on neurodegenerative diseases.

Education
Jawaharlal Nehru University (JNU), New Delhi, India
Biotechnology Ph.D. 1999
Jamia Millia Islamia, New Delhi, India Biosciences M.Sc. 1993
All-India Institute of Medical Sciences (AIIMS), New Delhi India Human Biology, specialization in biophysics 1991 B.Sc.(Hons)

Appointments
2009 – 2009 Assistant Professor, Department of Chemistry, Michigan Technological University, Houghton, MI.
2009 – 2009 Adjunct Research Assistant Professor, Department of Neurology, University of Massachusetts Medical School (UMMS), Worcester, MA.
2005 – 2009 Research Assistant Professor, Department of Neurology, UMMS, MA.
2003 – 2005 Instructor, Department of Neurology, UMMS, MA.
2000 – 2003 Post-Doctoral Fellow, Department of Neurology, UMMS, MA.
1999 – 2000 Post-Doctoral Fellow, Department of Neurology, Massachusetts General Hospital, Boston, MA.
1995 – 1999 Senior Research Fellow, Center for Biotechnology, JNU, New Delhi, INDIA.
1993 – 1995 Junior Research Fellow, Center for Biotechnology, JNU, New Delhi, INDIA.

Five recent publications

D) Five additional significant publications:

3) Rodriguez JA, Shaw BF, Durazo A, Sohn SH, Doucette PA, Nerissian AM, Faull KF, Eggers DK, Tiwari A, Hayward LJ, and Valentine JS. Destabilization of apoprotein is insufficient to explain Cu,Zn-superoxide dismutase-linked ALS pathogenesis.


Synergistic activities
2) Member of ‘Graduate Admissions and Recruiting Committee’ for Chemistry department at MTU.
3) Member of ‘Biochemistry Curriculum Committee’ for Chemistry department at MTU.
4) Member of ‘University Animal Care Committee’ and ‘Institutional Biosafety Committee’ at MTU.

Collaborators
Robert Brown (UMMS), Lawrence Hayward (UMMS), Zuoshang Xu (UMMS), Hoi Pang Low (UMMS), Robert Matthews (UMMS), Jeffrey Agar (Brandeis University); John Hart (UTHSCA), Joan Valentine (UCLA), Patricia Heiden (MTU), Haiying Liu (MTU), Rudy Luck (MTU).

Supervising and advising of students and trainees
At UMMS: Brian Mitchell Haas (summer student, Harvard University, MA); Benoy M. Chacko (graduate student, UMMS); Charusheila Ramkumar (graduate rotation student, UMMS) and Laura Baldassari (summer student, Worcester Polytechnic Institute, MA).

At MTU: Kyrie Pappas (project CH471, Spring 2010); Claire Drom (CH4995, Fall 2010).
Research technicians supervised: At UMMS: Hongru Zhou (UMMS); Kumudini Misra (UMMS).
Biographical Sketch

Martin Thompson
Associate Professor
Department of Chemistry Tel: (906) 487-3522
Michigan Technological University Fax: (906) 487-2061
1400 Townsend Drive Email: thompson@mtu.edu
Houghton, MI 49931

Education
Arizona State University, Tempe, AZ. Ph.D. Chemistry Ph.D. 2000
Dissertation “Synthesis and Characterization of the Photophysical and Photochemical Properties of Sequence Specific DNA-Binding Probes,” Advisor: Neal Woodbury
Arizona State University, Tempe, AZ. Chemistry, with a Concentration in Biochemistry B.S. 1995

Appointments
2009-present Associate Professor, Department of Chemistry, Michigan Technological University Assistant Professor, Department of Chemistry, Michigan Technological University (2003-2009)
2004 Visiting Scientist, Department of Biological Chemistry, University of Michigan Medical Center
2002-2003 Postdoctoral Fellow, Department of Biological Chemistry, University of Michigan
2000-2002 Postdoctoral Assistant, Howard Hughes Medical Institute, University of Michigan

Other Activities
2010-present Councilor, Upper Peninsula Section of the American Chemical Society
2007 Panel Member, National Institutes of Health, Center for Scientific Review, Study Section ZRG1 GGG-F(90)
2006-2009 Chair, Upper Peninsula Section of the American Chemical Society
Reviewer for: FEBS Letters, Protein Expression and Purification, Journal of Medical & Biological Sciences

Professional Affiliations
American Chemical Society, Biophysical Society, Council on Undergraduate Research

Research Interests
Fluorescence-based bioanalytical methods and biosensors; quantification of modification-dependent protein-protein interactions associated with transcription; development of assays for drug discovery; molecular recognition; cell-specific targeting using peptidomimetics;

Five Significant Publications

Additional Significant Publications

**Recent Collaborators**
Sarah Green (MTU), Haiying Liu (MTU), Lanrong Bi (MTU), Shiyue Fang (MTU), Kedmon Hungwe (MTU), Pushpalatha Murthy (MTU), Justin Carlson (Chemotrope)

**Graduate and Postgraduate Advisees**
Current graduate students: Katrina Bugielski
Past graduate students: Renu Chandrasekaran, Jon Maxwell, Renee Kerr, Mark Parmley, Wendy VanAken, Joshua Bailey
Undergraduate students: Talisha Sutton, Sam Stam, Christopher Kupitz, Andrew Spaeth, Kelli Whelan, Kirk Koebke, Jesus Fransisco Glaus Garzon, Marie Wilkening, Joshua Bailey
Postdoctoral Advisees: Alexis Black, Momoko Tajiri
Biographical Sketch

Hairong Wei  
Assistant Professor of Systems Biology & Molecular Biology  
School of Forest Resources and Environmental Science  
Michigan Technological University  
1400 Townsend Drive, Houghton, MI 49931  
Email: hairong@mtu.edu   Phone: (906) 487-1473  Fax: (906) 487-2915  
http://forest.mtu.edu/faculty/wei/index.htm

Current Research Interests
Systems Biology: Gene network constructions & gene function prediction  
Bioinformatics and Genomics on tree growth & wood development  
Biological database design and development  
Impact of CO₂ and abiotic stress on gene network  
New algorithm/software/pipeline development

Education
Beijing Forestry University, P.R. China  Agricultural Sci.  BS & 4 years  
Beijing Forestry University, P.R. China  Plant Genetics  MS & 3 years  
University of Hawaii at Manoa  Plant Mol. Biol  Ph.D. & 5 years  
University of Chicago  Computer Sci.  MS & 1.5 years  
University of Minnesota  Bioinformatics  Post-doc & 1.5 years  
University of Alabama at Birmingham  Biostatistics  Post-doc & 1 year

Appointments
2008~Present  Assistant Professor, Michigan Technological University, Houghton, MI  
2006~2008  Bioinformatics Developer, Wicell Research Institute, Inc., Madison, WI  
2005~2006  Bioinformatics Scientist, Operon Biotechnologies, Inc., Huntsville, AL  
2004~2005  Postdoc, Biostatistics, University of Alabama, Birmingham, AL  
2003~2004  Postdoc, Bioinformatics, University of Minnesota, Minneapolis, MN  
1996~2001  Res. Assistant, Plant Mol. Biology, University of Hawaii, Honolulu, HI  
1995~1996  Res. Assistant, Plant Genetics, University of Hawaii, Honolulu, HI  
1989~1995  Assistant Professor, and Lecturer, Forestry Genetics, Beijing Forestry University

Some selected publications

**Teaching**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW4099</td>
<td>Programming Skills for Bioinformatics</td>
<td>Fall 2009, 2011</td>
</tr>
<tr>
<td>FW5082</td>
<td>Gene Expression Data Analysis</td>
<td>Fall 2010, 2012</td>
</tr>
<tr>
<td>CS2321</td>
<td>Data Structure in Java</td>
<td>Spring 2011</td>
</tr>
<tr>
<td>FW4500</td>
<td>Experimental Design and Data Analysis for Natural Science</td>
<td>Spring 2012</td>
</tr>
</tbody>
</table>

**Recent Synergistic Activities**

1) Grant Proposal Reviews: NSF Organism and Environment Interaction. 2010
3) Invited speaker: International Conference on Sustainable Management of Multi-purpose Poplar Plantations, IUFRO, China, 2010
4) Invited speaker: Plant and Animal Genome XIX Conference, Jan 2011, San Diego, California.

**Collaborators & Collaborators & Other Affiliations (within last 48 months)**


**Advisor**

Fang Ruan, Ph.D. student in Systems Biology, Spring, 2010 to Present
Yang Li, Master student in Genomics. Fall, 2009 to Present
Hang Zhang, Master student in Computer Science, Spring, 2010 to Present
Biographical Sketch

Thomas Werner
Assistant Professor
Department of Biological Sciences
DOW 523, 1400 Townsend Drive
Michigan Technological University
Houghton, MI 49931
Phone: (906) 487-1209
FAX: (906) 487-3167
E-mail: twerner@mtu.edu

Education
2005 Ph.D., Cell and Molecular Biology, Umeå Center for Molecular Pathogenesis, Umeå University, Umeå, Sweden.
1997 M.Sc., Biology, Jena University, Jena, Germany.

Appointments
2010 - present  Assistant Professor, Department of Biological Sciences, Michigan Technological University, Houghton, MI.
2005 - 2010  Post-Doctoral Research Associate, Department of Molecular Biology, University of Wisconsin-Madison, Madison, WI.

Honors and Awards
2005 - 2008  Postdoctoral Long-term fellowship, Human Frontier Science Program
2005 - 2007  Postdoctoral Long-term fellowship, European Molecular Biology Organization (declined in favor of the HFSP fellowship)
1998 – 2000  Graduate fellowship Umeå University
1990   Special Award at the National Youth Science and Technology Competition “Jugend Forscht” (“Youth researches”), Mainz, Germany.

Peer Reviewed Publications
Memberships
Michigan Tech Biotechnology Research Center (BRC)

Current Collaborations
Sean B. Carroll and Shigeyuki Koshikawa, University of Wisconsin-Madison, WI.

Advisors
M.Sc. Advisor: Dr. Andreas Henke, Jena University, Jena, Germany
Ph.D. Advisor: Dr. Dan Hultmark, Umeå Center for Molecular Pathogenesis, Umeå University, Umeå, Sweden.
Postdoctoral Advisor: Dr. Sean B. Carroll, University of Wisconsin-Madison, WI.

Present Undergraduate Students
Bryant Kollie, Roger Yeager
Biographical Sketch

Ramakrishna Wusirika
Associate Professor
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Education
National Chemical Laboratory, and University of Pune, Pune, India  Biochemistry  Ph.D., 1995
University of Hyderabad, Hyderabad, India  Biochemistry  M.Phil., 1990
University of Hyderabad, Hyderabad, India  Biochemistry  M.Sc., 1988
Osmania University, Hyderabad, India  Biology  B.Sc., 1986

Appointments
2009 – present  Associate Professor  Department of Biological Sciences, Michigan Technological University, Houghton, MI.
2003 - 2009  Assistant Professor  Department of Biological Sciences, Michigan Technological University, Houghton, MI.
1999 - 2003  Post-Doctoral Research Fellow  Department of Biological Sciences, Purdue University, West Lafayette, IN.
1997 - 1999  Post-Doctoral Research Fellow  Department of Horticulture, Purdue University, West Lafayette, IN.
1995 - 1997  Post-Doctoral Research Fellow  Division of Biochemical Sciences, National Chemical Laboratory, Pune, India.

Recent Publications
11) Lai, J., Ma, J., Swigonova, Z., Ramakrishna, W., Linton, E., Llaca, V., Tanyolac, B., Park, Y.J., Jeong, O.Y., Bennetzen, J.L.,
13) Ramakrishna W, Deng Z, Ding CK, Handa AK, Ozminkowski RH Jr. A novel small heat shock protein gene, vis1,

**Synergistic Activities**
1) Member, American Society of Plant Biologists
2) Coordinator, Bioinformatics Program, Michigan Tech University
3) Ad hoc reviewer for several international journals and funding agencies (NSF, US-Israel BARD and U.S. Civilian Research
and Development Fund)
4) Chief editor for a special issue of International Journal of Plant Genomics

**Collaborators**
Jeffrey Bennetzen (U. Georgia, GA), Phillip SanMiguel (Purdue Univ, IN), Jianxin Ma (Purdue Univ, IN), Ramanjulu Sunkar
(Oklahoma State Univ, OK), Chung-Jui Tsai (U. Georgia, GA), Erich Grotewold (Ohio State Univ, OH), Sastry Jayanty (Colorado
State Univ, CO), Rupali Datta (MTU), Wan Jin Jahng (MTU), Charles Kerfoot (MTU)
Graduate and Postdoctoral Advisors
PhD Advisor: Prabhakar Ranjekar, National Chemical Laboratory, Pune, India
Postdoctoral Advisor: Jeffrey Bennetzen, University of Georgia, Athens, GA, Avtar Handa, Purdue University, West
Lafayette, IN, Prabhakar Ranjekar, National Chemical Laboratory, Pune, India

**Thesis Advisor**
Current Ph.D.
Surendar Reddy Dhadi, Kefeng Li and Sheikh Rafi
Past Ph.D./M.S.
Nicholas Krom, Zijun Xu, Deepak Kumar and Patience Tenney

**Current Visiting Scientist**
Zhiying Dou

**Past Visiting Scientist**
Bashir Yusuf (Ahmadu Bello University, Nigeria)

**Undergraduate Students Advised**
Nari Kang, Matt Ogg, Sulagna Gupta, Katie Kruger, Megan McQuillan, Jill Recla, Benjamin Baer and Holly Grunst
Response to Senate Proposal 51-04: Financial information for the proposed PhD in BMB program

I.a. There is a growing world-wide demand for scientists and engineers with advanced training in biochemistry and molecular biology. Michigan Tech has a long and rich history of research in the exciting field of biochemistry and molecular biology. Recent conceptual and technological advancements have widened the scope of what is possible to study in these fields and correspondingly, many recent faculty hires in individual departments and through the Strategic Faculty Hiring Initiative have increased the ranks of those around campus (Biological Sciences, Chemistry, Forest resources and Environmental Sciences, Chemical Engineering, Biomedical Engineering, Mathematics) engaged in biomedical research, plant genomics and other health-related biochemistry and molecular biology studies. Our ability to carry out cutting edge research in these areas will strongly benefit from greater coherence and integrated graduate training.

I.b. Because no additional resources are requested, we expect this proposal to be consistent with the university’s resource allocation criteria.

II.a. We anticipate that 2-5 students will enter the program immediately because they are the current students of faculty performing work relevant to the PhD program proposed here. In five years the program will have an estimated population of between 10-15 graduate students.

II.b. Initially, students will be drawn from existing programs. Specifically, these will be graduate students who would prefer a PhD in BMB rather than the one they are currently enrolled in and whose advisors comprise the core group of 14 faculty. For example, a participating faculty member in the Department of Chemistry has three graduate students. One is working on a project in protein expression, the other in enzyme mechanisms and the other in synthetic organic chemistry. For these students, this new program is more desirable than current offerings because it more closely aligns with their research interests. The University will be able to provide better service to these students by making this new program available. These students are currently under the auspices of the Dept of Chemistry, in this example, and the Dept of Chemistry will remain their administrative home unit even after the PhD in BMB comes on line. Similarly, students advised by faculty in other departments or schools will continue to have their current home department or school serve as their administrative home unit. The decision to enter the program is between the graduate student and the advisor. All costs for the student are incurred by respective administrative home unit – as is the case now. In the future, new students are expected to enter this program who would otherwise not have come to MTU. These students would have joined other universities with BMB PhD programs, as a BMB PhD program best reflects their areas of interest in research and education.

II.c. If the Biochemistry and Molecular Biology (BMB) B.S. degree offered as dual tracks in the Departments of Chemistry and Biological Sciences is an indicator of population changes, an increase is expected. The numbers for the Department of Chemistry revealed an increase of about 44 students in the four-year B.S. (Biochemistry and molecular biology and Pharmaceutical chemistry) degrees, with no impact on the number of B.S. Chemistry majors. The Department of Biological Sciences has 31 students in the BMB B.S. degree program. In summary, we expect to
see new growth, based on the undergraduate degree, where an increase in new students was seen as opposed to those entering the department and simply selecting a different major within the department.

II.d. Graduate students currently enrolled: Chemistry has 41; Forestry has 82; Biological Sciences has 38 graduate students

III.a. No effect.

III.b. The program introduces one course which is laboratory-based. This course will be team taught and the exercises will occur in the laboratories of member faculty. A lab fee will be charged to provide for expendable supplies.

The students’ administrative home departments will provide office space, computational resources, and necessary supplies and infrastructure support, and will consider the students for departmental teaching assistantships when appropriate and available. All such students will be counted as members of their home departments for the purposes of internal university accounting.

III.c. Students enrolled in the program will be housed within the home department of their advisors. The faculty members who have students in this program are the advisors.

III.d. The Biochemistry Ph.D. program, as an interdisciplinary, cross-department program, will be administered through the Graduate School. Participating faculty will elect a three-member steering committee. The committee will elect a Graduate Program Director who will work closely with the Dean of the Graduate School and will be assisted by a staff member. The Graduate Program Director will be invited to attend all meetings of the Graduate Faculty Council.

IV.a. None expected. Faculty listed in Table 1 of the proposal have fully functioning laboratories with the necessary equipment and computers. No new equipment is required to start up this program.

IV.b. The program builds on existing resources, so it is not anticipated that new library or other learning resources will be required.

V.a. No new resources are requested, and costs associated with recruiting and other program administration will be handled through the Graduate School and the departments of member faculty (currently; Biological Sciences, Chemistry, and Forestry Resources and Environmental Sciences).

VI. Yes, The Department of Chemistry has initiated three new programs: Biochemistry and Molecular Biology B.S., Pharmaceutical Chemistry B.S. and Cheminformatics

VI.a.1. In the BS in Biochemistry and Molecular biology proposal the goal was to double the number of students in the program. In 2003-4, the number of students in the program was 6; this
number included students in BL and CH interested in biochemistry and molecular biology. Currently the number of students in the two departments total 50 (CH-19; BL 31). In addition, there are 27 students in the closely related Pharmaceutical Chemistry program in Chemistry; the goal was 32 students by 2015. In Cheminformatics the number of students is 5; the goal is 20.

VI.a.2. Significant new resources were generated from external and internal sources in the Department of Chemistry, including cost share for CH4721: Research Methods in Biochemistry. This lab was funded by the NSF ($150,000) and Departmental resources ($100,000). CH3540: Biophysical Chemistry and CH3541: Biophysical Chemistry Lab are new offerings and a faculty member was hired to teach these courses. CH4222: Bioanalytical Chemistry was adapted from a five credit Intro Quant & Instrumental Analysis, specifically designed for the Biochemistry and Molecular Biology and the Pharmaceutical Chemistry degrees. Additional costs are incurred by the Department (via student fees) for supplies used for CH4995. The Department of Biological Sciences had preexisting courses in place before the start of the Biochemistry and Molecular Biology B.S. program. The biochemistry and molecular biology laboratories were upgraded with departmental resources.

VI.a.3. Since the Biochemistry and Molecular Biology B.S. was implemented, two new faculty members have been hired in the Dept. of Chemistry. One is an SFHI hire and the other is attributable to the new degree program and teaches Biophysical Chemistry/Lab. The Dept. of Biological Sciences has hired six new faculty members in this area in the last five years. Two of these are SFHI hires.

VI.a.4. Instrumentation in support of new lab courses in the Dept. of Chemistry is from the National Science Foundation, student laboratory fees, department budget and as described in VI.a.2. (above).

VI.b. Enrollment has doubled in the Dept. of Chemistry. All growth has been in the three new degrees without decreasing the existing Chemistry B.S.

Enrollment in other undergraduate degree programs increased from 261 to 266 in the last five years in the Dept. of Biological Sciences. In the same period, graduate student enrollment increased from 24 to 38.

VII.a. Total general fund budget: Biological Sciences: $2,363,600 (this is slightly different than compendium which has 2,374,801 for 2010-2011); Total general fund budget: Chemistry: 2,390,227; Total general fund budget: School of Forest Resources and Environmental Science: $3,578,444 (data from Compendium 2011)

VII.b. This number is impossible to get because Institutional Analysis does not track tuition revenue at the unit level. Tuition at the University is charged based on student type rather than course level and some students receive some sort of financial aid that reduces their net tuition revenue that is received by the University.

VIII. The other programs currently under consideration or development as proposals include Master's Biomedical Engineering, Accelerated Master's Biomedical Engineering, Master's
Program Security and Medical Informatics. Since there is no request for additional resources for this program and it does not overlap with the other programs under consideration, there will be no effect on these programs.

Comment [J]: These are now approved and in place.
Master’s Program in Biomedical Engineering  
Department of Biomedical Engineering  
College of Engineering and the Graduate School  
Michigan Technological University  
August 2011

1. Introduction

This is a proposal to formally establish a Master’s degree program in Biomedical Engineering (BME) within MTU’s Department of Biomedical Engineering. This proposal will establish Plan A, Plan B and Plan D MS degree options. The mission of the proposed program is to create a pathway for students to further enhance their engineering and life science knowledge, gaining a competitive edge in an increasingly demanding job market.

The proposed Master’s degree program in BME will be fully administered and maintained by the Department of Biomedical Engineering. The scope of the proposed program is similar to many existing programs at MTU as well as at other institutions. Engineering students with high academic standing can apply and be accepted for the program. Students without a Biomedical Engineering undergraduate degree are welcome into the program, but may be required to take additional life science courses to make up for deficiencies in life science training. Highly qualified non-engineering students are also welcome to apply, however, these individuals may be required to complete additional mathematical and/or engineering courses to make up for perceived deficiencies.

Participating students are also required to maintain good standing after acceptance into the program.

Our specific objectives are to:

1) Offer a Master’s degree beginning in the fall of 2012.
2) Initiate a recruiting effort to publicize the expanded graduate opportunities in BME at MTU.
3) Establish initial MS student enrollment at a level of 15 (including an estimated 12 from the accompanying proposal for an accelerated MS program).
4) Contribute to MTU’s mission to be a nationally prominent and internationally recognized technological university that bridges technology and business and meets the needs of a global and technologically rich society through excellence in undergraduate and graduate education, scholarship, and research.

2. Rationale

Biomedical Engineering is one of the fastest growing engineering specialties in the United States. The bachelor’s degree program in biomedical engineering at Michigan Technological University reflects this trend and has experienced steady growth in student numbers since the program was initiated in 1997. BME at MTU currently enrolls approximately 235 undergraduate students. To prepare students for careers in biomedical engineering requiring advanced education beyond the bachelor’s degree, the BME department established and offered a doctoral program in biomedical engineering starting 2005. BME currently has 15 doctoral students enrolled in the program.

At present, MTU has programs in biomedical engineering aimed at preparing students for both entry level (bachelor’s degree) terminal level (Ph.D. degrees) positions. Nevertheless, there is still a strong need for master’s program that can provide training to students who are interested in mid-level entry positions, or who desire to have a competitive edge compared to students with a standard 4-year BME bachelor’s degree.
There are many reasons to establish a master’s program in biomedical engineering at MTU. First, at the national level, there is an increasing demand for master’s degree level biomedical engineers. Without a master’s degree program at MTU, MTU graduates will be forced to attend competitor institutions if they wish to continue beyond a 4-year bachelor’s degree but do not want to commit at least 4 more years towards a Ph.D. degree.

Second, a master’s program in biomedical engineering is a natural progression for the Biomedical Engineering Department at MTU. To be competitive nationally, the university recognizes that it is important to have strong graduate programs, in addition to undergraduate programs, to achieve the highest quality education at all levels. The small size of the BME graduate student population has restricted the department’s efforts towards developing highly focused, advanced graduate-level courses. The establishment of a master’s program is expected to increase the size of the graduate program and provide a large number of self-supporting students. This will allow the department to engage in activities that strengthen the overall graduate mission of the department and the university.

Third, a master’s program in biomedical engineering will both directly and indirectly enhance the research efforts in the department. The proposed Plan A master’s program is a traditional, hands-on master’s degree that requires research leading to a thesis. The proposed Plan B requires a smaller project that results in a research paper. Finally the Plan D master’s degree is purely didactic in nature preparing students to further continue their education, if desired. As a result, the Plan D master’s program will allow the department to identify and recruit highly motivated and better prepared students into the department’s Ph.D. program.

3. Related Programs

Related Programs at MTU
Currently, the BME department at MTU has an undergraduate program that awards graduating students a bachelor’s of science in biomedical engineering, and a graduate program that awards students a Ph.D. in biomedical engineering. There are no master’s programs in BME. Students who wish to pursue a master’s degree in a biomedical engineering–related field at Michigan Technological University must pursue their degree from another engineering department, such as electrical, mechanical, materials science or chemical engineering.

Equivalent/Competitive Programs in the State of Michigan

University of Michigan
The Biomedical Engineering Department at the University of Michigan has a graduate program in the Horace Rackham School of Graduate Studies that grants M.S. and Ph.D. degrees in Biomedical Engineering. The department is jointly supported by the College of Engineering and the Medical School. In order to obtain an M.S. degree in Biomedical Engineering, students must satisfactorily complete (B or better for courses that are issued letter grades, and S for courses that are graded S/U) a minimum of 30 credits of graduate study beyond the bachelor's degree. Within this requirement, a group of core courses, or their equivalents in the biological sciences, as well as several graduate-level engineering and physical science courses, must be completed. Directed research work is required to familiarize the student with the unique problems associated with biological systems research.
Wayne State University
Wayne State University offers both the MS and Ph.D. degrees in Biomedical Engineering. The master’s degree is offered in two options: Plan A, which requires a minimum of 34 credit hours in course-work including an eight-credit thesis and Plan C, which requires a minimum of 34 credits in course work. Wayne State does not offer an accelerated BS/MS program.

Michigan State University
Biomedical Engineering is not available as a major at Michigan State, but several MSU degree programs include an optional concentration for biomedical-related focused study, including Biosystems Engineering, Chemical Engineering, Materials Science and Engineering, and Mechanical Engineering. The Electrical Engineering major includes a Biomedical Engineering major track.

Equivalent Programs Nationally
Nationally, master’s programs in biomedical engineering at research-oriented universities are the norm. Certain BME programs, notably the Georgia Institute of Technology/Emory program restrict awarding MS degrees to those doctoral students who have met the minimum requirements for a MS degree, but fail to complete the Ph.D. program.

The table below lists a few of the top rated biomedical engineering programs, and their MS programs (if offered).

<table>
<thead>
<tr>
<th>Top national undergraduate biomedical (bioengineering) programs</th>
<th>MS or equivalent program?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johns Hopkins University</td>
<td>Yes</td>
</tr>
<tr>
<td>Georgia Institute of Technology/Emory</td>
<td>M.S. only for failing Ph.D. students</td>
</tr>
<tr>
<td>University of California – San Diego</td>
<td>Yes</td>
</tr>
<tr>
<td>Duke University (Pratt)</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Washington</td>
<td>Yes</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>Yes</td>
</tr>
<tr>
<td>Boston University</td>
<td>Yes</td>
</tr>
<tr>
<td>Rice University</td>
<td>Yes (Master of Bioengineering – non-thesis)</td>
</tr>
<tr>
<td>Stanford University</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Arizona</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4. Projected Enrollment
We project our initial master’s graduate enrollment to be 3, plus an additional 12 from the proposed accelerated program for a total of 15. Our goal is to increase this number to 25 master’s students (combined accelerated program and this program) in 5 years. The estimation is based on exit interviews and alumni surveys from past years. Recruitment plans include (1) advising our BME undergraduate majors of the potential for continuing at MTU obtain a master’s degree in BME following one additional year of study, (2) working with MTU’s Undergraduate Admissions/Recruitment Office along with the Graduate School to develop a BME brochure and a focused marketing plan, (3) updating the BME Department web page highlight the master’s program.

5. Scheduling Plans
The master’s program in BME will be offered at the beginning of Fall Semester 2012.
6. Curriculum Design

**Admission Requirements:**
1) Only students with a cumulative GPA of 3.0 or above are eligible to enter the BME master’s program.
2) In general, all students who have a BS in an engineering discipline are eligible to apply. However, those students lacking undergraduate courses in the life sciences may be required to complete additional courses in the life sciences to correct for this deficiency.
3) Exceptional students with non-engineering BS degrees are also eligible to apply. However, these students may be required to complete additional courses in engineering and or mathematics to correct for this deficiency.
4) General GRE exam results are required to be submitted as part of the admissions process.
5) The standard Graduate School admissions process applies.

**Program Requirements:**
1) The number of credits required for the Master’s degree is 30 credits
2) Students who are accepted into the program will not be allowed to continue if their cumulative GPA falls below a 3.0. A cumulative GPA of 3.0 will be required for graduation.
3) Due to the interdisciplinary nature of the biomedical engineering program, courses also will be taken outside of the Biomedical Engineering Department as determined by the student and his/her advisory committee and dependent on the student’s area of emphasis. However, the students will need at least 12 credit hours (in addition to the 2, 1 cr seminar requirement – see #6, below) from the BME department.
4) Each student will have an academic/research advisor who is a member of the Biomedical Engineering faculty. The Advisor’s primary responsibility will be supervising the student’s academic and professional growth, as well as working with the student to develop an academic plan for enrolling in the appropriate courses for the student and program.
5) The academic plan developed by the student and academic advisor will need written approval from the faculty advisor and the departmental graduate coordinator.
6) Throughout their degree program, the graduate students will be required to attend the Graduate Seminar. During the first year of study, the students will receive one credit for each semester for participation. After the first year, attendance will still be mandatory, but the students will not receive credit.
7) All Graduate School residency and credit requirements must be met.

**Typical Program of Study:**
There are no core required classes for the MS in Biomedical Engineering. Course plans will be developed by the student, the student’s advisor and the BME graduate program coordinator. A minimum of 12 credits (of the minimum 30) must be taken from the BME Department.

Because of the breadth of the field of Biomedical Engineering, there is no single ’typical’ program of study. However, Appendix II lists some appropriate existing courses that a BME MS student may take to fulfill course requirements.

7. New Course Descriptions
Three new faculty hires (already hired; will begin Fall 2011) will develop new graduate level courses as part of their regular teaching duties to supplement existing graduate level courses (for our existing Ph.D. Program). However, these courses will not be required courses for the degree.

8. Library and Other Learning Resources
No additional library or other learning resources are associated with this program.
9. Faculty Resumes
Biomedical Engineering faculty resumes can be found at http://www.biomed.mtu.edu/fac_CVs/.

Participating Biomedical Engineering Faculty include:

Sean J. Kirkpatrick, Ph.D., Associate Professor & Chair
Michael Neuman, MD, Ph.D., Full Professor
Jeremy Goldman, Ph.D., Associate Professor
Keat Ghee Ong, Ph.D., Associate Professor
Megan Frost, Ph.D., Associate Professor
Rupak Rajachar, Ph.D., Associate Professor
Niloy Choudhury, Ph.D., Assistant Professor
Feng Zhao, Ph.D., Assistant Professor
Bruce Lee, Ph.D., Assistant Professor
Martyn Smith, Ph.D., Adjunct Professor
Qing-Hui Chen, Ph.D., Adjunct Assistant Professor
Karen Roemer, Ph.D., Adjunct Assistant Professor

10. Description of Available/Needed Equipment
Students will access the university-wide computing facilities already present.

11. Program Revenue & Costs
Presented below is a quick summary of the financial assessment of the proposed program. A more complete evaluation is given in Appendix I. The appended evaluation conforms to the proposal 51-04 of the University Senate of Michigan Technological University.

Revenue (Based on 2011-2012 Tuition & Student Voted Fees)
Graduate Resident and Non-Resident Per Credit Rate: $702

Engineering tuition Fee Per Semester For Undergraduates
Taking 6 Credits or more and Graduate Students Taking 5 Credits or More: $705

Student activity Fee: $44.30
Experience Tech Fee: $69.00

Per Student (30 credits* $702) $21,060
Engineering Tuition Semester Fee (4 semesters) $ 2,820
Fees (4 semesters) $ 453.20

Total per Student $24,333.20
Based on Initial Enrollment of 3 Students: $72,999.60 (Initial class)

New Costs
Student support: No financial support for MS students is required
Lab space: No new laboratory space is needed
New courses: BME already offers numerous graduate level courses as part of our Ph.D. degree program. We have also recently hired 3 new tenure-track faculty, each of whom will develop a graduate level course as part of their regular teaching assignment. Thus no new costs associated with new course development.

Student offices: BME has sufficient space to house the expected enrollment.

Student Advising: For the research MS students, much of the research advising will be completed during the usual weekly lab meetings that each of the BME faculty hold with their research groups. Course advising for the MS students will be minimal and the time required for this advising will be small as the BME faculty already perform these same advising tasks for BME Ph.D. students.

12. Space
No additional space is required to support this proposed program.

13. Policies, regulations and rules
Specific policies, regulations and rules for this program are stated in Section 6: Curriculum Design (above).

14. Accreditation Requirements
There are no further accreditation requirements for this proposed Master’s program.

15. Internal Status of Proposal
This proposal for a master’s program in Biomedical Engineering has been approved by the Faculty of the Department of Biomedical Engineering, by the Engineering Council, and by the Dean, College of Engineering.

16. Planned Implementation Date
This proposed master’s program will be implemented in the Fall of 2012.
Appendix I

Criteria for Financial Evaluation of proposed Academic Programs
Senate proposal 51-04

I. Relation to University Strategic Plan
   a. Relation of program to the University’s educational and research goals:
      The University and the College of Engineering both are striving to increase graduate enrollment. In this regard, the proposed MS program aligns with the University’s research and educational goals. In addition, we expect the proposed MS Program to serve as a feeder program for the Department’s Ph.D. program and thereby increase both the numbers of students and the quality of students in the Ph.D. Program.
   b. Consistency with the University’s resource allocation criteria:
      No new resources are being requested at the Departmental level to support this proposed program.

II. Impact on University Enrollment
   a. Projected number of students in the program:
      We project our initial master’s graduate enrollment to be 3, plus an additional 12 from the proposed accelerated program for a total of 15. Our goal is to increase this number to 25 master’s students (combined accelerated program and this program) in 5 years. The estimation is based on exit interviews and alumni surveys from past years. Recruitment plans include (1) advising our BME undergraduate majors of the potential for continuing at MTU obtain a master’s degree in BME following one additional year of study, (2) working with MTU’s Undergraduate Admissions/Recruitment Office along with the Graduate School to develop a BME brochure and a focused marketing plan, (3) updating the BME Department web page highlight the master’s program.
   b. Source of new students:
      Initially, we project that all new students will have earned their BS Degree from Michigan Tech. However, as the degree program matures, we project that we will draw students from other universities into the program.
   c. What is the likely correlation between demand for the new program and existing enrollment patterns at MTU?:
      We do not foresee any significant changes in the enrollment patterns at MTU as a result of this program. However, we do expect that students who are interested in obtaining an MS in BME will now do so through the Department of Biomedical Engineering as opposed to other Engineering Departments (e.g., MEEM, ECE).
   d. What is the current enrollment in the unit?:
      BME currently enrolls approximately 240 undergraduate students and 12 Ph.D. students.

III. Impact on Resources Required by Department in which the program is Housed
   a. Faculty Lines: No new faculty lines are requested
   b. Faculty and Student Labs: No new Laboratory space is requested. All faculty maintain and active research lab as part of our Ph.D. Program.
   c. Advising: For the research MS students, much of the research advising will be completed during the usual weekly lab meetings that each of the BME faculty hold with their research groups. Course advising for the MS students will be minimal and the time required for this advising will be small as the BME faculty already perform these same advising tasks for BME Ph.D. students.
d. Assessment:
   Faculty members will have to devote time to assessing the MS students. More students will enroll in our graduate courses and the work will need to be assessed. Faculty advisors and committee members will need to devote time to reviewing the student’s research and reading/assessing MS theses.

IV. Impact on resources Required by Other Units Within the University
a. Other academic units with regard to faculty, labs, and assessment:
   BME MS students may take courses from other Units on campus, if there is sufficient space in the courses. Faculty from other Units would have to assess the student’s performance in these courses just as they would for any other graduate student.

b. Information Technology, Library, Central Administration etc.:
   New students will, of course, increase the demands on IT, the Library, etc. However, it is within the University’s goals to increase the number of graduate students enrolled. The students in the Program will pay the Engineering Tuition Fee which should, presumable, help to offset some of these costs.

V. Assessment of the Ability to Obtain the Necessary Resources Assuming Requested Funds are Obtained:
   No new funds are requested; No new faculty lines are requested.

VI. Past proposals:
   The Department has not initiated any other new degree programs in the past 5 years.

VII. Departmental Budget Contribution
a. What is the Department’s total general fund budget? $1,127,115 (2011-20112 Budget Year)
b. How much tuition does the Department generate (approximate numbers)?
   1. Credit hours taught by Department: 1321 credit hours at $420.50/hour = $555,480.50 (+ fees) (Undergraduate in FY10)
      157 credit hours at $702/hour = $110,214 (+fees) (Graduate in FY10)
      Total: $555,480.50 + $110,214 = $665,694.50
   
   Note that these values will increase slightly due to increased enrollment this academic year.

   2. Number of credit hours taken by BME majors:
      Ave. of 16.38 cr hrs per student per semester * 240 students = 3,930 cr. hrs per semester (Undergraduate)
      3,930cr hrs at $420.50/hr (in FY10) = $1,652,565
      Ave of 9 cr hrs per student per semester * 12 Ph.D students = 108 cr. hrs per semester (Graduate)
      108 cr hrs at $702/hr = $75,816
      Total: $1,652,565 + $75,816 = $1,728,381

VIII. a. How do the benefits from this Program compare to other alternatives that are currently under consideration or development?
   No alternatives are currently under consideration or development.
b. Will approval and allocation of resources to this program preclude the development of other programs?
   No allocation of new general fund resources or space is requested, so other programs will not be precluded from being developed based on these considerations.
Appendix II
List of Appropriate Existing Courses
(not necessarily all inclusive; does not include research credits or special topics courses)

Department of Biomedical Engineering Courses
BE5100 Cell/Tissue mechanics BE5200 Biology for Engineers II
BE5300 Polymeric Biomaterials BE5510 Cardiovascular Engineering
BE5500 Active Implant. Dev. BE5700 Biosensors
BE5940 Intro Tissue Eng. BE5550 Biostatistics for Health Sciences
BE5990 Grad Seminar BE5800 Adv. Biomaterials Interfaces
BE5880 Princ & Anal/Cell Proc. BE5900 Biomedical Optics

(Note BME has recently hired 3 new faculty members into the Department. As part of their regularly assigned teaching duties, they will each develop a graduate-level course for the existing Ph.D. Program. These courses have yet to be defined, however, they will be added to this list as they are developed and offered.)

Other College of Engineering Courses*
EE5440 The Laser EE5522 Digital Image Processing
EE5540 Statistical Optics EE5750 Dist Embedded Control Sys
EE5940 Electrophysics Seminar EE5950 Signals and Systems Seminar
EE5410 Engineering Electrodynamics EE5520 Fourier Optics
EE5500 Prob & Stoch Processes MEEM5170 Finite Element Methods
CM5900 Nanobiosensors MEEM5240 Comp. Fluid Dynamics
MEEM5150 Advanced Mechanics of Mats. MEEM5700 Dynamic Meas/Signal Analysis
MEEM6110 Adv. Continuum Mech MY5260 Crystallography
MY5580 Atomic force Microscopy

Courses Offered in the College of Science and Arts*
BL5340 General Immunology BL5502 Biological Sciences Seminar
BL5030 Molecular Biology BL5025 The Scientific Profession
BL4840 Mol. Biol. Tech CH5120 Pharm Chemistry: Drug Design
CH6920 Adv. Mass Spectrometry PH5410 Quantum Mechanics
CH6790 Protein Folding

*Based on availability
This is a proposal to revise the terms applied to the different categories of Graduate Faculty at Michigan Technological University.

Currently there are two categories of Graduate Faculty: Graduate Faculty and ad hoc Graduate Faculty.

In addition there are people who are not members of the Graduate Faculty but who have received permission to teach graduate courses. These individuals are not allowed to supervise graduate students or serve on graduate committees (and have no special title at present).

The proposed new naming scheme separates members of the Graduate Faculty into different groups based on broad characteristics. This change will help students to understand that there are different categories of Graduate Faculty (including different terms of service). This change will also make it easier for the University to accurately communicate with external audiences about the number and type of faculty involved with our graduate programs. Finally this change will make it easier for individuals associated with our graduate programs to accurately communicate their level of involvement and privileges.

The proposed names and definitions for the Graduate Faculty are:

1) **Full Members**: Members of the academic faculty holding the rank of ASSISTANT PROFESSOR, ASSOCIATE PROFESSOR, or PROFESSOR.
2) **Affiliated Members**: Members holding the rank of LECTURER, ADJUNCT, and EMERITUS faculty and faculty holding a rank with a prefix of VISITING. Affiliated Members’ appointments are reviewed annually.
3) **Contributing Members**: Members with special technical expertise that are employees of Michigan Tech and have been nominated for membership in the Graduate Faculty by an academic department or school and have been appointed to the Graduate Faculty by the dean of the Graduate School. Contributing Members’ appointments are reviewed annually.
4) **Temporary Members**: Members with special technical expertise that are not employees of Michigan Tech. Temporary members must be nominated for membership in the Graduate Faculty by an academic department or school and must be appointed to the Graduate Faculty by the dean of the Graduate School. Temporary Members’ appointments are reviewed annually.

The proposed name and definition for individuals who are not members of the Graduate Faculty but who have received permission to teach graduate courses is:

**Graduate Instructional Faculty**: Individuals who are have been recommended by an academic department or school to teach one or more graduate courses and who have been approved by the dean of the Graduate School. These individuals may not supervise graduate students’ research or serve on graduate committees. Appointments are reviewed annually.

The attached sheets show how these names align with the text of the Faculty Handbook.
1.5.3 Graduate Faculty Status

A. Membership

The Graduate Faculty consists of members of the academic faculty holding the rank of ASSISTANT PROFESSOR, ASSOCIATE PROFESSOR, or PROFESSOR who have been appointed by the Dean of the Graduate School. The Dean of the Graduate School may also grant graduate faculty status to LECTURER, ADJUNCT, and EMERITUS faculty and faculty holding a rank with a prefix of VISITING, but these appointments are for one year and must be reviewed and reappointed on an annual basis.

Under special circumstances, the graduate dean may appoint individuals with special technical expertise to the graduate faculty for a specific term and purpose, such as serving as a member of a student’s advisory committee.

Only graduate faculty members are eligible to teach graduate courses (500 level and above), serve as examining members on Masters and PhD committees, and supervise Masters and PhD students.

B. Qualifications of Graduate Faculty

1. Qualifications expected for graduate faculty appointment:

a. Experience and continued interest in the conduct of research.
b. The necessary background for, and a continued interest in, teaching graduate courses.
c. Continued interest in serving as a graduate student advisor.

2. Evidence of Qualifications

Faculty may meet the qualification requirements if they:

a. Are currently involved in research work or graduate instruction or in advising graduate students.
b. Regularly publish articles in recognized journals having national distribution or books related to their field of study.
c. Have earned the terminal degree in their field.

C. Appointment Procedures

Graduate Faculty appointment and retention decisions are made by the Dean of the Graduate School with recommendations and advice from department chairs, deans of colleges and schools, and the Graduate Council.

Recommendation for Graduate Faculty status is made in writing by the department chair of the appropriate academic unit or by the deans of the Schools of Business and Forestry/appropriate Schools. These recommendations are forwarded to the college dean, where appropriate, and then to the Graduate Dean.

D. Review of Graduate Faculty

It is expected that department chairs/school deans will continually review the performance of all individuals holding graduate faculty status in their respective units using criteria outlined in Section B above.

When, in a department chair/school dean's professional judgement, a faculty member holding a graduate faculty appointment is no longer satisfactorily functioning in this capacity, s/he must recommend that the individual in question be removed from graduate faculty status. The Dean of the Graduate School may also initiate the removal process in consultation with the appropriate chair/dean. The Dean of the Graduate School will act on recommendations with the advice and consent of the Graduate Council.

Comment [J5]: Text to be updated during summer, 2011 to reflect University practice.
Changes to GACS (Graduate Assistant Cost Share)

The deans have had a lot of discussions lately about the University's need to promote (and reward) units that are effective at obtaining external support for graduate students. We all agree that we are going to need to increase the amount of external support for students significantly if we are going to meet our strategic plan goals in the graduate area.

In fall 2009, 178 students were funded by external sponsored accounts (these are students coded in Banner as FELE, GADE, and GRA). In fall 2010, 215 students were externally supported. In contrast, the number of internally funded lines was 318 in fall 2009 and fall 2010. The increase in number of externally supported students is very positive, and it is appropriate to begin to reward units that facilitating Michigan Tech’s progress toward its Strategic Plan goals.

Together, the Graduate School and the academic deans have come up with a proposal (outlined below) that will reward units that obtain external support for graduate students. The goal of this new policy is to stimulate further growth in the number of students supported by sponsored projects. If this goal is not achieved, this new policy will be revised as appropriate.

We are still very early in the planning stages and there are many procedural issues that remain to be worked out. At this point the deans would appreciate receiving feedback about the proposed new policy. The existing policy is outlined directly below and the proposed new policy follows at the end of this document.

Current policy is that GACS is available in the following situations:

- When cost share is mandatory.
  - The Graduate School will provide up to a maximum of 50 percent of the total required cost-share capped at the equivalent of the cost of nine credits per student (for a maximum of two students) per semester for academic year (two semesters) tuition at the time the proposal is submitted.

- When cost share is not mandatory (voluntary uncommitted) (for assistant professors only).
  - The Graduate School will provide partial funding for one graduate student per budget year on proposals submitted by an assistant professor serving as lead PI. Cost-share support will be capped at the equivalent of the cost of nine credits of academic year tuition (two semesters) at the time the proposal is submitted. Documentation of the dollar amount of the GACS commitment will not be disclosed in the budget justification section of the proposal.

- When the proposal is large (> $500k/year) and interdisciplinary, multidisciplinary, or contribute significantly to the University’s mission.

(See: http://www.mtu.edu/gradschool/administration/academics/policies-procedures/gacs/ )
Proposed New Policy:

Recent developments have precipitated a review of the current GACS policy and development of some recommendations for change.

- Required cost-share will continue to be available as before for single investigators and large projects.
- Voluntary uncommitted GACS funds will not be committed (even internally) to projects at the proposal stage. This is an appropriate change because NSF has recently updated its stand on voluntary committed cost share (it is now prohibited).
- A GACS “incentive return” will be awarded to departments in an amount proportional to the amount expended on graduate student support from sponsored projects.
  - The goal is to return a 1/3 the cost of graduate tuition for every student that receives full-time support (stipend plus tuition) from a sponsored project.
  - The actual amount returned will be based on the availability of funds.
  - This new approach will be phased-in and the amount of funding to be made available will increase as existing GACS commitments expire.
  - All existing commitments will be honored.
  - Returns will be based on actual expenditures (rather than budget) in graduate student stipend, hourly, and tuition categories.
  - Funds will be returned the unit level (department chair or school dean).
  - Funds will be available for use to support graduate students *only*.
  - All support from sponsored projects will be considered (not just projects proposed by assistant professors).
Pre-defense Form - Please type; handwritten forms are not acceptable

This form is required for the following degrees: PhD, MS (plan A, B, C) and Master of Forestry

Off campus students should e-mail a completed form to their graduate program; they will print and submit.

Return this form to the Graduate School two weeks prior to the oral defense.

Provide information about you and your program.

Last Name, First Name, MI Charlesworth, Debra

M Number (ex: M12345678) M12345678

Select Degree Type ☐ PhD ☐ MS ☐ MFor

Select Graduate Program Chemistry

A draft of your dissertation or thesis is due to your committee and the Graduate School two weeks prior to your defense.

Draft Due Date 10/03/2011

Title of thesis, report, or dissertation The best dissertation ever!

Select your defense date, time, and place.

Students make their own arrangements to reserve a room on campus and set a date and time for the defense. All information in this section must be provided when the form is submitted to the Graduate School.

Defense Date (M/D/YYYY) 10/17/2011 Start Time of Defense 2pm

Place - building and room number Admin 407A

Provide your committee members.

The advisor and co-advisor (if applicable) serve as chairs of the committee. At least four members of the graduate faculty are required for doctoral candidates. At least one member will be from outside the student’s administrative home department or school.

Jeremy Gilbert, Co-Chair

Eugene Lautenschlager, Co-Chair

Kathleen Faber

Wesley Burghardt

Sign the form. A graduate program director may sign for any advisor. Advisors should verify the ETD and embargo options selected on the next page, and will ensure that the committee has received a draft of a thesis, report, or dissertation two weeks before the defense date.

Jeremy Gilbert Date

Eugene Lautenschlager Date

Graduate Program Director, Chemistry Date

Assistant to the Dean of the Graduate School Date

Do all graduate programs want to sign? We can selectively take off programs who find this unnecessary.