Minutes of the Graduate Faculty Council Meeting

Tuesday, January 19, 2010

1) Meeting called to order at 4:05 pm.

**Members** (15): Bill Yarroch (ASE), James Pickens (SFRES), Renfang Jiang (Math), Blair Orr (Peace Corp), Beth Flynn (HU), Amy Marcarelli (Bio Sci), Steve Seidel (Comp Sci), Chris Middlebrook (Elec & Comp Eng), Ruth Archer (Bus & Econ), Seth Donahue (Bio Med), Gerard Caneba (Chem Eng), Sam Sweitz (Env Policy), Jim Hwang (Materials Sci), Craig Friedrich (MEEM), Kim Fook Lee (Physics), Greg Waite (Geo)

**Guests** (5): Heather Suokas (Grad Sch– recording secretary), Nancy Byers Sprague (Grad Sch), Jim Diehl (GMES), Jim Frendewey, (SOT), Guy Hembroff (SOT)

2) Review and approval of 12/01/09 meeting minutes.

3) Old Business
   a. Graduate Certificates Proposal (B. Yarroch): The Senate Curricular Committee has not yet acted on this.
   b. Graduate Certificate in International Profile Proposal (B. Orr): Waiting on the decision from the Senate Curricular Committee in regards to the graduate certificates proposal.
   c. Graduate Program Review (J. Huntoon): No new report.

4) New Business
   a. Master’s Program Security and Medical Informatics (G. Hembroff & J. Frendewey):
      This is a natural progression for the School of Technology. Previously the SOT offered associate degrees exclusively (last associate program ended in 2005) and that has changed and moved on to offering only bachelor’s degrees. The entire faculty hired in SOT are PhD candidates. The school has changed a lot over the years and is continuing to change. The medical informatics proposal fits in well with the SOT’s capabilities. The current area that SOT has in relation to this informatics proposal is the undergraduate computer network systems administration. A lot of the research in the school of technology is imbedded into the medical informatics field. The department of labor is saying, in terms of labor statistics, that there will be an eighteen percent increase in medical informatics until 2016 which is the biggest increase in all job employment in the United States. SOT is capable of taking the next step and propose this master’s program. To add validity to the program SOT is partnering with Marquette General Health System, which is a teaching hospital and is facilitated through Michigan State University. There will be two classes each semester that will be instructed from Marquette General. This is all part of the distance learning initiative they are using to structure this particular graduate program. The SOT feels there is a lot of research potential in this area. G. Hembroff then went on to address the comments made during the December GFC meeting (see meeting minutes on the GFC archives page). This is not a database network administration program. See the handouts section on the GFC website to review the definition of medical informatics. The handout details what medical informatics is, what types of research will be accomplished and some current articles from the Journal of American Medical Informatics Association. The program will deal with different types of structuring of data and different types of components of data. The prerequisites have been modified and the modified proposal is found on the
handouts section of the GFC website. In regards to the substitutions (whether or not other courses within departments/programs other than SOT can be taken instead of the proposed listed courses) – yes, this is a possibility. One thing they had to look at when considering this is whether or not certain components (what is taught from a health care decision making process) are imbedded into the possible substitution courses. One possibility is the TSMI5161 (database management and security) being substituted with CS4421 (database systems). Another possibility is TSMI5221 (protocols and systems for internet and web security) to be substituted with EE5723 (computer and network security). S. Siedel passed out a handout (can be found on the handout section of the GFC website) that includes comments that were addressed above. It also includes examples of overlaps. Which staff at Marquette General will be instructing the distance learning classes? If the proposal is passed then those decisions will be made. One instructor will be hired to teach the four courses. Differences between the Medical Informatics program and other programs on campus will need to be clearly defined. Will there be any commuting to Marquette General? No, this is an online distance learning program. Research options (Plans A, B, or C) are still being decided on. Distance research is more time consuming and more difficult. Why is this a master's program as opposed to a bachelor’s program? The work that is being done in terms of the research components are done at a graduate level. The knowledge needed for the courses would make it unfair to put it at an undergraduate level. G. Hembroff has documentation regarding how to classify what constitutes adequate education for someone involved in medical informatics or security. What distinguishes this program as science rather than arts? The content of the courses and research is more from a science and math perspective rather than arts. It also deals with a high level of security content. Most master’s programs at Tech have bachelor’s programs behind them. This doesn’t have a specific bachelor’s program behind it. The proposal does not list a specific bachelor's degree needed to enter this course. The proposal states that the online courses will average five to six students per class. How is this cost effective? There are both degree seeking and non-degree seeking students who can take these courses and they anticipate thirty to forty students. The target demographic for this program are individuals from computer science, computer engineering or information technology. The proposal needs to address the above concerns before this is sent to the Senate. The proposal will be revised and brought back to GFC on 2/2/10.

b. Proposal to Modify the “Senior Rule” Policy (N. Byers Sprague): The proposed name for this revised policy is “Integrated Undergraduate/Graduate Degree Programs.” The goals are to allow individual departments/programs to offer integrated undergraduate/graduate degree programs, attract Michigan Tech bachelor’s students into the master’s programs, allow students an early opportunity to become engaged in graduate-level research, allow students to pay undergraduate tuition for a limited number of credits taken while an undergraduate student and apply these credits toward a graduate degree and finally allow students to double count a limited number of credits towards both the bachelor’s and master’s degree. The current policies along with the above goals are detailed in the handout section of the GFC website. This is an expansion on the current policy. Clarify “graduate credits.” Does this mean graduate level credits or credits applicable to a graduate degree? Applicable credits because they do not need to be 5000 level credits. Does this have to go to the Senate? The dean will answer this question. Will this affect the MIGS transfer students? No, this is strictly for Michigan Tech students who are getting an undergraduate degree here. In regards to the text “In most situations, this means that a student may accumulate a maximum of ten credits as an undergraduate that can later be applied toward the graduate degree,” the proposal needs to clearly state that each department/school may set lower maximum allowable
credits. Another issue is that research credits can be counted toward the graduate degree as an undergraduate. Something needs to be inserted stating that research credit will not count towards the master’s degree or at least only a small portion will count towards the master’s degree. This could possibly be done as a “special topics” research course or directed study. N. Byers Sprague will bring these issues to the dean of the Graduate School. The proposal will be revised and brought to the February meeting.

c. Proposal for Geophysics PhD Program (G. Waite): This is a program that already exists but does not have a name. There are no new costs because this is an existing program. The department was offering Geophysics degrees under the guise of another program. They have well equipped laboratories to accomplish the Geophysics research. They have one of the best paleomagnetics labs in the United States. This program will help recruit and retain students. Call for a vote to approve and move to the Senate. Unanimous vote to approve.

5) Next meeting will occur on the first Tuesday in February (2).

6) Motion to adjourn at 5:08 pm.
Proposal for an Interdisciplinary Graduate Certificate: 
The International Profile Certificate

William I Rose  
Geological Engineering & Sciences  
Blair Orr  
Forestry and Environmental Sciences  
Alex Mayer  
Civil and Environmental Engineering  
John Gierke  
Geological Engineering & Sciences  
Andrew Storer  
Forestry and Environmental Sciences

1. General Description
This proposal recommends the establishment of a Graduate Certificate called the International Profile. This non-departmental certificate would be available to all degree-seeking as well as nondegree-seeking students enrolled in the Graduate School at Michigan Technological University.

Title of Certificate: **International Profile Certificate**

Catalog Description

The International Profile Certificate recognizes advanced study of any field, but with a substantial international perspective that demonstrates an ability to bridge cultural and language barriers and collaborate effectively.

2. Rationale

Professional work in most fields demands work with diverse groups of people in a wide variety of physical and cultural environments. Educational programs could be expected to include exposure and demonstrated success in working all over the world, and in dealing with all aspects of work on a global basis, because it has a direct link to productivity in workplaces. The degree offerings of a university should reflect accurately the training of students in international contexts.

Michigan Tech has strong and growing international programs. Important examples of these are the Peace Corps associated Masters International Programs in six different academic departments (http://peacecorps.mtu.edu/). In these programs there is two years of volunteer duty in a foreign country and substantial language and cultural training. These programs have changed the focus of their home departments substantially, so that international work is developing even more rapidly than before. International exchange programs for graduate students, such as

   **EHaz:** (http://www.geo.mtu.edu/EHaz/index.htm),

   **SustR:** (http://www.geo.mtu.edu/%7Easmayer/sustr.htm)
and TIES (http://www.doe.mtu.edu/news/TIES_program_05.html)

have triggered significant international exchanges and multi-university course and degree programs. Both Forest Resources and Environmental Science and Geology have just proposed new joint graduate degree programs through EUAtlantis which will involve substantial mobility of MS students to Europe. The development of the Michigan Tech Chapter of Engineers Without Borders, the Aqua Terra Tech Enterprise and other international Senior Design efforts and the D80 Center are grass roots developments that have affected many different graduate programs. We believe that the International Profile is a necessary and appropriate educational opportunity for postgraduate students that will offer them an attractive supplement to their graduate degrees in this era of rapid paced technological change and with a strong need for international bridging. In addition to language and cultural coursework, students will spend one or more semesters abroad doing research, internships and/or coursework.

The International Profile Certificate is designed to:

(1) encourage students to pursue international research, internship and course opportunities;
(2) deepen students' understanding of world cultures and global issues;
(3) develop a world wide perspective on science, engineering and social issues, such as global change and natural hazards;
(4) encourage a basic proficiency in another language; and
(5) enhance intercultural communication skills

3. Related Programs

Undergraduate minors such as “Study Abroad Minors” or “International Minors” exist at many universities (see University of Minnesota, Auburn). A 12 credit Ph D Minor exists in Global studies at the University of Indiana, and we expect that many such examples are now developing on other campuses. At Michigan Tech graduate minors do not exist, so a certificate seems the best current option.

4. Projected Enrollment

Based on likely faculty participants and current graduate enrollments, we estimate that approximately 20 students may be enrolled at any time. In time we anticipate that this program would become available to students via Distance Learning.

5. Scheduling Plans

This graduate certificate program is primarily a regular (daytime) program.
6. Curriculum Design

A total of 12 credits are required for an International Profile. Students must earn a grade of B or higher in each course to be applied toward the certificate. As an interdisciplinary certificate, a maximum of 6 credits is allowed in courses at the 3000- and 4000- levels.

(A) Foreign Language Requirement
A knowledge equivalent to two years of college coursework in a foreign language is a prerequisite. The student can demonstrate this either by taking such courses at Michigan Tech or another university, by scoring at the third year level or higher on the modern language test administered by the Humanities Department for Spanish, French or German, or by similar scores on modern language tests in other languages.

(B) International and Intercultural Awareness (3 credits minimum)
BA4710
BA4780
CE5993
CE5990, 5991, 5992
EC3100
FW5770
FW5720
GE5001
HU3253
HU3261
HU3262
HU3263
HU3264
HU3502
HU3545
HU3850
HU5050
PSY3070
SS3100
SS3410
SS3610
SS3620
SS3940
SS4210
UN4000
UN5990

(C) Required International Experience (6 credits) Students must have a minimum of six credits of coursework taken in a foreign country while concurrently enrolled as an Michigan Tech graduate student.

(D) Integrated International Studies
UN 5555 Integrated International Studies Seminar (1 credit)
UN 5555 will be proposed as a new course.

**UN5555 Integrated International Studies Seminar** (1 credit, fall, spring). Prerequisite: graduate standing, instructor approval, and a minimum of one semester of graduate study in a foreign country. Seminar discusses the cultural differences of implementing research in a foreign country. Case studies and history of universities in other countries are included.

For convenience, relevant course descriptions are given below:

**BA 4710 - International Management**
Study of managing work in a global context. Assesses impact of culture and the international environment (economic, social, legal, technological) on management, personnel, marketing, accounting, and finance strategies. Examines international business structures from licensing to joint ventures. Develops attitudes and skills leading to increased international effectiveness.

4
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior
Pre-Requisite(s): BA 3700 and EC 3100(C)

**BA 4780 - International Business Communications**
Studies the importance of intercultural communication competence for effective business relationships. Provides a theoretical and practical foundation for successful business communication by examining the communication processes and contextual units.

Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore
Pre-Requisite(s): UN 1001 and (UN 1002 or UN 1003) and UN 2001 and UN 2002

**CE 5990 - Civil Engineering Graduate Seminar**
Detailed study and group discussions of current literature and graduate research projects related to the broad field of civil engineering. Topics will be combined to address the student's area of interest, including construction, environmental, geotechnical, structures, transportation, and water resources. External speakers discuss current related issues.

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

**CE 5991 - Environmental Engineering Graduate Seminar I**
Presentations and discussion of current literature and research related to the broad field of environmental engineering.

Credits: 1.0
Lec-Rec-Lab: (0-1-0)
Semesters Offered: Fall

**CE 5992 - Environmental Engineering Graduate Seminar II**
Presentations and discussion of current literature and research related to the broad field of environmental engineering.

Credits: 1.0
Lec-Rec-Lab: (0-1-0)
Semesters Offered: Spring
CE 5993 - Field Engineering in the Developing World
Study of applying appropriate and sustainable engineering solutions and technology in the developing world. Concepts of sustainable development are covered. Topics are drawn from several areas of engineering, including water supply/treatment, wastewater treatment, materials, solid waste, construction, and watersheds.
Credits: 2.0
Lec-Rec-Lab: (0-1-2)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Level(s): Graduate

EC 3100 - International Economics
Introduction to international economics, including balance of payments, accounting, foreign exchange markets, international trade theory, barriers to trade, trade and development, regional economic integration, and current U.S. international economic issues.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall, Spring, Summer
Pre-Requisite(s): EC 3001 or (EC 2002 and EC 2003) and UN 2002

FW 5720 - International Forestry Seminar
Seminar for students who have completed FW5730. Synthesizes field work in a theoretical framework. Covers macro aspects of development theory.
Credits: 1.0
Lec-Rec-Lab: (0-1-0)
Semesters Offered: Fall, Spring, Summer
Restrictions: Must be enrolled in one of the following Level(s): Graduate
Pre-Requisite(s): FW 5730

FW 5770 - Rural Community Development Planning and Analysis
Context, analysis, and monitoring of development processes of rural communities in tropical countries.
Credits: 2.0
Lec-Rec-Lab: (2-0-0)
Semesters Offered: Spring
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

GE 5001 - Intercultural Natural Hazards Communication in Latin America
Credits: 2.0
Lec-Rec-Lab: (0-2-0)
Semesters Offered: Fall
Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

HU 3261 - Communicating Across Cultures
Comparative study of interpersonal communication across cultures by both foreign and American students, with emphasis on cultural patterns, attitudes, values, and nonverbal behaviors. Instructor selects cultures for study from Third World, Western, or non-Western regions.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman
Pre-Requisite(s): UN 1002 or UN 1003
HU 3262 - Topics in Francophone Cultures
An introduction to Francophone cultures (in English) in a comparative perspective. Includes a survey of French history and its influence on modern-day French and Francophone societies through movies, media, and recent technologies, and a critical examination of cross-cultural differences between French and American cultures.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman
Pre-Requisite(s): UN 1002 or UN 1003

HU 3263 - Topics in German-Speaking Cultures
An introduction to German-speaking culture (in English) in a comparative perspective. Includes a survey of Central-European history and its influence on modern-day German-speaking societies through movies, media, and recent technologies, and a critical examination of cross-cultural differences between German and North-American cultures.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: May not be enrolled in one of the following Class(es): Freshman
Pre-Requisite(s): UN 1002 or UN 1003

HU 3264 - Topics in Spanish-Speaking Cultures
An introduction to Spanish-speaking culture (in English) in a comparative historical perspective. Includes a survey and a critical cross-cultural examination of Latin-American culture and Spanish-speaking societies (European, Caribbean, and North, Central and South American) through literature, music, film, art and other media. Spanish-speaking cultures and North American society.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: Spring
Restrictions: May not be enrolled in one of the following Class(es): Freshman
Pre-Requisite(s): UN 1002 or UN 1003

HU 3502 - World Mythologies
Survey of the major mythological systems of the world with particular attention to those areas of commonality between the various civilizations. Films may provide contextual background.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2001-2002 academic year
Pre-Requisite(s): UN 1002 or UN 1003

HU 3545 - Literature Across Borders
Study of literary genres, themes, and movements, with emphasis on comparing and contrasting perspectives reflected in literatures from Western and non-Western cultures. Topics may focus on historical, social, aesthetic, and cultural factors as they influence these literatures. Films may be used.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: Fall - Offered alternate years beginning with the 2004-2005 academic year
Pre-Requisite(s): UN 1002 or UN 1003

HU 3850 - Cultural Studies
Examines the way that culture communicates values, feelings, beliefs; structures differential relations of power and possibility; creates difference and hierarchy. Considers the struggles over meaning that open up possibilities for diversity and change.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: Spring
Pre-Requisite(s): UN 1002 or UN 1003

HU 5050 - Intercultural Communication
A critical examination of cross-language and cross-cultural equivalences and differences through the study of acculturation, values, traditions, role expectations, perceptions, stereotypes, and gender issues as well as other verbal and nonverbal problems and issues of communication. Emphasizes the dimensions of communication within a comparative cultural context.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: On Demand
Restrictions: Must be enrolled in one of the following Level(s): Graduate

PSY 3070 - Cross-Cultural Psychology
Introduces the student to cross cultural psychology and sociocultural theory as it is applied to psychology. Examines research on cultural specific and universal behaviors. Emphasizes the benefits and challenges of diversity in organizations and diversity skills that promote interpersonal and organizational success.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)

SS 3100 - Developing Societies
An overview of the developing world. Asks "What is development?" in ecological, human, and economic terms. Explores variation among developing societies and elements of internal differentiation, including cultures, regions, classes, and genders. Emphasizes active student exploration of strategies for change, including technology, business, and political transformations.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring - Offered alternate years beginning with the 2000-2001 academic year
Pre-Requisite(s): UN 1002 or UN 1003

SS 3410 - World Resources & Development
Examination of the human geography and resources of various world regions. Emphasizes factors affecting prospects for development, including population dynamics, natural resource endowment, social and cultural systems, and spatial structure of society. Case studies of individual countries supplement general concepts and theories.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall, Summer - Offered alternate years beginning with the 2001-2002 academic year
Pre-Requisite(s): UN 2002

SS 3610 - International Law
Explores the principles, content, and logic of public international law, the law of nations. Students brief cases, prepare longer briefs to defend a side in a moot case, and engage in a moot court.
Credits: 3.0
Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall, Spring - Offered alternate years beginning with the 2000-2001 academic year
Pre-Requisite(s): UN 2002

SS 3620 - International Environmental Technology Policy
Explores the relationship between markets and government policies in moving national economies and corporations toward "greener" technology choices. Topics may include industrial ecology, regulation, innovation, and pollution prevention. Course employs examples from U.S., Canada, EU, and Japan. When possible, students work on a real-life project for a client.
**SS 3940 - World Affairs**
The study of current issues and themes in world affairs and of significant world tension areas. Detailed examination of central issues in selected recent regional or international conflicts or high profile internal problems in selected countries.

- **Credits:** 3.0
- **Lec-Rec-Lab:** (3-0-0)
- **Semesters Offered:** Fall, Spring - Offered alternate years beginning with the 2001-2002 academic year
- **Pre-Requisite(s):** UN 2002

**SS 4210 - Global Change in Culture and Society Since 1400**
Explores the increasing interconnectedness of world cultures since 1400. The course examines the social, economic, and political changes that accompanied the rise of world capitalism from multiple theoretical perspectives. Themes include colonialism, agency, resistance, world-systems theory, and globalization.

- **Credits:** 3.0
- **Semesters Offered:** Spring - Offered alternate years beginning with the 2007-2008 academic year
- **Pre-Requisite(s):** UN 2002
- **Restrictions:** May not be enrolled in one of the following Class(es): Freshman

**UN 4000 - Remote Sensing Seminar**
A seminal series that covers topical issues in remote sensing, ecosystem research, and global change. Required for all students with a minor in remote sensing.

- **Credits:** 1.0; Repeatable to a Max of 2
- **Lec-Rec-Lab:** (0-1-0)
- **Semesters Offered:** Fall, Spring
- **Restrictions:** May not be enrolled in one of the following Class(es): Freshman, Sophomore

**Library and other Learning Resources.**
No additional library or learning resources are required.

**6. Computing Access Fees**
No computing access fees are required beyond those normally incurred by enrolled graduate students.

**7. Faculty Resumes**
Key faculty for this graduate certificate program include the three proposers, whose short vitae are attached at the end of this proposal: Numerous additional faculty and staff that are important to this program are those associated with the language programs in Humanities department and those who teach classes listed under section 6B (above), especially in HU and SS. This initiative recognizes a strong commitment to international perspectives in all study areas and receives broad support across the Michigan Tech campus. As such the main impact of this certificate may make these international classes more visible to graduate students.
Description of available/needed equipment.

8. Program Costs
There are no additional direct costs associated with establishing this graduate certificate program at this time. Foreign language courses are already in high demand and overbooked. The sustainability of offering UN5555 in the longer term may depend upon additional resources.

9. Space
No additional space is required.

10. Policies Regulations and Rules
All policies, regulations and rules are described in Section 6 and follow University Senate policy for Graduate Certificates. The committee of Peace Corps Masters International programs (including all of the proposers) will assist the Graduate School in the administration of this certificate. The committee may designate appropriate classes to qualify for the certificate in addition to those listed in this proposal. Recommendations for modification of the curricular requirements of this certificate shall be made through the to the Dean of the Graduate School.

11. Accreditation (Not applicable)

12. Internal Status of the Proposal

13. Planned Implementation
This program could begin starting in fall semester, 2009.

Vitae of organizers follows
WILLIAM I ROSE
Professor, Department of Geological Engineering and Sciences
Michigan Technological University
HOUGHTON, MI 49931 USA
906 487 2367; raman@mtu.edu
www.geo.mtu.edu/~raman

PROFESSIONAL PREPARATION:
Ph.D. in Geology, Dartmouth College, 1970;
A.B. in Geography, Geology, Dartmouth College, 1966.

APPOINTMENTS:
9/79-present: Professor of Petrology, Michigan Technological University, Houghton.
6/90- 6/ 98 Department Chair, (planned new building; hired 8 new faculty); 9/74-9/79: Associate Professor of Petrology, 9/70-9/74; Assistant Professor of Petrology.
1/99-12/99: Visiting Leverhulme Fellow, Dept of Earth Sciences, University Of Bristol, UK.
8/85-6/86: Visiting Scientist, Los Alamos National Laboratory.
1/81-present: Geochemist (W.A.E. basis), USGS, Cascade Volcano Observatory , Vancouver, WA; Alaska Volcano Observatory, Anchorage; VDAP.
8/77-8/78: Senior Visiting Scientist, Upper Atmosphere Group, National Center for Atmospheric Research, Boulder, CO.
8/77-8/78: Visiting Scientist, Branch of Isotope Geology, USGS , Denver, CO.

RELATED PUBLICATIONS


SYNERGISTIC ACTIVITIES


2. Since 1980: **Educational efforts shared with many other campuses**: Video based educational efforts in Optical Mineralogy, 1982; Volcanic Rock Textures, 1985; and video field trips: 1987-1993; Volcanic Rocks and their vent areas, Industry Short Courses (field trips and lectures); 1976-1985; Graduate Student field trip efforts, 1997 (Western Mexico and IAVCEI meeting); NSF funded International Travel Grant to IAVCEI Bali meeting, and associated Hawaii and Pinatubo field trips, July 2000; NSF Int Travel Grant for students to attend IAVCEI meeting in Chile, 2004. Special session exploring graduate volcanology educational efforts, AGU 2002. 2005-2009: FIPSE-NAFTA 6 University Consortium in Earth Hazards (EHaz), funded by Dept of Education.


4. Since 1992: Development of Michigan Tech Remote Sensing Institute. Co-organizer and Interim Director of an institute with 35 faculty members from nine different MTU departments, Development of shared lab facilities, success with equipment funding as a NASA center of excellence, development of an interdisciplinary minor program in remote sensing; many interdisciplinary seminar series and several new interdisciplinary classes.


RECENT COLLABORATORS EXTERNAL TO MICHIGAN TECH (2000-2005)
Stephen Self (Open University); Andrew Harris (University of Hawaii); Luke Flynn (University of Hawaii); Hans Graf (Cambridge Univ); Fred Prata (CSIRO, Australia); Arlin Krueger (UMBC); Vincent Realmuto (NASA/JPL); Frank Marzano (University “La Sapienza” of Rome); Costanza Bonadonna (Univ So Florida); Christiane Textor (Max Planck Inst Meteorology); Alain Bernard (University of Bruxelles);

THESIS ADVISEES AND POSTDOCTORAL SCHOLARS SPONSORED, LAST 5 YEARS
Tianxu Yu, STC/NOAA Washington, DC
Song Guo, Canadian Centre for Remote Sensing, Montreal  
Sebastien Dartevelle, Los Alamos National Lab  
Demetrio Escobar, Volcanologist, SNET, El Salvador  
Yingxin Gu, SAIC/USGS EROS Data Center, Sioux Falls, SD  
I Matthew Watson, Bristol University UK  
Matthew Patrick (current Post Doc) Owen P Mills, Adam Durant, Janelle Byman, Kelly Durst,  
John Lyons, Ellen Engberg, Hans Lechner, Adam Blankenbicker, Jemile Erdem, Karinne  
Knutsen, Ingrid Fedde (current graduate students)  

**Graduate Students Supervised:** 39 M.S. and 14 Ph.D.  

**Graduate Advisor:** Richard E Stoiber, Dartmouth College, deceased.
BLAIR ORR
School of Forest Resources and Environmental Science
Michigan Technological University

Professional Preparation


Appointments

2008 – present: Director of Peace Corps Programs. Michigan Technological University
2006 – present: Professor of Forestry, Michigan Technological University
1998 – 2006: Associate Professor of Forestry. Michigan Technological University
1992 – 2006: Assistant Professor of Forestry. Michigan Technological University
1988 – 1992: Assistant Professor of Forestry, The University of the South

Five Relevant Publications


Five Other Publications


Synergistic Activities

Peace Corps Master’s International Program
EU-US Atlantis Program
TIES – FIPSE and SustR programs in Mexico; Veracruz Study Abroad Program
World Forestry Committee of the Society of American Foresters
International Society of Tropical Foresters

Courses and Workshops:

Trees in Agricultural Systems; Overseas Research; Graduate Tropical Forestry; International Forestry Practicum; International Forestry Seminar; Community Planning and Analysis, Master’s Graduate Seminar; Doctoral Graduate Seminar

Collaborators and Affiliations

Dr. James B. Pickens, Michigan Technological University
Dr. Alex S. Mayer, Michigan Technological University
Dr. Willem Beets, retired
Dr. Karlyn Eckman, University of Minnesota
Dr. James Mihelcic, U. of South Florida
Dr. Kathleen Halvorsen, Michigan Technological University
Dr. Miquel Armando Ramirez, Universidad Veracruzana
Dr. Martin Yemefack, Institute of Agricultural Research for Development, Cameroon
J. Cardenas Castillo, Oruru Technical School, Bolivia
Dr. Thomas Van Dam, Michigan Technological University

Graduate Advisor: Dr. J. Buongiorno, U. of Wisconsin – Madison

Graduate Students (M.S.)

Biographical Sketch

Alex S. Mayer
Department of Civil & Environmental Engineering
Michigan Technological University

Professional Preparation
Brown University, Sc.B. Civil/Environmental Engineering, 1981
University of North Carolina at Chapel Hill, M.S. Environmental Engineering, 1987
University of North Carolina at Chapel Hill, Ph.D. Environmental Engineering, 1992

Appointments
September 2005-present: Director, Michigan Technological University Center for Water & Society
September 2002-present: Professor
September 1998-August 2002: Associate Professor
March 1992-August 1998: Assistant Professor
Department of Geological Engineering and Sciences
Michigan Technological University, Houghton, MI
September 2000-May 2001: Visiting Professor
Department of Civil Engineering and Geosciences
Technological University of Delft, Netherlands
August 1995-November 1995: Visiting Professor
Department of Chemical Engineering
University of Sonora
1981-1985: Civil Engineer
Water Resources Projects Section, Planning Division
East Bay Municipal Utility District, Oakland, CA

Five Relevant Publications

Five Other Publications
Synergistic Activities
AQUA3, ExCIT, SustR, and TIES Programs in Water Resources Management: managed projects, recruited and advised graduate and undergraduate students from Mexico, U.S. and Canada, developed curriculum, developed and led field trips dealing with Mexican water resources issues, working with engineers, economists, sociologists, etc., has led to several collaborative research and education initiatives.

Textbook on groundwater contamination: co-edited and co-authored with engineers, geologists, and soil scientists, book accessible to university professors and students and practitioners, funded by Fulbright Scholarship.

Rio Yaqui basin modeling project: principal investigator for effort to develop integrated hydrologic-economic-institutional model, involves working with economists, policy-makers, government agencies.

Michigan Tech Center for Water and Society: Director and co-founder of university-wide effort to integrate research, education and outreach efforts at Michigan Tech, involves engineering, forestry and environmental sciences, biology, chemistry, humanities and social science departments; state and federal agencies, non-governmental organizations, etc.

Watershed management plan for Huron Creek: lead investigator on multi-disciplinary group of faculty and students and community advisory group developing watershed management plan for Huron Creek, a small, highly-impacted creek that empties into Lake Superior. Development of plan has included local K-12 teacher and student involvement in gathering data, producing a community watershed interpretive program, and participation in a watershed advisory committee.

Michigan Environmental Education Curriculum Support (MEECS) program: Developed and authored several modules for middle school environmental curricula made available to all middle school science teachers in Michigan.

Courses, Workshops or Special Courses Taught During the Past Three Years
Undergraduate Courses: Geohydrology, Water & Society, Environmental Engineering Senior Design Project, Geological Engineering Senior Design Project
Graduate Courses: Mathematical Modeling of Earth Systems, Field Engineering for the Developing World
Workshops: Watershed Management Certificate Program (Sonora, Mexico)

Collaborators & Other Affiliations
Asbornsen, H., co-investigator, University of Iowa
Chadde, J., co-investigator, Center for Science, Mathematics and Environmental Outreach; Houghton, MI
Garcia Ruiz, J.L., co-investigator, U. Sonora, Hermosillo, Mexico
Gorman, H., co-investigator, Michigan Technological University, Houghton, Michigan
Hand, D., co-author, Michigan Technological University, Houghton, Michigan
Halvorsen, K., co-investigator, Michigan Technological University, Houghton, Michigan
Hassanizadeh, S.M., co-author, U. Utrecht, Utrecht, The Netherlands
Mihelcic, J., co-investigator, University of South Florida, Houghton, Michigan
Pere Lugo, co-investigator, University of Puerto Rico Mayagüez
Sivapalan, M., co-investigator, University of Illinois
Solomon, B., co-author, Michigan Technological University, Houghton, Michigan
Watkins, D., co-investigator, Michigan Technological University, Houghton, Michigan
Zhang, Q., co-investigator, Michigan Technological University, Houghton, Michigan
Zimmerman, J., co-investigator, Yale University

Graduate Advisor: Miller, C.T., U. North Carolina, Chapel Hill, NC

Recent STEM Graduate Dissertation/Thesis/Project Advisees
Bau, D., Ph.D. Environmental Engineering, 2006
Ballard, M., Ph.D. Environmental Engineering, in progress
Betz, K., M.S. Geological Engineering, 2006
Endres, K., Ph.D. Environmental Engineering, 2004
Fitzgerald, K., M.S. Geological Engineering, in progress
Kersten, L, M.S. Environmental Engineering, 2008
Munoz Hernandez, A., Ph.D. Environmental Engineering, 2009
Ollila Ojeda, M., M.S. Environmental Engineering, 2006
Robles Murua, A., Ph.D. Environmental Engineering, in progress
Rodriguez Ibarra, W., M.S. Environmental Engineering, 2005
Van Grinsen, M., M.S. Geology, in progress
Biographical Sketch for John S. Gierke, Ph.D., P.E.,

a. Professional Preparation
Michigan Technological University Civil Engineering BSCE 1984
Michigan Technological University Civil Engineering MSCE 1986
Michigan Technological University Environmental Engineering Ph.D. 1990

b. Appointments
Associate Professor - September 1996 to Present;
Michigan Technological University, Houghton, Michigan 49931-1295
Visiting Associate Professor - January 1999 through December 1999
University of Delaware, Newark, Delaware
Assistant Professor - July 1990 through August 1996
Michigan Technological University, Houghton, Michigan 49931-1295
Summer Research Faculty Visitor - June 1991 to August 1991
Environmental Sciences Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831.

c. Publications

(i) Five Relevant Publications

(ii) Five Other Significant Publications
d. Synergistic Activities
(1) Principal investigator for the Michigan Tech Remote Sensing for Hazard Mitigation and Resource Protection in Pacific Latin America Project, National Science Foundation Partnerships for International Research and Education, where research is conducted on developing, applying, and testing remote sensing in geologic hazards and water resources in Costa Rica, Ecuador, El Salvador, Guatemala, Nicaragua, and Panama; (2) Graduate advisor for M.S. students in Michigan Tech’s Masters International/Peace Corps programs in geohazards and in civil and environmental engineering where students conduct their masters research whilst serving in the U.S. Peace Corps; (3) Collaborating with faculty at the University of Puerto Rico—Mayaguez to involve their undergraduate geology students in remote sensing research in Pacific Latin America; (4) Organized a 1-day workshop on applications of remote sensing for characterizing groundwater aquifers in conjunction with the 9th Congress on Latin American Hydrogeology in Quito, Ecuador, July 7, 2008; (5) Research on hydrology of glacier melting in Alaska and invited for participating in a workshop (proposal pending) on the future impacts of climate change on glaciers and the ecology of the Andes.

e. Collaborators and Other Affiliations
(i) Collaborators and Co-Editors: Falta, Ronald W. (Clemson University), Imhoff, Paul (University of Delaware), McCray, John M. (Colorado School of Mines), Stewart, Bo (Praxis Environmental).
(ii) Graduate Advisor: Neil J. Hutzler, Michigan Technological University
(iii) Thesis Advisor for (last five years denoted in bold): Anderson, Cecilia P. (ERM-West), *Bachmann, Nancy-Jeanne (Emmons & Olivier Resources, Inc), Bruning, Jill N. (searching for employment), Carpenter, Michael D. (consulting), Castor, Meaghan G. (consulting), Ebsch, Jeffery (Coleman Engineering), *El-Beshry, Manar, Fish, Randy E. (Peace Corps, serving in Tanzania), Fader, Caleb (Peace Corps, serving in Uganda), Fuchs, Valerie J. (Michigan Technological University), Gross, Essa L. (Michigan Technological University), Gu, Yingxin (McGill University), Harrison, Elizabeth (Los Alamos National Laboratory), Hegemann, Robert (Peace Corps, serving in Honduras), Hein, Gretchen L. (Michigan Technological University), Huntzinger, Deborah N. (Post-doc, University of Michigan), *Hutchins, Margot J. (Michigan Technological University), Jenson, Jeremy (Peace Corps, serving in Benin), Keating, Gordon (Los Alamos National Laboratory), Kremer, Theodore J. (Malcolm Pirnie, Inc.), Kucharski, Matthew J. (Peace Corps, serving in Philippines), Mackenzie, Heidi L. (Grenkowitz) (Ford Motor Company), Muraski, Jennifer L. (Montgomery Watson), *Myre, Elizabeth A. (Engineering development work in Haiti), *Quinman, Joseph (ARCADIS), *Ritchie, Beatrice, Rios Sanchez, Miriam (Michigan Technological University), Sanders, Deborah L. (ERM-West), Sawall, R. Hardy (Geotrans), Schmunk, Steven W. (Marquette Intermediate School District), Sherman, Heidi M. (Consulting), Shonsey, Cara W. (Michigan Technological University), Smith, Gwynneth (Peace Corps, serving in Suriname), Stright, Lisa E. (Stanford University), Taeg, Deborah A. (AMEC), **VanAntwerp, Darby J. (RMT), Vincent, Ashlee K. (Michigan Technological University), Wang, Congli (Consulting), *Wojick, Christopher L. (Michigan Technological University). *Served/serving as co-advisor, **Served as co-advisor, student at different university.

Advisor for 20 M.S. and 2 Ph.D. graduates, co-advisor for 3 M.S. and 2 Ph.D. graduates; currently advising 2 Ph.D. students and 10 M.S. students and co-advising 1 Ph.D. student.
Biographical Sketch: Andrew J. Storer

School of Forest Resources and Environmental Science
Michigan Technological University,
1400 Townsend Drive, Houghton, Michigan, 49931, USA
Telephone: (906) 487-3470, Email: storer@mtu.edu, Fax: (906) 487-2915

Professional Preparation
St. Anne's College, University of Oxford. Pure and Applied Biology. B.A. (Hons) 1986
St. Anne's College, University of Oxford. M.A. 1993
Department of Zoology, University of Oxford. Forest Entomology. D.Phil. 1993

Appointments
2005 – Present Associate Professor, Forest Insect Ecology, School of Forest Resources and Environmental Science, Michigan Technological University
2007 – Present Director, The Honors Institute, Michigan Technological University
2001 –2005 Assistant Professor, Forest Insect Ecology, School of Forest Resources and Environmental Science, Michigan Technological University
1998 - 2001 Assistant Research Entomologist, Division of Insect Biology, University of California, Berkeley.
1999 - 2001 Instructor, Department of Landscape Horticulture, Merritt College, Oakland.
1992 - 1997 Postdoctoral Researcher, Division of Insect Biology, University of California, Berkeley.

Publications (5 most closely related – from work in Africa or other locations outside the US)

Publications (5 other)


**Synergistic Activities**

1) Active research in forest health and educational programs in global technological leadership in Ghana.

2) Director of the Honors Institute at Michigan Technological University. This institute encourages undergraduates to develop research and other professional experience during their undergraduate career.


4) Member of the editorial board of the Journal of Pest Science (Springer). Subject editor for Forest Entomology


**Collaborators and other affiliations**

a) Collaborators and coeditors

Abeney, EA (Forest Research Institute of Ghana), Bonello, Pierluigi (The Ohio State University), Cobinnah J.R. (Forest Research Institute of Ghana), Delisle, J. (Natural Resources Canada), Erbilgin, N. (University of Edmonton), Gordon, Thomas R. (University of California, Davis), Hyslop, MD (Michigan Technological University), Jurgensen MF (Michigan Technological University), Karnosky, David (Michigan Technological University), Marshall, J.M. (Michigan Technological University), McNee, William R. (Wisconsin Department of Natural Resources), McPheron, Brice A. (University of California, Berkeley), McCullough, Deborah (Michigan State University), Nagel, Linda M. (Michigan Technological University), Opuni-Frimpong, E. (Forest Research Institute of Ghana), Risch, AC (Swiss Federal Institute for Forest, Snow and Landscape Research), Ritokova, G. (UC Davis), Standiford, Richard B. (University of California, Berkeley), Schutz M (Swiss Federal Institute for Forest, Snow and Landscape Research), Shields JM (Michigan Technological University), Webster, CR (Michigan Technological University), Witter John A. (University of Michigan), Wood, David L. (University of California, Berkeley).

b) Graduate and Postdoctoral Advisors

Graduate: Martin R. Speight, University of Oxford; David Wainhouse, Forest Research, England
Postdoctoral: David L. Wood, UC Berkeley; Thomas R. Gordon, UC Davis

c) Thesis Advisor and Postgraduate Scholar Sponsor

Thesis Advisor to: Tara Bal (Michigan Technological University), Brian L. Beachy (deceased), Jessica A. Beachy (Michigan Technological University), Sarah Brodeur-Campbell (Michigan Technological University), Ryan DeSantis (University of Oklahoma), Michelle Freeman (Michigan Technological University), Elizabeth E. Graham (University of Illinois), Brian P. Henry (Washington DC), Jordan M. Marshall (Michigan Technological University), Emmanuel Opuni-Frimpong (Forest Research Institute of Ghana), Melissa Porter (Michigan Technological University), Bryan K. Roosien (Michigan Technological University), Justin M. Rosemier (Kentucky Wesleyan University).

Total advised: Graduate students: 13, Postdoctoral Scholars: 1
PROPOSAL FOR Ph.D. PROGRAM IN
ENVIRONMENTAL AND ENERGY POLICY

Submitted by the
Department of Social Sciences
November 16, 2009 Version

Contact: Barry Solomon; bdsolomo@mtu.edu

1. General description and characteristics of program

This new Environmental and Energy Policy (EEP) Ph.D. program, to be administered in the Department of Social Sciences of Michigan Technological University (Michigan Tech) with 17 core and affiliated faculty from across campus advising students, will prepare students to conduct research in support of societal decisions regarding environmental- and energy-policy goals, strategies and programs. The doctoral program will train students to use the tools and approaches of multiple disciplines, including sociology, geography, anthropology, political science, economics, history, sustainability science, ecology, and hydrology in support of research programs involving an integrated assessment of environmental & energy-related policy choices. This program builds on the department’s existing M.S. program in Environmental Policy.

2. Rationale

Michigan Tech’s strategic plan calls for the university to establish “world-class research, scholarship, and innovation in science, engineering, and technology that promotes sustainable economic development.” In support of this goal, a doctoral program that focuses on policy-related research supporting societal decisions and choices toward a sustainable society is vital. Efforts to achieve sustainable interactions with Earth systems—and to do so in a socially just and economically efficient manner—involves more than simply developing new technologies, or a better understanding of natural environmental systems. It also involves reaching consensus on the goals that society hopes to achieve, assessing the different strategies associated with achieving those goals, and determining whether progress toward those goals is being made. For example, understanding the limits of corn-based ethanol as a transportation fuel, and the need for a second generation of non-food based biofuels, requires understanding of the life cycle greenhouse gas emissions, water and land use requirements, and effects on soils, but also the long-term economic costs and implications for food security. Thus, in investigations related to sustainability, research in the natural sciences and engineering should be tightly coupled with research into societal choices and policy tools.

Establishing a Ph.D. program in Environmental and Energy Policy (EEP) would:

- Improve Michigan Tech’s competitiveness in securing sustainability-related research funds.
- Improve Michigan Tech’s ability to attract promising scholars and quality graduate students.
- Complement existing strengths in sustainability-related research in engineering and the natural sciences, including programs currently coordinated by centers of research such as the Center of Energy Excellence, Power and Energy Research Center, the Center for Water and Society, and the Sustainable Futures Institute.
- Represent the logical extension of the Masters Degree in Environmental Policy currently administered by the Department of Social Sciences. Such a new PhD program was strongly recommended by the Department of Social Science’s Periodic External Review in 2002. Scholars with expertise in ecological economics, sustainability science, computational social science, environmental & natural resource sociology, environmental geography, environmental anthropology, and environmental history are already in place and would form the core of the faculty needed to implement the Ph.D. program.

The proposed doctoral program faculty already has significant expertise in the field of environmental sustainability, especially with regard to energy policy. They have collaborated extensively across disciplinary and departmental boundaries to pursue energy and environmental sustainability questions, including those related to the development of woody bioenergy forms in the Upper Midwest, the siting of wind farms, waterborne disease-related risk perceptions in Mexico, the regulation of on-site sewage systems in the Great Lakes, payment for ecosystem services in a variety of settings, the political economy and ecology of agricultural and industrial systems, the dynamics of watershed management groups, and brownfield redevelopment. As a group, they also support a range of methodologies, including survey research, ecological and environmental economics, anthropological and historical analysis, spatial analysis, and the modeling of decision-making agents.

As shown in Appendix B, the 17 Core and Affiliated faculty have substantial experience in securing external research support. While in most cases the existing Environmental Policy faculty members have been co-PIs on projects rather than PIs, in a substantial number of cases there has been graduate student funding provided by external agencies, which helps to demonstrate the capacity of the EEP program to support doctoral students. While additional EEP faculty, such as (Alex) Mayer and Storer, have generally not supported Environmental Policy students in the past, they would like to collaborate and be affiliated with this program and would be pleased to help support doctoral students in EEP. Appendix B thus provides a good general indicator of the extent of funding available in EEP, and the important role of socioeconomic and policy dimensions. The EEP program expects to be competitive in winning future support from the NSF, U.S. EPA, U.S. Department of Energy, U.S. Department of Education, USDA Forest Service, U.S. Agency for International Development, Michigan Department of Environmental Quality, Michigan Department of Education, and the Michigan Economic Development Corp. In some cases the masters program in Environmental Policy has been precluded from playing a larger role, such as was the case in the sustainability IGERT, which supports doctoral students. Thus a doctoral program in EEP will remove this constraint in such cases, and allow students to be involved in research projects of larger scope and scale. It is expected that 2-4 doctoral students will be supported as RAs through such external funding in the early program years.

This faculty group also has 13 years of experience administering and graduating students in the existing and highly successful Masters in Environmental Policy. This program has graduated around 40 students who have gone on to pursue PhDs, law degrees, and careers in industry, non-
profits, consulting firms, government agencies, and academia. The gender ratio of students in the masters program in environmental policy has been 55% female and 45% male and 36%
international, with a 50-50 gender split anticipated in the proposed doctoral program. The new PhD program would expect to place graduates in a similar mix of areas, with about 60% ending up in academic and research positions, and 40% finding employment in government agencies, non-profits, industry and consulting firms. National trends and studies by the National Research Council, American Association for the Advancement of Science, and other prestigious groups have shown environmental and energy policy to be strong growth areas for employment.

3. Discussion of related programs within Michigan Tech and at other universities

There are no programs at Michigan Tech similar to this doctoral degree proposal. In the North Central states there are four such similar programs: at Indiana University, University of Michigan, Michigan State University (MSU), Southern Illinois University at Carbondale (SIU).

Each program in the region is organized somewhat uniquely, and is different from the one proposed here, although all such doctoral programs are united by the need to develop and implement practical solutions to environmental problems. Indiana University, which is consistently ranked in the top two or three graduate programs in environmental policy nationwide, offers a Ph.D. in public affairs with a focus on environmental policy, and a Ph.D. in public policy that is jointly administered by the School of Public and Environmental Affairs (SPEA) and the Department of Political Science. Environmental policy students are also strongly encouraged to take courses in environmental sciences in SPEA. At the University of Michigan a Ph.D. is offered in the School of Natural Resources and Environment with a focus on resource policy and behavior. In contrast, at MSU students may seek a Ph.D. specialization in environmental science and policy, but since there is no home department that offers this degree the student must pursue it through one of many existing doctoral programs. Another related doctoral program is at SIU in Environmental Resources and Policy. It is designed similarly to MSU’s program, and currently has three co-directors from three different departments.

There are also several environmental policy programs that are embedded in programs in environmental science and schools of forestry (e.g., Yale, Duke, UC Santa Barbara). Of the other doctoral programs in environmental policy four deserve special mention. The University of California at Berkeley has a department of environmental science, policy and management within a College of Natural Resources, with a large doctoral program that covers issues ranging from ecosystem science to environmental history, environmental policy, and international forest management. Three other such programs have a stronger emphasis on energy: the University of Delaware through its Center for Energy and Environmental Policy, Georgia Tech through its School of Public Policy, and a small doctoral program in Energy, Resources and Environment at the School of Advanced International Studies of the Johns Hopkins University. The program at SIU also offers a concentration in energy. As shown below in Table 1, there are four basic program models for structuring a doctoral program in environmental and energy policy.

The intellectual foundation for this proposal is the belief that there is a significantly growing need for innovative and interdisciplinary solutions to the growing problems of sustainable energy development and mitigation of global climate change, which requires in-depth study and analysis
beyond a 2-year masters degree. The proposed program at Michigan Tech will therefore expand upon our masters-level curriculum and uniquely combine interdisciplinarity in support of the Michigan Tech and national goal of sustainable development, with a strong focus on energy as well as environmental policy. Such a doctoral program is lacking in the State of Michigan and few exist nationwide. This requires the addition of a few courses that focus on energy resources, energy efficiency, and energy and sustainability policy. It will be structured as a hybrid that combines elements of the MSU/SIU and Delaware models, though on a smaller scale, and would take advantage of our strong skills in working across social, natural and applied sciences in the pursuit of research and teaching on environmental sustainability. Moreover, housing the central administration in the Department of Social Sciences will help to give the program a clear home, identity, and center of authority and responsibility. However, if other units at Michigan Tech, especially the School of Business and Economics, add new faculty with specialties that complement this proposal, it is envisioned that the proposal may be modified so that other academic units can play an even larger role. Our major focus on energy is reflected in the research publications and projects of EEP program faculty, many of whom are currently actively engaged in interdisciplinary bioenergy-related research projects and teaching. This is expected to be a distinct advantage as there are very few doctoral programs in the U.S. in energy policy.

Table 1. Alternative Models for a Ph.D. Program in Environmental & Energy Policy

<table>
<thead>
<tr>
<th>Model</th>
<th>Administration</th>
<th>Strength</th>
<th>Weakness</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Policy, Internat. Studies</td>
<td>Separate School or College</td>
<td>Institutional Support</td>
<td>One of Several Foci</td>
<td>Indiana, Georgia Tech, Johns Hopkins, Maryland</td>
</tr>
<tr>
<td>Environmental Science, Forestry, or Natural Resources</td>
<td>Separate School or College</td>
<td>Institutional Support</td>
<td>Less Visibility</td>
<td>UC Berkeley, Yale, Duke, Michigan, UCSB</td>
</tr>
<tr>
<td>Independent</td>
<td>Research Center or Single Dept.</td>
<td>Autonomy</td>
<td>Less Buy-in</td>
<td>Delaware</td>
</tr>
<tr>
<td>Umbrella</td>
<td>Campus-wide</td>
<td>Greater Buy-in Too Diffuse</td>
<td></td>
<td>MSU, SIU</td>
</tr>
</tbody>
</table>

4. Projected enrollment. We project an enrollment of between 5-10 students at any given time. While some students will enter the Ph.D. program following completion of an M.S. in environmental policy at Michigan Tech, eventually most students are expected to be new entrants to Michigan Tech from other states and nations.

5. Scheduling plans (Extension, Evening, Regular). All courses will be taught during regular daytime hours.

6. Curriculum design

Admitted students will have a B.S. or, preferably, an M.S. degree in one or more fields related to social sciences, public policy, or the environment. Assuming an M.S. degree in environmental
policy or the social dimensions of environmental issues, the student coursework requirement would take 2 years. If students do not have an M.S. degree in this field they would be expected to take 3 years of courses. These would include courses in research methods, research design, policy theory, advanced environmental policy analysis, and three courses in a specialty area preparing them for their dissertation focus. All students must meet the prerequisite of at least one microeconomics and one statistics course.

Once admitted to the Ph.D. program, students must:

- Complete 60 credits of coursework past their B.S. undergraduate degree. Thirty credits may come from their Masters degree work.
- Pass a comprehensive oral and written exam of their knowledge in areas related to their dissertation. This exam will be administered by a committee of 4 faculty members, at least one of who will be from outside the Department of Social Sciences.
- Conduct significant research supporting some aspect of a societal or organizational choice related to an environmentally related policy or program.
- Write and defend a dissertation as a final product.

The required coursework must satisfy the following (Bold = new course):

A) Core courses (12 credits)

All students will be required to take the following:

SS 5550 Global Environmental History (3 credits) – will replace SS5100
SS 5300 Environmental Policy and Politics (3 credits) – will be re-titled Environmental and Energy Policy
SS 5400 Sociology of the Environment (3 credits)
**SS5310 Ecological Economics (3 credits)** or EC 5650 Environmental Economics (3 credits)

B) Research Design and Methods courses (10-11 credits)

Students will be required to take the following two courses (additional methods courses can be taken to fit each student’s research needs):

SS 6002 Research Design (3 credits)
SS 5001 Advanced Social Science Methods (4 credits)

In addition, all students will also be required to take one of the following statistics courses:

EC 4200 Econometrics (3 credits)
PSY5220 Advanced Statistical Analysis and Research Design II (4 credits)
MA 5701 Statistical Methods (3 credits)
C) Concentration courses (9 credits)

Students must choose at least three courses from one policy area: a) Energy Policy; b) Environmental and Natural Resources Policy; and c) Sustainable Development.

a. Energy Policy

EC 5620 Energy Economics
**SS 6XXX Advanced Seminar in Energy Policy**
MEEM 4200 Principles of Energy Conversion
MEEM 5990 Fuel Cell Technology
MET 4900 Alternative Energy Systems
EE 5200 Advanced Methods in Power Systems
EE 5260 Wind Power

b. Environmental and Natural Resources Policy

FW 4380 Landscape Ecology (will be renumbered as a SS 5000 level course)
**SS/FW 5111 Advanced Natural Resource Policy**
SS 5635 Environmental Diplomacy and Law
SS 4200 Environmental Anthropology
EC 5640 Natural Resource Economics
EC 5650 Environmental Economics
FW 55510 Advanced Forest Health

c. Sustainable Development

**SS 5313 Sustainability Science, Policy and Assessment**
ENG/SS 5510 Sustainable Futures I
ENG/SS 5520 Sustainable Futures II
ENG/SS 5530 Graduate Colloquium in Sustainability
BA 4790 Ecological Sustainability and Organizations
BA 5760 Corporate Social Responsibility & Business Ethics
**UN 5100 Water Resource Colloquium**

D) Unspecified credits (28-29 credits)

These credits include reading courses, research credits (between 12-18 credits), and any courses related to the student’s research interests.

7. New course descriptions

We will accommodate the teaching of new courses (some of which will replace existing courses) through moving existing graduate courses to every other year and through the addition of four EEP faculty hired to start between Spring 2009 & Fall 2010 (Mayer, Rouleau, Sinha & Mineyte).
SS 5550 Global Environmental History. Earth systems are now so entangled with human activity that it is difficult to understand one without considering the other. This course is a history of the interaction of the two. It links major developments in world history and environment change with important changes in how humans have interacted with and perceived their relationship to the rest of nature. Of particular interest are changes, debates, and choices that place the challenge of sustainability in historical perspective.

SS 6002 Research Design. The objective of this course is to explore the fundamentals of research design and analysis, particularly as these are applied to identifying, initiating, carrying out, and completing a thesis or dissertation research in Environmental and Energy Policy. The course would examine the concepts and structure of scientific inquiry such as inductive and deductive reasoning, ethical issues in research, and the nature of research design. During the course, the students would learn how to formulate appropriate research questions, and how to turn these into valid assessments of the real world. The course will briefly review various qualitative, quantitative and mixed methods used in social science research, and students would learn to understand the nature of variables, as well as how to collect and analyze. The course would also consider the use of primary historical and secondary sources of data.

SS 5001 Advanced Social Science Methods. This course provides a graduate-level introduction to social science methodology and highlights its role in research design, data construction, and data analysis. It exposes students to a variety of social science methods, emphasizing quantitative or mixed-methods approaches such as survey research. The course uses practical examples to highlight key concepts and techniques including: sample design, sampling error, data collection, hypothesis testing, linear and non-linear regression analysis, and advanced statistical or computational methods (i.e., GIS or computer simulation for experimentation). The course also underscores the importance of sampling frames, context and wording of survey questions, non-response data, interviewer/interviewee relations, sample estimation and error, and alternative research designs. The goal is to provide proficiency and encourage critical thinking for students preparing to engage in quantitative research in the social sciences.

SS 5310 Ecological Economics. This course will survey the emerging transdisciplinary field of ecological economics, which combines theories and methods from neoclassical economics, systems ecology, and other fields. Ecological economics starts with the preanalytical vision that the economy is a sub-system of the Earth’s ecological systems, not vice versa. Foundational issues include examination of the optimal scale of the human economy, efficient allocation of resources, and the equitable distribution of resource flows among populations and between humans and other species. Major applications of ecological economics, such as to energy and climate change problems, will also be reviewed.

SS 5313 Sustainability Science, Policy and Assessment. This course will cover foundational scientific concepts, such as dynamic systems and catastrophe theory, as applied to socioecological systems, and the use of indicators and their aggregation into quantitative indices to track the progress of these systems towards sustainability targets and goals. The course will also review policies that have been implemented at the local, national, and global scale to guide the sustainable development of socioecological systems.
**SS/FW 5111 Advanced Natural Resource Policy.** This course surveys basic important federal policies related to water, land, forest, mineral, and wildlife and fisheries management. It uses policy analysis tools to understand the theory and study of policy development and implementation.

**SS 6XXX Advanced Seminar in Energy Policy.** This course will examine current issues in energy policy, both domestically and internationally. Emphasis will be placed on policy instruments and treaties to develop renewable and sustainable energy sources and energy efficiency technologies, in the context of international efforts to reduce greenhouse gas emissions and growing scarcity of fossil fuels.

**UN 5100 Water Resource Colloquium.** This seminar will cover current topics in water resources. Objectives: (1) build towards a common literacy on water resources issues; (2) identify areas of common interest among students and faculty in water resources topics.

8. **Additional resources required**

Most of the resources required to construct this Ph.D. program are already in place serving the existing M.S. Program in Environmental Policy (EP). As of Fall 2010, the program will have 11 core and 6 affiliated faculty, 11 of whom have their primary appointments within the Department (Appendixes A). If the School of Business and Economics hires additional faculty in the environmental and energy fields, it is envisioned that additional economics faculty members may be added to this list. The current M.S. program is built around four core courses that are taught yearly. The faculty members who deliver these courses generally teach one graduate course per year, with the remainder of their teaching effort devoted to undergraduate students. The graduate courses taught as part of the M.S. program serve not only EP students, but graduate students across campus as well. The M.S. program will remain in place after the introduction of the Ph.D. program but will be re-evaluated after three years of experience with the Ph.D. program.

The proposed Ph.D. program will make several additional graduate courses—not all of which will need to be taught yearly—available to EP students and graduate students across campus. These will be met through making new and existing graduate courses offered on an every other year basis and through the participation of new faculty who have already been hired (two of whom are replacement hires and two of who are SFHI hires).

Given that the existing core faculty and the new required positions are also expected to support undergraduate departmental programs and the university’s general education program new PhD teaching assistantship lines are needed. Increasing the capacity of the core faculty to focus on funded research projects would require four graduate teaching assistantship (GTAs) positions to free up faculty resources now devoted to general education courses. Thus, some of the new PhD students will be expected to teach some of the department’s general education courses when the students have sufficient qualifications in the social sciences. These GTA lines would also provide a baseline of financial assistance for students in the program; beyond that baseline, students would be funded through extramural support associated with faculty research projects.
9. **Library and other learning resources.** The existing library hard copy and electronic journal, report, and book resources as augmented through occasional interlibrary loans are sufficient to support ongoing and future environmental and energy-related social science research.

10. **Computing Access Fee.** Same as for other graduate students in the department, current at $285 per student per academic year, which may need to rise to $325.

11. **Description of available/needed equipment.** Laboratory and office computers, same as for other graduate students in the department.

12. **Program costs, years 1 through 3.** $300,000. The major costs to the university will be the requested support for 4 additional Ph.D. GTAs based on fall plus spring term stipend of $11,769 (soon to rise) and tuition and fees of $13,134 per student, for a total of approximately $100,000 per year, or $300,000 total for years 1 through 3 (which assumes some annual increase. Note the EP Masters program currently has 5 GTAs). We would expect the Ph.D. students to teach some of the Department’s share of UN courses when they have sufficient qualifications and skills.

A second need is for space for several additional students beyond that associated with the current M.S. program. We anticipate that the new doctoral students will be housed in the existing Environmental Policy graduate student office, where space is limited. The Department will work with the Dean of Sciences and Arts to resolve space issues as they arise.

13. **Policies, regulations and rules.** No additional policies, regulations, or rules beyond those mandated by the Graduate School.

14. **Accreditation requirements.** Accreditation is not necessary for this program.

15. **Internal status of the proposal.**

   - Department of Social Sciences, September 23, 2009, Date Approved October 19, 2009
   - Dean, College of Sciences and Arts, October 20, 2009, Date Approved
   - Provost, _________, 2009, Date Approved
   - Graduate Faculty Council, _________, 2009, Date Approved
   - University Support Units, _________, 2009, Date Approved
   - University Senate, _________, 2009, Date Approved
   - Academic Affairs Officers, _________, 2009, Date Approved
   - Board of Control, _________, 2009, Date Approved

16. **Planned implementation date.** Fall 2010
APPENDIX A: Affiliated Faculty Specialty Areas & Faculty Resumes (* designates core faculty). Curriculum vitae included at the end.

**Bradley Baltensperger**, Geography (CLS)

Dr. Baltensperger is a geographer with particular interests in agriculture, ethnicity, natural hazards, and global environmental systems. His recent work has focused on improvement of geoscience, geography, environmental and history education in K12 schools through programs that enhance teachers’ content knowledge and ability to improve student learning. He has advised 21 master’s students and has served on over 35 other masters and doctoral committees at Michigan Tech.

**William Breffle**, Environmental Economics (SBE)

Dr. Breffle is an applied microeconomist specializing in environmental and natural resource economics. His areas of expertise include non-market valuation, discrete choice modeling, benefit-cost analysis, restoration program planning, and health economics for over ten years. Prior to joining Michigan Tech, he conducted and managed economic research primarily for testimony for large Natural Resource Damage Assessments (typically at Superfund sites) involving mining injuries, petroleum spills, health advisories, groundwater contamination, and other injuries. He has done work in 13 states for a variety of Federal, state, local, and tribal clients. He has supervised 1 masters student at Michigan Tech.

**Gary Campbell**, Mineral Economics (SBE)

Dr. Campbell is the Director of the M.S. Program in Applied Natural Resource Economics in the School of Business and Economics at Michigan Tech. He has experience in China, Ethiopia, Mongolia, and South Africa. Metal markets and mining sustainability are areas of current research interest. He has supervised 10 masters students and served on 40 other masters and doctorate committees. He has also been the external examiner on 5 doctorate theses for the University of Witwatersrand, South Africa.

**Mary Durfee**, Political Science (SS)

Dr. Durfee publishes on the Great Lakes of North America and international environmental law. Her research interests are in two areas. First is third-party intervention before international courts and duties *erga omnes* in public international law. Second is information transparency in the development of treaties. She currently serves as an appointed member of the EPA Science Advisory Board’s Homeland Security Advisory Committee. She was a Fulbright Scholar to Malta in 2007-08 where she taught international law and international relations as well as various speaking and environmental education events at the request of the U.S. Embassy.

**Louise Nelson Dyble**, History and the Built Environment (SS)

Dr. Dyble specializes in the history of technology, infrastructure and the built environment, and metropolitan government and governance. Her book, *Paying the Toll: Local Power, Regional Politics, and the Golden Gate Bridge* (2009), traces the history of the bridge in the context of regional politics, development and planning. Her ongoing research includes a study of road and highway financing in the United States with a focus on turnpike authorities and the changing politics of public enterprise and privatization. She is also engaged with study of business/government relations and the development of California agriculture.
Hugh Gorman*, Environmental History and Policy (SS)

Dr. Gorman is a historian trained at the intersection of environmental history and the history of technology. He studies interactions between policy choices, technological innovation, and environmental change—with the goal being to inform efforts to construct policies that reward sustainable practices. He is working on a book that examines how industrial society first learned to bypass ecological limits associated with production of fixed nitrogen and now is learning to manage the consequences. Past work includes a history of how, in the period 1890 to 1990, socio-technological systems for producing, transporting, and refining oil evolved in response to pollution-related concerns and policies aimed at addressing those concerns.

Kathleen Halvorsen*, Sociology of Natural Resources (2/3 SS/1/3 SFRES)

Dr. Halvorsen is a sociologist of natural resources specializing in water and forest policy processes. Her current emphases are in woody bioenergy, climate change, and water resources policies. Her projects focus in the U.S. and Mexico. She has advised 20 masters and doctoral students and sat on an additional 40 doctoral and masters student committees from across campus during her career at MTU.

Carol MacLennan*, Anthropology (SS)

Dr. MacLennan is an anthropologist specializing in environmental anthropology and history. Her research on industrialization and environmental policy is both historical and ethnographic and currently located in Hawai‘i, and the Western U.S. She studies water histories, landscapes, and toxics in mining and sugar plantation communities. She has supervised nine graduate students in Environmental Policy and Industrial Archaeology and served on over 40 MS and Ph.D. graduate committees.

Audrey Mayer*, Sustainability Science (2/3 SS/1/3 SFRES)

Dr. Mayer is an ecologist with additional expertise in environmental policy. Her current research is focused on sustainability assessment, sustainable forest management, and biodiversity conservation. She has mentored graduate students while at the U.S. Environmental Protection Agency and at the University of Helsinki, and currently serves as the major advisor to one master’s student and one doctoral student, as well as a committee member for several theses and dissertations.

Alex Mayer*, Hydrology (CEE/GMES)

Dr. Mayer is Professor of Environmental and Geological Engineering and Director of the Center for Water & Society at MTU. His teaching and research focuses on human-biophysical interactions in water systems, water resources management and modeling, and groundwater flow, transport, and remediation and includes computational, field, and laboratory studies. The primary geographic settings for this work are the Laurentian Great Lakes and northwest Mexico. He has supervised 9 PhD and 19 masters committees and has sat on an additional 112 graduate student committees.

Diana Mincyte*, Rural and Environmental Sociology (SS)

Dr. Mincyte is currently a research fellow at the Rachel Carson Center for Environmental Studies, Ludvig Maximilians University-Munich and will join MTU’s Department of Social Sciences in 2010. As an environmental sociologist, she examines how the implementation of sustainable development policies affects land-use and occupational structures in the Global South. Her book project focuses on post-
socialist Europe and considers how local farmers and consumers negotiate the EU agro-food reforms and environmental regulations with their daily practices and incomes.

**Mark Roberts, Natural Resource Economics (SBE)**

Dr. Roberts studies the cycles in mineral and energy prices, especially metals and petroleum. He is currently writing a textbook on energy economics. Dr. Roberts has advised 22 master’s students, is currently advising six master’s students, and served on an additional 6 doctoral and 35 masters student committees from across campus during his career at Michigan Tech.

**Fredric L. Quivik, Environmental History (SS)**

Dr. Quivik is an historian of technology who has worked for fifteen years as an expert witness in Superfund and related environmental litigation. He has also worked for more than three decades documenting, preserving, and interpreting historic sites that have an industrial or engineering character. He studies the history of industrial systems, industrial landscapes, and energy history.

**Mark Rouleau*, Political Science (SS)**

Dr. Rouleau specializes in the application of advanced computational methods to complex international problems and processes. He has used Agent-Based Modeling to explore many environmental topics, such as land-use decision-making, the development of water-quality markets, international environmental policy-making, and the interplay of environmental factors and civil violence.

**Deb Ranjan Sinha*, Geography (SS)**

Dr. Sinha specializes in environment and development policy issues. His research uses the political ecology framework, and incorporates environmental history and GIS analysis. His past research include implementation of community forestry in Nepal, land use/land cover change in response to market liberalization in India, and impact of legacy pollution on redevelopment in deindustrialized urban spaces in the U.S.

**Barry Solomon*, Ecological Economics and Economic Geography (SS)**

Dr. Solomon is a specialist in energy and environmental policy, and policy instruments for environmental protection. He serves as the director of Michigan Tech’s masters program in environmental policy. His current research emphases include sustainable biofuels, wind power, climate change, greenhouse gas markets, and nuclear waste management. His main projects focus on the U.S. and Sweden. He has advised 10 masters and doctoral students and sat on an additional 24 doctoral and masters student committees.

**Andrew Storer, Insect Ecology (SFRES)**

Dr. Storer studies insect/fungus/plant interactions, impacts of exotic species on forest ecosystems, interactions among fire, insects and disease in forests and urban forest health. His research projects currently focus on insect, disease, weed and fire issues in the U.S. Midwest, California and Ghana. He has advised or is advising 22 masters and doctoral students and has sat on an additional 22 doctoral & masters student committees.
Barry D. Solomon  
Professor of Geography and Environmental Policy  
Department of Social Sciences  
Michigan Technological University  
1400 Townsend Drive  
Houghton, MI 49931-1295  
phone: (906) 487-1791; email: bdsolomo@mtu.edu

Education

University of California, Irvine, B.A. Social Ecology, 1977  
Indiana University, M.P.A. Environmental Policy, 1979  
Indiana University, Ph.D. Regional Analysis & Planning, 1983

Experience

2003 - date  Professor of Geography & Environmental Policy, Michigan Technological University,  
Dept. of Social Sciences.  Associate, Sustainable Futures Institute.  
2008, fall  Visiting Scholar, Center for Public Sector Research, University of Gothenburg, Sweden.  
2002 - 2003  Visiting Associate Professor, Bren School of Environmental Science & Management,  
University of California at Santa Barbara, and Department of Environmental Studies,  
University of California at Santa Cruz.  
1995 – 2002  Associate Professor of Geography and Environmental Policy, Michigan Technological  
University, Department of Social Sciences.  
1989 - 1995  U.S. Environmental Protection Agency, Acid Rain and Climate Change Divisions,  
Washington, D.C., Senior Economist.  Helped develop and implement first national (SO₂)  
emissions trading program in the United States.  
& End Use, Washington, D.C., Senior Economist.  
1984 - 1986  Federal Energy Regulatory Commission, Office of Electric Power Regulation,  
1984, fall  Consumer Energy Council of America, Washington, DC, Research Associate.  
1982 - 1984  West Virginia University, Visiting Assistant Professor of Geography & Energy  
Economics, and Research Associate, Regional Research Institute.

Selected Publications (over 160 total)

Solomon, B.D. High-level radioactive waste management in the U.S. *Journal of Risk Research*,  
Halvorsen, K.E., Barnes, J.R. and Solomon, B.D. Upper Midwestern USA ethanol potential form  
Solomon, B.D. and V. Luzadis, eds., *Renewable Energy From Forest Resources in the United States*  
(Oxfordshire: Routledge, 2009).  
Energy From Forest Resources in the United States* (Oxfordshire: Routledge, 2009).  
Solomon, B.D. Regional economic impacts of cellulosic ethanol development in the North Central states.  
In B.D. Solomon and V.A. Luzadis, eds. *Renewable Energy From Forest Resources in the United  
States* (Oxfordshire: Routledge, 2009).  
Solomon, B.D. and Johnson, N.H. Valuing climate protection through willingness to pay for biomass


**Synergistic Activities**

Dr. Solomon is the founder and past president of the United States Society for Ecological Economics. At Michigan Tech, environmental and energy policy research by Dr. Solomon has been conducted since 2003 under the auspices of the Sustainable Futures Institute (SFI) at Michigan Technological University (MTU), which he helped to establish, and he has been working with several collaborators since the late 1990s. The SFI has been an especially effective way to collaborate across disciplines on complex problems in the environmental, natural resources, economics, and energy fields. In addition, he previously worked on several interdisciplinary, sponsored research projects at MTU’s Institute of Materials Processing, Power and Energy Research Center, and the former U.S. EPA supported Center for Clean and Industrial Treatment Technologies.

**Current Professional Organizations**

- U.S. Society for Ecological Economics (founder and past president)
- International Society for Ecological Economics
- Association of American Geographers
- International Association for Society and Natural Resources
- American Association for the Advancement of Science
Kathleen E. Halvorsen
Associate Professor of Natural Resources Policy
Joint Appointment Department of Social Sciences/
School Forest Resources and Environmental Sciences
Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931-1295

Education


Experience

2002 – date Associate Professor, Michigan Technological University.
1995- 2001 Assistant Professor, Michigan Technological University.

Selected Relevant Peer-Reviewed Publications


- Supervised student

Synergistic Activities


Lead organizer (with Dennis R. Becker and Clare Hinrichs) of Sessions 1-5 on the Social Dimensions of Biomass Energy at International Symposium on Society and Resource Management (ISSRM) at Burlington VT. June 2008.

Graduate Director, Environmental Policy Masters Program; Sustainability Faculty Hiring Initiative Committee Member; Advisory Board Member Center for Water and Society, Affiliated Faculty Member with the Sustainable Futures Institute and the Center for Water and Society at Michigan Technological University.

Associate Editor, Society and Natural Resources; Editorial Board, Environmental Management; 2nd Vice President, Society for Human Ecology; Council Member, International Association on Society and Natural Resources.

Collaborators: Clare Hinrichs, Pennsylvania State University; Theresa Selfa, Kansas State; Dennis Becker, University of Minnesota; Cass Moseley, University of Oregon; Sarah McCaffrey and Pamela Jakes, USFS. PhD Advisor: Margaret Shannon, University of Vermont.

Graduate advisees currently (6): PhD in Forest Science, Andrew Kozich; MS in Environmental Policy: Susan Balint, Karl Makinen, Chris Hohnholt, Brian Pattullo. Co-advising Doctoral Student in Environmental Engineering with Alex S. Mayer: Agustin Robles Morua. Graduated within past three years (5): Smriti Dahal (MS in Environmental Policy), Gerald K Greer (MS Environmental Policy), Matthew Zumstein (MS Forestry), Joy Wang (MS Environmental Policy), Melanie Barbier (MS Environmental Policy).
Hugh S. Gorman
Associate Professor of Environmental History and Policy

Department of Social Sciences
Michigan Technological University
Houghton, Michigan 49931
hsgorman@mtu.edu
(906) 487-2366 (office)
(906) 487-2468 (fax)

Education
Ph.D., History and Policy, Carnegie Mellon University, August 1996.

Academic Positions
Associate Professor of Environmental History and Policy, Michigan Technological University 2002 - present
Haas Fellow, Beckman Center for the History of Chemistry, Chemical Heritage Foundation, 2003 - 2004
Assistant Professor of Environmental History and Policy, Michigan Technological University 1996 - 2002

Research Interests
I study the historical interactions between policy choices, technological innovation, and environment change, with the main goal being to inform efforts to construct policies that are environmental sustainable, economically viable, and socially just.

Publications

Books

Edited Volumes
Hugh S. Gorman and Alex Farrell, eds., Monitoring the Environment: Taking a Historical Perspective, special issue of Environmental Monitoring and Assessment 106 (July 2005).

Journal Articles and Book Chapters

Courses Taught

Environmental Decision Making (1997 to 2006): Graduate-level group practicum in which students study and contribute to an environmental decision-making process.

Global Environmental Systems (2006-present). Graduate-level course that examines different approaches to understanding links between economies and ecologies.

U.S. Environmental History (1997 to present): Examines how environments, uses of the environment, and perceptions of nature have changed since colonization.

Science, Technology, and Society: Interactions and Interrelationships (1996 to present): Examines how scientific advances and technological innovations have influenced and been influenced by ethical and political choices.

Institutions: Capitalism, Democracy, and Globalization (2000 to 2006): Introductory course that examines how key institutional systems have changed over time.


Western Civilization (1996 to 2000): A one semester course in Western Civilization.

Current Professional Organizations

American Society for Environmental History

Society for the History of Technology
  Treasurer, 2008 – present
  Envirotech special interest group, co-chair 2006 - present
Carol A. MacLennan  
Michigan Technological University  
Department of Social Sciences /Houghton, MI 49931-1295  
(906)487-2870 camac@mtu.edu

Education

University of California, San Diego. History. B.A. 1970  
University of California, Berkeley. Anthropology. M.A. 1971  
University of California, Berkeley. Anthropology. Ph.D. 1979

Experience

Associate Professor of Anthropology. Social Sciences Department. Michigan Technological University. 1985- present.  
Lecturer, Department of Anthropology. Sonoma State University. 1978  
Community Development Specialist, Hopi Tribal Council, Oraibi, AZ. 1973-74.

Professional Societies


Honors, Awards, Professional Service


Research Fields

Political ecology, industrial communities (mining, sugar cane), environmental policy (toxics; mining), democracy and public policy
Publications

Audrey L. Mayer
Assistant Professor in Ecology and Environmental Policy
Michigan Technological University
Department of Social Sciences &
School of Forest Resources and Environmental Sciences
209 AOB, 1400 Townsend Dr.
Houghton, MI 49931
+1.906.487.3448
almayer@mtu.edu

Education:

Major: Ecology and Evolutionary Biology (minor in Environmental Policy)
Dissertation: Cape Sable seaside sparrow (Ammodramus maritimus mirabilis) habitat and the Everglades: Ecology and conservation.

Major: Biology/Public Policy Analysis
Theses: Habitat selection of the California gnatcatcher (Polioptila californica); The Natural Communities Conservation Plan: A problematic solution to species conservation.

Positions Held:

Assistant professor, Ecology and Environmental Policy, Michigan Technological University (01/2009 to present)
Docent (adjunct professor) in Environmental Policy, University of Helsinki (02/2007 to date)
Researcher, University of Helsinki, Faculty of Biosciences (01/2007 to 12/2008)
Researcher, University of Tampere, School of Economics and Business Administration (01/2006 to 12/2006)
Ecologist, US Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Sustainable Technologies Division, Sustainable Environments Branch (06/2002 to 01/2006)
Adjunct assistant professor, University of Cincinnati, Department of Biological Sciences (04/2002 to 01/2006)
Post-doctoral research associate, USEPA, ORD, NRMRL, STD, SEB (09/2001 to 06/2002)
Post-doctoral research associate, University of Cincinnati, Department of Biological Sciences (02/2000 to 09/2001)

Courses Taught:

Michigan Technological University
SS 3300 “Environmental Problems” (Spring 2009, 2010)
SS 3930 “Environmental Issues” (Fall 2009)
UN 1001 “Developing a Sustainability Mindset” (Fall 2009)
FW 4380 “Landscape Ecology” (Spring 2010)

University of Helsinki
“Natural scientific literature on environmental protection”, University of Helsinki (Spring 2007)
University of Cincinnati
BS 604 “Ornithology”, University of Cincinnati (Fall 2003)
“Foundations of Ecology” graduate seminar, University of Cincinnati (Fall 2002)
“All about birds”, University of Cincinnati – Communiversity (Fall 2001 and 2002)

University of Tennessee, Knoxville (Graduate Teaching Assistant, Fall 1995 through Fall 1999)
Tutor, biology, ecology, genetics and animal sciences, Women’s Athletic Department (Fall 1996
through Spring 1998)

Pomona College
General Biology instructor (Spring 1995)

Selected Recent Peer-Reviewed Publications:

Diana Mincyte

US Office Address: Department of Advertising
University of Illinois, Urbana-Champaign
103 Gregory Hall
810 S. Wright Street
Urbana, IL 61820

Home Address:
403 W. Hill Street. Apt. #4
Champaign, IL 61820

Diana Mincyte

Education

PhD University of Illinois at Urbana-Champaign, IL; Sociology, October 2006
Dual MA Bowling Green State University, OH; American Culture Studies and Popular Culture, August 1999
MA Vytautas Magnus University, Lithuania; English, June 1997
BA Vytautas Magnus University, Lithuania ; English, June 1995

Experience

October 2009 – Present Research Fellow, Rachel Carson Center for Environmental Studies, Ludvig Maximilians University-Munich, Germany
August 2006 – August 2009 Visiting Assistant Professor, Advertising; University of Illinois, Urbana-Champaign

Research Areas

- Environmental Justice, Land-Use, Global Inequalities
- Food Systems, Alternative Agro-Food Economies
- Consumer Societies and Gender
- East Europe, Post-Socialism, Globalization, Westernization
- Historical and Qualitative Research Methods, Video Ethnography

Selected Publications

Edited Volumes:


Articles:


Teaching Experience

List of Excellent Teachers as Ranked by Their Students  2005-Present, Eight Courses

Undergraduate Courses (University of Illinois, Urbana-Champaign unless noted otherwise)

- Environmental Communications; Sustainability and Consumption; Body Image in Consumer Culture; Global Studies in Consumer Culture; Post-Socialism: Economy; Culture and Power in East Europe; Africa in World Perspective; Introduction to Popular Culture (Bowling Green State University)

Graduate Courses (University of Illinois, Urbana-Champaign)

- Green Consumerism and Environmental Advocacy; Globalization and Anti-Globalization; Advertising in Communications; Consumer Behavior and Decisions
Bradley H. Baltensperger
Professor of Geography
Chair, Department of Cognitive & Learning Sciences
Michigan Technological University
Ph: 906-487-2425; Email: brad@mtu.edu

Education
Ph.D., 1974, Clark University, Geography
B.A., 1969, University of Nebraska, History

Employment
1974-present Michigan Technological University
   2001-present Chair, Department of Cognitive & Learning Sciences
   1995-2001 Director, Environmental Policy Program
   1994-present Professor of Geography
   1987-1990 Head, Department of Social Sciences
1990-1991 Gastprofessor and Fulbright Fellow, Philipps-Universität, Marburg, Germany

Selected Publications
Book

Articles
Reviews


Papers Presented

Approximately 30 papers presented in Germany, Czech Republic, Canada, Barbados, and the U.S., including to the Association of American Geographers, the International Geographical Union, Western History Association, American Society for Engineering Education, Society for Risk Analysis, and the Eastern Historical Geography Association.

Public Service

Michigan Association of School Boards, Board of Directors, 1992-present; President, 1999-2000
Convener and Chair, Michigan Education Accountability Task Force, 1999-2001
Houghton-Portage Township School Board, 1988-present; President, 1997-2000; 2006-present
Copper Country Association of School Boards; President, 1999-2000

Selected Professional Activities

Association of American Geographers
   International Research and Scholarly Exchange Committee, 1994-2000
   Chair, Rural Development Specialty Group, 1994-98

Manuscript Referee for:

   Great Plains Research  Great Plains Quarterly
   Journal of Geography  Agricultural History
   Professional Geographer  Journal of Soil and Water Conservation
   Johns Hopkins University Press  Prentice-Hall
   Oxford University Press  University of Nebraska Press
   John Wiley & Sons  Harper Collins

Proposal Referee for:  National Science Foundation  Smithsonian Institution
MARK ROULEAU  
Department of Social Sciences  
Michigan Technological University  
Houghton, MI USA 49931  
+906-487-2113  
mdroulea@mtu.edu

EDUCATION

Present  
**George Mason University**  
PhD Computational Social Science

5/2006  
**University of Delaware**  
MA Political Science and International Relations

5/2004  
**Michigan Technological University**  
BS Computer Science (Minor in Social Sciences)

EXPERIENCE

**George Mason University**  
*Funded by the Office of Naval Research (MURI)*  
(Partners: Yale University and the U.S. Dept. of State)  
*Research Assistant*  
Developed a computer simulation that explored the interplay between environmental constraints and civil unrest/war using Agent-Based Modeling.

**U.S. Department of Agriculture**  
*Assistant Economist*  
Led a pilot study investigating the application of Agent-Based Modeling in the development of water quality trading markets. Also involved in efforts to assess the economic impact of ethanol transportation to fueling facilities.

**George Mason University**  
*Funded by The Joyce Foundation*  
(Partner: Harvard University)  
*Research Assistant*  
Developed an automated voter-redistricting program utilizing computational optimization techniques (i.e. Simulated Annealing).

**University of Delaware**  
*Funded by The National Science Foundation*  
*Research Assistant*  
Developed an Agent-Based Model to investigate the emergence of international environmental norms and to assess their impact upon international climate change and global warming negotiations.
AWARDS

• Nominated Outstanding Teaching Assistant (Fall 2005)
• Recognition of Outstanding Research at George Mason (Fall 2008)
• Selected as George Mason’s representative to Virginia’s Outstanding Research forum (February 2009)

PUBLICATIONS


PAPERS & POSTERS PRESENTED


2009 (Feb.) Rouleau, Mark. “Agent-Based Modeling in the Social Sciences,” presented at the Virginia Outstanding Research Forum in Richmond, VA.


Deb Ranjan Sinha  
Department of Social Sciences  
Michigan Technological University  
Phone: 906-487-1843  
Email: deb.sinha@mtu.edu  
Internet: www.singho.net/deb

EDUCATION

2009  
Ph.D. Geography, Graduate School of Geography, Clark University, Worcester, USA.

2003  
M.A. Geography, Department of Geography, University of Illinois, Urbana-Champaign, USA.

1998  
M.S. Ecology, Salim Ali School of Ecology and Environmental Sciences, Pondicherry University, Pondicherry, India.

1996  
B.Sc. (Honors) Zoology, Hindu College, University of Delhi, New Delhi, India.

AREAS OF SPECIALIZATION

- Political Ecology (Third World, First World, Urban)
- Geography of Development
- Environmental History
- Spatial Analysis & Modeling using GIS

ACADEMIC ACHIEVEMENTS

Publications

Peer-reviewed Publications

Thesis and Dissertation

Fellowship/Scholarship/Financial Aid Received
- Pruser Holzhauer Graduate Enhancement Funds ($500) from Clark University.
- Human Dimensions of Environmental Systems Scholars Fellowship ($5,000) from the University of Illinois, Urbana-Champaign.
- Travel grant ($1,000) from the Department of Geography, from the University of Illinois, Urbana-Champaign.
- Graduate College Fellowship ($1,000) from the University of Illinois, Urbana-Champaign.
• **Fred W. and Demetra Foster Fellowship** ($1,000) from the Department of Geography at the University of Illinois, Urbana-Champaign.

• **Fellowship** (INDRs.10,000) from the French Institute of Pondicherry for Master’s Thesis research.

• Recipient of **Teaching Assistantships** and **Full Tuition Waivers** from the University of Illinois and Clark University.

**Professional Membership** – Association of American Geographers.

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**PROFESSIONAL EXPERIENCE**

**Research Experience**


*Research Assistant*, Strengthening Vulnerable Communities in the Worcester Built Environment Project, George Perkins Marsh Institute, Clark University

May 2004 – April 2005

*Brownfield Assistant*, City of Worcester, Worcester, USA.

November 2000 – August 2001

*GIS Consultant and Researcher*, for Center for the Study of Institutions, Populations and Environmental Change (CIPEC), Indiana University, Bloomington, USA.

October 1999 – June 2000

*Research Associate*, “Linking Ecology, Economics and Institutions of Forest Use in the Western Ghats of India” project, Institute for Social and Economic Change (ISEC), Bangalore, India.

**Teaching Experience**

August 2009 – ongoing

*Assistant Professor*, Department of Social Sciences, Michigan Technological University, Houghton, USA.

August 2008 – May 2009

*Instructor*, Department of Geography and Urban Studies, Temple University, Philadelphia, USA.

August 2002 – May 2004

*Teaching Assistant*, Graduate School of Geography, Clark University, Worcester, USA.

August 2000 – May 2002

*Teaching Assistant*, University of Illinois, Urbana-Champaign, USA.

**Non-Profit Work Experience**

August 1998 – September 1999

*Program Officer*, World Wide Fund for Nature – India (WWF-India), New Delhi, India.

Coordinated and monitored conservation projects funded by the organization; liaised with various funding agencies regarding ongoing and future projects.


*Research Associate*, Centre for Women’s Development Studies (CWDS), New Delhi, India.

Conducted literature review on the role of women in the Joint Forest Management program in the state of West Bengal, India.

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**COMPUTER SKILLS**

• **GIS and Remote Sensing Softwares:** ArcGIS 9.x, ArcView 3.x, ArcInfo, ERDAS 9.x, IDRISI Taiga, SADA (Spatial Analysis and Decision Assistance).

• **Statistical Softwares:** SPSS, S-Plus, STATISTICA.

• **Other Softwares:** MS Office Suite, Endnote.

• **GPS:** Garmin, Magellan and Trimble.
Mary H. Durfee  
Associate Professor of Government  
Department of Social Sciences  
Michigan Technological University  
Houghton, MI 49931-1295  
906-487-2112, mhdurfee@mtu.edu.

Education  
M.A. Cornell, 1983  

Professional Service and Consulting  
Member, E.P.A. Science Advisory Board’s Homeland Security Advisory Committee. 2005-  
Panel Reviewer, NSF: IGERT; Proposal reviewer: NSF Career Award.  
Consultant, WestED, for an NSF IGERT program review 2001-2002. Also, consulted at the ABT  
Consultant/member of Environmental Protection Agency, Science Advisory Board, Committee on  
Environmental Engineering, Subcommittee on the Diffusion and Adoption of Innovations in Environmental  

Visiting Professor/consultant, University of Malta, 2008-Present

Selected Recent Publications  
Collaborative Effort to Improve Sanitation in a Marginalized Community in Northwest Mexico,”  
Haapala, K. R., M. J. Hutchins, J. L. Rivera, V. Kumar, A. R. Clarke, T.D. Eatmon, R. A. Harris, M. H.  
Durfee, J. R. Mihelcic, D. R. Shonnard, and J. W. Sutherland, 2007, “Education, Research, and  
Training Aspects of the Sustainable Futures NSF IGERT Project,” Proceedings of the 2007 ASEE  
North Midwest Sectional Conference, September 20-22, Houghton, MI  
Shamir, M., Shamir, L., and M.H. Durfee, “The Application of Fuzzy Logic to the Precautionary  

Teaching  
In the past I taught Environmental Decision making, International Environmental Technology Policy, and  
co-taught with David Shonnard (Chemical Engineering) Sustainable Futures I. In spring 2010 I’ll teach a  
new course, International Environmental Law and Diplomacy.
MS Environmental Policy Student Theses Directed

*Public Participation and the Creation of a Sewage Lagoon in Tesopaco, Mexico by Agustin Robles Morua, 2005.

* chaired.
Louise Nelson Dyble  
Department of Social Sciences  
Michigan Technological University  
(906) 487-2189  
ldyble@mtu.edu

EDUCATION


M.A., History, University of California, Berkeley 1999.


EXPERIENCE

2009-  Assistant Professor of History, Department of Social Sciences, Michigan Technological University, Houghton MI

2007-2009  Associate Director for Research, Keston Institute for Public Finance and Infrastructure Policy, School of Planning, Policy and Development, University of Southern California, Los Angeles, CA

2006-2007  Weisman Fellow, Division of the Humanities and Social Sciences, California Institute of Technology, Pasadena CA

2005-2006  Visiting Assistant Professor, St. Martin’s University, Lacey WA

Kevin Starr Fellow in California Studies (2004-2005)

SELECTED PUBLICATIONS


“Reconstructing Transportation: Linking Tolls and Transit for Place-Based Mobility,” Technology and Culture 50 (Jul 2009).

“Revolt Against Sprawl: Transportation and the Origins of the Marin County Growth Control Regime.” Journal of Urban History 34 (Nov. 2007). Michael C. Robinson Award for best essay or article in public works history.


CURRENT RESEARCH

Paying for Pavement: Turnpikes, Toll Roads and Economic Ideology - A book project exploring the changing political economy of transportation infrastructure in global context from the 1970s to the present. With funding from the Keston Institute and the Smith Richardson Domestic Public Policy Fellowship, 2008-2009.

Indulgence or Innovation? Alternative Foods in the San Francisco Bay Area, a collaborative book co-authored with Michael De Alessi, Sally K. Fairfax, Matthew Gerhart, Greig Tor Guthery, Lauren Gwin, and Jennifer Sokolove. Sponsored by the Department of Environmental Science, Policy and Management, UC Berkeley.

Controlled Cornucopia: California Agriculture the Industrialization of Fruit and Vegetables in America - A book project exploring post-1945 agricultural policy with a focus on state-level government and politics and the consolidation and standardization of production, distribution, and marketing.

TEACHING

The History of Planning and Development. University of Southern California School of Planning, Policy and Development upper-division lecture course, Fall 2008.


American Environmental History. St. Martin’s University upper-division seminar, Spring 2006.


From Railroads to Automobiles: Politics, Development, and Transportation in United States History. UC Berkeley upper-division seminar, Fall 2000.

San Francisco Politics, 1850-1950. UC Berkeley senior research seminar, Spring 1999.


PROFESSIONAL ACTIVITIES AND SERVICE

Board of Trustees, Public Works Historical Society, July 2009-present.

Board of Directors, Urban History Association, January 2008-present.

Society for American City and Regional Planning, Conference Arrangements Committee, 2009.


Kenneth Jackson Award Committee (best book), Urban History Association, 2008.

Fredric L. Quivik  
Department of Social Sciences  
Michigan Technological University  
flquivik@mtu.edu

**Education**

University of Pennsylvania, PhD, History and Sociology of Science, 1998

Columbia University, M.S. in Historic Preservation, 1977

University of Minnesota, Bach. of Environmental Design, School of Architecture, 1975

St. Olaf College, B.A. in Art, 1971

**Recent Employment History**

**Associate Professor of History**, Michigan Technological University, beginning in January 2010.


**Select Scholarly Publications**

“Engineering Nature: The Souris River and the Production of Migratory Waterfowl,” forthcoming in *History and Technology*.


**Recent Scholarly Presentations**


**Courses Taught**

“Energy in American History” University of Pennsylvania
“Law, Environment, and Technology in America”
“Introduction to Environmental History”
“History of American Technology”

“Technology and the American Experience” University of California at Berkeley
“Technology and Society”
“History of American Science and Technology”

“History of American Architecture” Montana State University
“History of Gothic and Renaissance Architecture”
Gary A. Campbell
School of Business and Economics
Michigan Technological University
1400 Townsend Drive
Houghton, Michigan 49931-1295
Telephone: (906) 487-2808
e-mail: gacampbe@mtu.edu

EDUCATION

M.S., Economics (natural resources economics), 1980, Iowa State University.
B.S., Economics, 1977, University of Missouri-Rolla.

EXPERIENCE

1982-2008: Professor of Natural Resource Economics, Adjunct Professor of Geological Mining & Engineering & Sciences (1994-present), Michigan Technological University.

March-May 2001: Visiting Lecturer, Department of Management and Economics, China University of Mining and Technology-Beijing

May-June 1998: Visiting Lecturer, Department of Mining Engineering, University of Witwatersrand (South Africa)

1990-91: Fulbright Visiting Professor of Economics, Addis Ababa University (Ethiopia).


ADMINISTRATIVE DUTIES

Developed and established Michigan Technological University's M.S. program in Mineral Economics (name changed to Applied Natural Resource Economics). Currently, Program Coordinator.

RECENT COURSES TAUGHT

Economics of Natural Resources (undergraduate & graduate), Principles of Economics, International Economics, and Global Competition.
SELECTED JOURNAL ARTICLES


SELECTED PAPER PRESENTATIONS


“The Debate over the Impact of Mining on the Environment and Sustainability in the Local Community,” with Christa Walck, Presented at the Annual Society for Mining, Metallurgy and Exploration Meeting, February 27, 2008, Salt Lake City, Utah.


William S. Breffle  
Associate Professor of Environmental Economics  
School of Business & Economics, Economics  
Michigan Technological University  
(906) 487-1959  
Email: wsbreffl@mtu.edu

Education

Ph D, University of Colorado at Boulder, 1999.  
Major: Economics  
Supporting Areas of Emphasis: Environmental and natural resource economics, econometrics  
Dissertation Title: Issues in Recreation Demand  
Major: Economics  
Supporting Areas of Emphasis: International finance and trade, quantitative economics, econometrics  
BA, University of Colorado at Boulder, 1990.  
Major: Economics

Experience

Associate Professor – School of Business & Economics (2007-2009).  
Instructor, University of Colorado at Boulder. (2006).  

TEACHING

Michigan Tech  
EC 3001, Principles of Economics, 2 courses, Total SCH: 351.  
EC 3100, International Economics, 4 courses, Total SCH: 552.  
EC 4650, Environmental Economics, 1 course, Total SCH: 39.  
EC 5650, Environmental Economics, 1 course, Total SCH: 15.  
EC 5999, Graduate Research, 2 courses, Total SCH: 12.

Graduate Student Advising

Master's Thesis Committee Chair, Kristen Maroney, School of Business & Economics - Economics. (September 5, 2006 - May 2, 2008).
Selected Publications

Book Chapters


Refereed Journal Articles


Conference Proceedings

Mark C. Roberts  
Professor of Natural Resource Economics  
School of Business and Economics  
Michigan Technological University  
1400 Townsend Drive, Houghton, MI 49931  
Phone: 906-487-2771, Fax: 906-487-2944, mroberts@mtu.edu

EDUCATION

1974. B.S. (Mining Engineering). New Mexico Institute of Mining and Technology.

ACADEMIC EXPERIENCE

School of Business and Economics, Michigan Technological University  
8/99 to present. Professor of Mineral Economics  
8/90 to 8/99. Associate Professor of Mineral Economics.  
8/85-8/90. Assistant Professor of Mineral Economics.

BUSINESS and PROFESSIONAL EMPLOYMENT


SELECTED PUBLICATIONS


**SELECTED RESEARCH GRANTS**

• **2008.** MTU Faculty Development Grant Award, “Travel for Energy Economics book Research” Funded for $3000.
• **2008.** SBE Faculty Development Grant Award, “Travel for Energy Economics book Research” Funded for $3021.

**SELECTED CONSULTING**

• 1990-93: Expert witness for Richard D. Reed, Attorney representing the Township of Republic, Michigan in litigation concerning the specific iron ore tax for the Republic Mine, Michigan.
• Winter, 1987-88: Provide an independent review of the impact of proposed mining operations on the Town of Ladysmith and Rusk County, Wisconsin (with Dr. Gary Campbell).

**CURRENT INSTRUCTIONAL ACTIVITIES**

• Economic Decision Analysis (Engineering Economy)
• Econometrics
• Advanced Engineering Economy (graduate)
• Energy Economics (undergraduate)
• Energy Economics (graduate)
Alex S. Mayer

Department of Geological & Mining Engineering & Sciences
1400 Townsend Dr.
Michigan Technological University
Houghton, MI 49931-1295

office: (906) 487-3372
fax: (906) 487-3371
home: (906) 483-0818
cell: (906) 370-1287
email: asmayer@mtu.edu

Education
Brown University, Sc.B. Civil/Environmental Engineering, 1981
University of North Carolina at Chapel Hill, M.S. Environmental Engineering, 1987
University of North Carolina at Chapel Hill, Ph.D. Environmental Engineering, 1992

Experience
September 2005-present: Director, Michigan Technological University Center for Water & Society
September 2002-present: Professor
September 1998-August 2002: Associate Professor
March 1992-August 1998: Assistant Professor
Department of Geological Engineering and Sciences
Michigan Technological University, Houghton, MI
September 2000-May 2001: Visiting Professor
Department of Civil Engineering and Geosciences
Technological University of Delft, Netherlands
August 1995-November 1995: Visiting Professor
Department of Chemical Engineering
University of Sonora
1981-1985: Civil Engineer
Water Resources Projects Section, Planning Division
East Bay Municipal Utility District, Oakland, CA

Selected Publications (66 refereed journal articles, proceedings articles and book chapters)


**Current Research Projects**

GK12: GlobalWatershed: Integrating Rural and Global Perspectives with Research and Technological Advances, PI, National Science Foundation, $2,500,000, 9/09 to 8/14.

Biocomplexity of Hydrological Service Payments and Watershed Sustainability in Mexico, co-PI, National Science Foundation, Planning Grant, $38,500, 9/09 to 8/10.

Enhancing the Capacity for Sustainable Forest Management and Ecosystem Service Provisioning in Chiapas and Oaxaca, PI, US Agency for International Development, $290,000, 09/08 to 08/11.

SustR: Sustainable Development for Rural Communities- Social, Health, Economic, and Environmental Advances, PI, US Department of Education, $180,000, 09/08 to 08/12.

Graduate Student Scholarships to Advance a Global Outlook of Economic and Social Prosperity that Protects the Environment, co-PI, National Science Foundation, Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) $599,978, 6/08 to 5/12.

Modeling and Analyzing the Use, Efficiency, Value and Governance of Water as a Material in the Great Lakes Region through an Integrated Approach, PI, National Science Foundation, $1,078,000, 09/07 to 08/12.

Sustainable Wastewater Management in the Rio Sonora Basin, Mexico, PI, Consejo Nacional de Ciencia y Tecnologia (Mexico), $80,000, 01/04 to 12/10.

**Selected, Past Projects**

Watershed Management Plan for Huron Creek Watershed, PI, Michigan Department of Environmental Quality, $74,000, 09/07 to 12/08.

Michigan Tech-UNISON Linkage: Training a Core of Water Resources Experts, PI, U.S. Agency for International Development, $787,000, 03/03 to 08/06.

Multi-Objective Decision-Making for Environmental Remediation, PI, Environmental Protection Agency, $292,000, 09/98 to 05/03.

Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation, PI, Environmental Protection Agency, $474,000, 11/96 to 10/01.
Andrew J. Storer
School of Forest Resources and Environmental Science
Michigan Technological University,
1400 Townsend Drive, Houghton, Michigan, 49931, USA
Telephone: (906) 487-3470, Email: storer@mtu.edu, Fax: (906) 487-2915

Education

St. Anne's College, University of Oxford. Pure and Applied Biology. B.A. (Hons) 1986
St. Anne's College, University of Oxford          M.A. 1993
Department of Zoology, University of Oxford. Forest Entomology. D.Phil. 1993

Experience

2009 – Present  Professor, Forest Insect Ecology, School of Forest Resources and Environmental Science, Michigan Technological University
2007 – Present  Director, The Honors Institute, Michigan Technological University
2005 – 2009  Associate Professor, Forest Insect Ecology, School of Forest Resources and Environmental Science, Michigan Technological University
2001 –2005 Assistant Professor, Forest Insect Ecology, School of Forest Resources and Environmental Science, Michigan Technological University
1998 - 2001  Assistant Research Entomologist, Division of Insect Biology, University of California, Berkeley.
1999 - 2001  Instructor, Department of Landscape Horticulture, Merritt College, Oakland.
1992 - 1997  Postdoctoral Researcher, Division of Insect Biology, University of California, Berkeley.

Recent Publications


Synergistic Activities
1) Director of the Honors Institute at Michigan Technological University. This institute encourages undergraduates to develop research and other professional experience during their undergraduate career.
3) Member of the editorial board of the Journal of Pest Science (Springer). Subject editor for Forest Entomology
4) Active research in forest health and educational programs in global technological leadership in Ghana.

Collaborators and other affiliations
a) Collaborators and coeditors
Abeney, EA (Forest Research Institute of Ghana), Bonello, Pierluigi (The Ohio State University), Cobinnah J.R. (Forest Research Institute of Ghana), Delisle, J. (Natural Resources Canada), Erbilgin, N. (University of Edmonton), Gordon, Thomas R. (University of California, Davis), Hyslop, MD (Michigan Technological University), Karnosky, David (Michigan Technological University), Jurgensen MF (Michigan Technological University), Marshall, J.M. (Michigan Technological University), McNee, William R. (Wisconsin Department of Natural Resources), McPherson, Brice A. (University of California, Berkeley), McCullough, Deborah (Michigan State University), Nagel, Linda M. (Michigan Technological University), Opuni-Frimpong, E. (Forest Research Institute of Ghana), Risch, AC (Swiss Federal Institute for Forest, Snow and Landscape Research), Ritokova, G. (UC Davis), Standiford, Richard B. (University of California, Berkeley), Schutz M (Swiss Federal Institute for Forest, Snow and Landscape Research), Shields JM (Michigan Technological University), Webster, CR (Michigan Technological University), Witter John A. (University of Michigan), Wood, David L. (University of California, Berkeley).
b) Graduate and Postdoctoral Advisors
Graduate: Martin R. Speight, University of Oxford; David Wainhouse, Forest Research, England Postdoctoral: David L. Wood, UC Berkeley; Thomas R. Gordon, UC Davis
### APPENDIX B: Current and Past Funding

**Barry D. Solomon**

<table>
<thead>
<tr>
<th>Title</th>
<th>Sponsor</th>
<th>Project Start &amp; End Date</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center of Energy Excellence for Cellulosic Ethanol: Project 1: Feedstock Supply Chain Model (Co-PI)</td>
<td>Michigan Economic Development Corp.</td>
<td>2009-11</td>
<td>$385,000</td>
</tr>
<tr>
<td>Hydrogen Education Curriculum Path at Michigan Technological University (Co-PI)</td>
<td>U.S. Department of Energy</td>
<td>2008-11</td>
<td>$375,000</td>
</tr>
<tr>
<td>Evaluation of Low Greenhouse Gas Bio-Based Energy Technologies (Co-PI)</td>
<td>Caterpillar, Inc.</td>
<td>2006</td>
<td>$150,000</td>
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<tr>
<td>Biocomplexity: Renewable Energy From Forest Resources: An Investigation into the Viability of Large-Scale Production of Sustainable Transportation Fuels from Lignocellulosic Biomass (Co-PI)</td>
<td>National Science Foundation MUSES Program</td>
<td>2005-10</td>
<td>$1,800,000</td>
</tr>
<tr>
<td>Biocomplexity: Renewable Energy From Forest Resources: Investigating the Complex Interrelated Issues Associated with Generating Automotive Fuels from Lignocellulosic Biomass (Co-PI)</td>
<td>NSF MUSES Planning Grant</td>
<td>2004-05</td>
<td>$114,498</td>
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<tr>
<td>Novel Direct Steel Making by Combining Microwave, Electric Arc and Exothermal Heating Technologies (Senior Personnel)</td>
<td>U.S. Department of Energy</td>
<td>2001-03</td>
<td>$500,000</td>
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<tr>
<td>A Safe Minimum Standards Analysis of the Florida Manatee (PI)</td>
<td>MTU Faculty Development Grant</td>
<td>2000-01</td>
<td>$2500</td>
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<tr>
<td>Title</td>
<td>Sponsor</td>
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<tr>
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<td>---------------------------------------------</td>
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</tr>
<tr>
<td>Compliance Assistance Center for the Chemical Industry (ChemAlliance) (Co-PI)</td>
<td>U.S. Environmental Protection Agency</td>
<td>1998-2003</td>
<td>$1,500,000</td>
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<tr>
<td>Workshop to Establish a United States Society for Ecological Economics (PI)</td>
<td>MTU Faculty Development Grant</td>
<td>1998-99</td>
<td>$1200</td>
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<tr>
<td>Habitat Management and Endangered Species (PI)</td>
<td>MTU Faculty Development Grant</td>
<td>1996-97</td>
<td>$2300</td>
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Kathleen E. Halvorsen

<table>
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<tr>
<th>Title</th>
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<tr>
<td>Biocomplexity of Hydrological Service Payments and Watershed Sustainability in Mexico (Senior Personnel; PI Heidi Asbjornsen, Iowa State University)</td>
<td>NSF OISE</td>
<td>2009-10</td>
<td>$34,600</td>
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<tr>
<td>Enhancing the Capacity for Sustainable Forest Management in Chiapas and Oaxaca (Co-PI)</td>
<td>USAID TIES</td>
<td>2009-11</td>
<td>$249,999</td>
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<tr>
<td>Center of Energy Excellence for Cellulosic Ethanol: Project 2: Increasing availability of feedstocks and ensuring sustainability (Co-PI)</td>
<td>Michigan Economic Development Corp.</td>
<td>2009-11</td>
<td>$ 520,894</td>
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<tr>
<td>GK12: Global Watershed: Integrating Rural and Global Perspectives with Research and Technological Advances (Senior Personnel)</td>
<td>NSF GK12</td>
<td>2009-14</td>
<td>$2,500,000</td>
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<tr>
<td>Engaging Social Scientists in the WATERS Initiative (Co-PI)</td>
<td>NSF</td>
<td>2008-9</td>
<td>$10,600</td>
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<tr>
<td>Biocomplexity: Renewable Energy From Forest Resources: An Investigation into the Viability of Large-Scale Production of Sustainable Transportation Fuels from Lignocellulosic Biomass (Co-PI)</td>
<td>NSF MUSES</td>
<td>2005-10</td>
<td>$1,800,000</td>
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<tr>
<td>Cellulosic Ethanol Potentials and Obstacles in the Upper Midwestern United States (PI)</td>
<td>USDA</td>
<td>2006-09</td>
<td>$21,000</td>
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<tr>
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<tr>
<td>The Effect of Climate Change Beliefs and Values on Support/Use of</td>
<td>NSF SURF (MTU competition)</td>
<td>2008</td>
<td>$3000</td>
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<tr>
<td>Alternative Fuels Like Cellulosic Ethanol (Co-PI)</td>
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<td></td>
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<tr>
<td>Social Effects of Lignocellose Biofuel Production in the Upper</td>
<td>NSF SURF (MTU competition)</td>
<td>2007</td>
<td>$3000</td>
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<tr>
<td>Midwest (Co-PI)</td>
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<tr>
<td>Creation of Center for Water and Society (Co-PI)</td>
<td>MTU Research Excellence Fund</td>
<td>2005-06</td>
<td>$55,000</td>
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<tr>
<td>Wind Energy in the Upper Midwest (PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2006-07</td>
<td>$1000</td>
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<td>Land Use Planning in the Western Upper Peninsula of Michigan (PI)</td>
<td>USDA McIntire Stennis:</td>
<td>2003-06</td>
<td>$21,000</td>
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<tr>
<td>Biocomplexity: Renewable Energy From Forest Resources: Investigating</td>
<td>NSF MUSES Planning Grant</td>
<td>2004-05</td>
<td>$114,498</td>
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<tr>
<td>the Complex Interrelated Issues Associated with Generating Automotive Fuels from Lignocellulosic Biomass (Co-PI)</td>
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<tr>
<td>Gaps in Great Lakes Septic Regulatory Programs (Co-PI)</td>
<td>Joyce Foundation</td>
<td>2002-04</td>
<td>$81,000</td>
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</table>

**Hugh S. Gorman**

<table>
<thead>
<tr>
<th>Title</th>
<th>Sponsor</th>
<th>Project Start &amp; End Date</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Society’s Changing Interaction with and Knowledge of the Nitrogen Cycle (PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2007-08</td>
<td>$2350</td>
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<tr>
<td>The Evolution of NOx Air Quality Monitoring (PI)</td>
<td>Chemical Heritage Foundation, Haas Fellowship</td>
<td>2003-04</td>
<td>$55,000</td>
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<tr>
<td>Monitoring the Environment: Scales, Methods, and Systems in Historical Perspective, Society for the History of Technology, in support of a 2-day workshop (PI)</td>
<td>Society for the History of Technology</td>
<td>2003</td>
<td>$10,000</td>
</tr>
<tr>
<td>Gaps in Great Lakes Septic Regulatory Programs (Co-PI)</td>
<td>Joyce Foundation</td>
<td>2002-04</td>
<td>$81,000</td>
</tr>
<tr>
<td>Title</td>
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<td>Amount</td>
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<tr>
<td>The Evolution of Pollution Control Efforts in the Oil Industry (PI)</td>
<td>MTU Faculty Development Grant</td>
<td>1998-99</td>
<td>$1800</td>
</tr>
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</table>

**Carol A. MacLennan**

<table>
<thead>
<tr>
<th>Title</th>
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<th>Project Start &amp; End Date</th>
<th>Amount</th>
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<tr>
<td>Sustainable Development for Rural Communities: Social, Health, Economic, and Environmental Advantages (Co-PI)</td>
<td>U.S. Department of Education, FIPSE</td>
<td>2008-11</td>
<td>$180,000</td>
</tr>
<tr>
<td>Manuscript Completion for <em>Sovereign Sugar</em> (PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2007</td>
<td>$2000</td>
</tr>
<tr>
<td>Sugar Industry and Environment in Hawaii, 20th Century (PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2006</td>
<td>$3500</td>
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<tr>
<td>Huron Mining Complex: Mapping and History (PI)</td>
<td>City of Houghton, Michigan</td>
<td>2003</td>
<td>$5000</td>
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<tr>
<td>Hawaiian Sugar and Sovereignty (PI)</td>
<td>MTU Faculty Development Grant</td>
<td>1997</td>
<td>$5000</td>
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<tr>
<td>Travel to Collections Grant, Hawaiian Sugar Plantation Archives (PI)</td>
<td>National Endowment for Humanities</td>
<td>1993</td>
<td>$500</td>
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<tr>
<td>Hawaiian Sugar Industry (PI)</td>
<td>Wenner-Gren Foundation for Anthropological Research</td>
<td>1990-91</td>
<td>$9500</td>
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**Mary H. Durfee**

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>IGERT: Achieving Environmental, Industrial, and Societal Sustainability via the Sustainable Futures Model (Co-PI)</td>
<td>NSF</td>
<td>2004-10</td>
<td>$3,400,000</td>
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</tbody>
</table>
**Diana Mincyte**

<table>
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<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Residential Fellowship: The Politics of Subsistence and Sustainability in Post-Industrial Europe (PI)</td>
<td>Rachel Carson Center for Environmental Studies, Ludwig Maximilians University, Munich</td>
<td>2009-10</td>
<td>$73,183</td>
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<tr>
<td>Global Patterns of Sustainable Consumption - Focal Point Research Grant/Graduate Student Training Grant (Co-PI)</td>
<td>University of Illinois</td>
<td>2009</td>
<td>$15,000</td>
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<tr>
<td>On-Line Course Development Grant (Co-PI)</td>
<td>European Union Center, University of Illinois</td>
<td>2009</td>
<td>$5000</td>
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<tr>
<td>Food Culture, Globalization and Nationalism – Collaborative Research Grant (PI)</td>
<td>National Endowment for the Humanities</td>
<td>2008</td>
<td>$15,000</td>
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<tr>
<td>Funding to organize workshop, “Ecologies of Consumption” (Co-PI)</td>
<td>University of Illinois &amp; Environmental Council of Illinois</td>
<td>2008</td>
<td>$21,000</td>
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<tr>
<td>Nutritional Health and the Media – Government Research Award (PI)</td>
<td>Government of Lithuania</td>
<td>2008</td>
<td>$5000</td>
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</table>

**Bradley H. Baltensperger**

<table>
<thead>
<tr>
<th>Title</th>
<th>Sponsor</th>
<th>Project Start &amp; End Date</th>
<th>Amount</th>
</tr>
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<tbody>
<tr>
<td>Global Watershed: Integrating Rural and Global Perspectives with Research and Technological Advances (Co-PI)</td>
<td>NSF GK-12</td>
<td>2009-14</td>
<td>$2,500,000</td>
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<td>Michigan Tech Noyce Scholars Program (PI)</td>
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<td>2009-14</td>
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<td>Michigan Teacher Excellence Program (MiTEP): A Model for Improving Earth Science Education Nationwide (Co-PI)</td>
<td>NSF Math and Science Partnerships</td>
<td>2008-13</td>
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<td>Increasing Expertise in Earth Science Education (PI)</td>
<td>NSF Geoscience</td>
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<td>Improving Teacher Quality: World History and Geography (Co-PI)</td>
<td>Michigan Department of Education</td>
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<td>Field Training for Teachers in Earth System Science (Co-PI)</td>
<td>Michigan Space Grant Consortium</td>
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<td>Improving Teacher Quality: Partnerships for Professional Development: Community Land Use (PI)</td>
<td>Michigan Department of Education</td>
<td>2003-05</td>
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<td>Improving Teacher Quality: Partnerships for Professional Development: Watershed Investigations (PI)</td>
<td>Michigan Department of Education</td>
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<td>Building GIS Capacity for the Industrial Archaeology and Environmental Policy Programs at MTU (Co-PI)</td>
<td>MTU Research Excellence Fund</td>
<td>1998</td>
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<td>Social Dimensions of the Greenhouse Effect (PI)</td>
<td>GTE Foundation</td>
<td>1989</td>
<td>$4000</td>
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<td>Community Risk Perception (PI)</td>
<td>MTU Creativity Grant</td>
<td>1985</td>
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<td>Energy Decisions and the Upper Midwest (PI)</td>
<td>U.s. Department of Energy</td>
<td>1981</td>
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<td>Hedgerow Distribution and Removal in the Non-forested Regions of the Midwest (PI)</td>
<td>MTU Faculty Development Research Grant</td>
<td>1980</td>
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**Alex S. Mayer**

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<td>GK12: Global Watershed: Integrating Rural and Global Perspectives with Research and Technological Advances (PI)</td>
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<td>Biocomplexity of Hydrological Service Payments and Watershed Sustainability in Mexico (Co-PI)</td>
<td>NSF, Planning Grant</td>
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<td>Enhancing the Capacity for Sustainable Forest Management and Ecosystem Service Provisioning in Chiapas and Oaxaca (PI)</td>
<td>USAID</td>
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<td>SustR: Sustainable Development for Rural Communities- Social, Health, Economic, and Environmental Advances (PI)</td>
<td>US Department of Education</td>
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<td>Graduate Student Scholarships to Advance a Global Outlook of Economic and Social Prosperity that Protects the Environment (Co-PI)</td>
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<td>Modeling and Analyzing the Use, Efficiency, Value and Governance of Water as a Material in the Great Lakes Region through an Integrated Approach (PI)</td>
<td>NSF</td>
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<td>Sustainable Wastewater Management in the Rio Sonora Basin, Mexico (PI)</td>
<td>Consejo Nacional de Ciencia y Tecnologia (Mexico)</td>
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<td>Watershed Management Plan for Huron Creek Watershed (PI)</td>
<td>Michigan Department of Environmental Quality</td>
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<td>Engaging Social Scientists in the WATERS Initiative: Special Sessions at the 2008 International Symposium on Society and Resource Management (PI)</td>
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<td>2008-09</td>
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<td>Center for Water and Society (PI)</td>
<td>MTU</td>
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<td>Michigan Tech-UNISON Linkage: Training a Core of Water Resources Experts (PI)</td>
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<td>Multi-Objective Decision-Making for Environmental Remediation (PI)</td>
<td>U.S. Environmental Protection Agency</td>
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<td>AQUA3: North American Alliance for Sustainable Water Resources Management (PI)</td>
<td>U.S. Department of Education</td>
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<td>Ph.D. Fellowships in Computational Engineering and Sciences (PI)</td>
<td>U.S. Department of Education</td>
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<td>Computational Facilities for MTU's CS&amp;E Program (Co-PI)</td>
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<td>Metrics for Optimization of Environmental Remediation Problems (PI)</td>
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<td>Multi-Scale Investigation of Mass Transfer Limitations in Surfactant-Enhanced Aquifer Remediation (PI)</td>
<td>U.S. Environmental Protection Agency</td>
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<td>A Mathematical Modeling Approach to Determine the Advance of Saline Intrusion in the Guaymas Valley, Sonora, Mexico (Co-PI)</td>
<td>Consejo Nacional de Ciencia y Tecnologia (Mexico)</td>
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<td>Monitoring and Assessment of Northern Hardwoods Groundwater Remediation Efforts (PI)</td>
<td>Mead Paper Company</td>
<td>1996-00</td>
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<td>Capillary Desaturation of Nonaqueous Phase Liquids in Porous Media (PI)</td>
<td>MTU Research Excellence Found</td>
<td>1997-98</td>
<td>$32,000</td>
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<td>In Situ Subsurface Remediation Technologies: Integration into an Interdisciplinary Engineering Curriculum (CO-PI)</td>
<td>NSF</td>
<td>1994-98</td>
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<td>Mechanistic Relationships for Physical Nonequilibrium Phenomena in Vadose Zone Solute Transport (PI)</td>
<td>NSF</td>
<td>1993-97</td>
<td>$142,000</td>
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<td>Environmental Treatment Design Options Tool (ETDOT) (Co-PI)</td>
<td>MTU/EPA Center of Excellence</td>
<td>1993-96</td>
<td>$184,000</td>
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<td>Environmental Fate and Risk Assessment Tool (EFRAT) (Co-PI)</td>
<td>MTU/EPA Center of Excellence</td>
<td>1995-96</td>
<td>$126,000</td>
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<td>In Situ Containment of Heavy Metals in Soils and Groundwater through Chemical Precipitation (Co-PI)</td>
<td>Michigan Tech Research Excellence Fund</td>
<td>1994-96</td>
<td>$36,000</td>
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<td>Enhanced Visualization for Analysis of Groundwater Modeling Efforts (Co-PI)</td>
<td>MTU Research Excellence Fund</td>
<td>1992-94</td>
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<td>Enhanced Visualization for Analysis of Groundwater Modeling Efforts (PI)</td>
<td>Cray Research Corp.</td>
<td>1993-94</td>
<td>$170,000</td>
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<td>Characterization of a Large Fault Zone as a Barrier to Fluid Flow: The San Andreas Fault near Desert Hot Springs, CA (PI)</td>
<td>Petroleum Research Fund</td>
<td>1994-96</td>
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Andrew J. Storer

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<td>2009 Multistate Comparison of Emerald Ash Borer Trapping and Survey Tools (PI)</td>
<td>USDA APHIS</td>
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<td>Beech Bark Disease and Resistance in American Beech (PI)</td>
<td>USDA Forest Service</td>
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<td>Phloem Reduction in Support of Slow Ash Mortality (SLAM) project (PI)</td>
<td>USDA Forest Service</td>
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<td>Project Coordinator for the Slow Ash Mortality (SLAM) Project (PI)</td>
<td>USDA Forest Service</td>
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<td>Ash Inventory, Trapping and Treatment in Support of the Slow Ash Mortality (SLAM) Project (PI)</td>
<td>USDA Forest Service</td>
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<td>2008 Detection Survey for <em>Sirex noctilio</em> in Michigan (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2008-09</td>
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<td>2008 Michigan and Wisconsin Emerald Ash Borer Detection Survey: Trap Trees and Purple Traps (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2008-09</td>
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<td>Multistate Comparison of Emerald Ash Borer Trapping and Survey Tools (PI)</td>
<td>USDA Forest Service, Northeast Region/Animal Plant Health Inspection Service</td>
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<td>2007 Michigan and Wisconsin Emerald Ash Borer Detection Survey – Supplement (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2007-09</td>
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<td>2007 Ash Damage Survey: Ground Evaluation of Aerial Imagery (PI)</td>
<td>USDA Forest Service, Forest Health Monitoring</td>
<td>2007-08</td>
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<td>Identification of Wood and Bark Infesting Beetle Species Caught in Sirex Woodwasp Detection Traps in Michigan (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2006-07</td>
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<td>Effects of Invasive Earthworms on Ecosystem Function, Forest Health &amp; Biodiversity in Northern Hardwood and Hemlock Forest Systems (PI)</td>
<td>USDA Forest Service, Northern Research Station</td>
<td>2006-11</td>
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<td>Insect Incidence Following Prescribed Fire in Upper Michigan (PI)</td>
<td>McIntire Stennis Program</td>
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<td>Implementation of Ash Phloem Model (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
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<td>Living with Emerald Ash Borer - Refinement of Trap Tree Technologies (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
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<td>Determination of the Impact of Emerald ash Borer in Core Areas - Developing a Catalog of Live Trees (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2007-08</td>
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<td>2007 detection survey for Sirex noctilio in Michigan (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2007-08</td>
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<td>2007 Michigan and Wisconsin emerald ash borer detection survey (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2007-08</td>
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<td>Supplement to 2006 emerald ash borer detection survey (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
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<td>Evaluation of public awareness of issues relating to the movement of firewood and the exotic emerald ash borer (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2006-07</td>
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<td>Detection survey for emerald ash borer on state land in Wisconsin (PI)</td>
<td>Wisconsin DNR</td>
<td>2006-07</td>
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<td>Multistate comparison of emerald ash borer trapping tools (PI)</td>
<td>USDA Animal Plant Health Inspection Service</td>
<td>2006-07</td>
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<td>2006 Michigan and Northern Wisconsin emerald ash borer detection survey (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2006-07</td>
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<td>Michigan and Northern Wisconsin Emerald ash borer detection survey 2005 (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2005-06</td>
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<td>Towards sustainable timber production in Ghana (Co-PI)</td>
<td>International Tropical Timber Organization</td>
<td>2005-08</td>
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<td>Modeling phloem removal from ash stands to reduce the density of emerald ash borer while maximizing genetic diversity of ash (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2005-07</td>
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<td>Risk assessment and suppression of garlic mustard invasion in Michigan (Co-PI)</td>
<td>USDA Forest Service</td>
<td>2005-07</td>
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<td>Interactions among prescribed fire, mechanical treatments, insect pests and pathogens in red pine (PI)</td>
<td>USDA Forest Service, Forest Health Monitoring</td>
<td>2004-08</td>
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<td>Michigan Statewide trap-tree emerald ash borer detection survey, 2004 (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2004</td>
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<td>Constraints imposed on Plantation mahogany production in West Africa by the mahogany shoot moth (Co-PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2002</td>
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<td>Effects of fire and mechanical treatments in a post harvest jack pine forest (PI)</td>
<td>McIntire Stennis program</td>
<td>2004-06</td>
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<td>Effect of invasive earthworms on fungal and soil invertebrate diversity of northern hardwood and hemlock forest ecosystems (PI)</td>
<td>Huron Mountain Wildlife Foundation</td>
<td>2004-05</td>
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<td>Monitoring and evaluating health of ash trees on Michigan's rural forests (University of Michigan Portion) (Co-PI)</td>
<td>USDA Forest Service, Northeast Region</td>
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<td>Monitoring and evaluating health of ash trees on Michigan's rural forests (Michigan Tech Portion) (PI)</td>
<td>USDA Forest Service, Northeast Region</td>
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<td>Effect of invasive earthworms on fungal and soil invertebrate diversity of northern hardwood and hemlock forest ecosystems (Co-PI)</td>
<td>Huron Mountain Wildlife Foundation</td>
<td>2004-05</td>
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<td>A predictive model for exotic plant species for the great lakes network of the U.S National Park Service (PI)</td>
<td>National Park Service</td>
<td>2004-07</td>
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<td>The distribution of red wood ants in North American forests (Co-PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2005</td>
<td>$2500</td>
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<td>Research on pitch canker on Regeneration of Monterey pine forests and impacts of pitch canker (PI)</td>
<td>Del Monte Forest Foundation</td>
<td>2002</td>
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<td>Research on pitch canker on Regeneration of Monterey pine forests and impacts of pitch canker (PI)</td>
<td>Pebble Beech Company</td>
<td>2003</td>
<td>$42,500</td>
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<td>Survey of exotic earthworm invasion of Huron Mountain Club lands (Co-PI)</td>
<td>Huron Mountain Wildlife Foundation</td>
<td>2004</td>
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<td>Entomology and Pathology data collection and presentation: Blodgett Forest Research Station site of the national fire and fire-surrogate study (PI)</td>
<td>U.C. Berkeley</td>
<td>2004</td>
<td>$14,474</td>
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<td>Interactions of bark and ambrosia beetles with Phytophthora ramorum, cause of sudden oak death in coast live oaks and their role in tree failure (Senior personnel)</td>
<td>University of California, Integrated Pest Management Project</td>
<td>2002-05</td>
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<td>Updated integrated pest management systems for pitch canker: Known and potential insect vectors (Senior personnel)</td>
<td>University of California Integrated Pest Management Project</td>
<td>2002-05</td>
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<td>Entomology and Pathology data collection &amp; presentation: Blodgett Forest Research Station site of the national fire and fire-surrogate study (PI)</td>
<td>UC Berkeley</td>
<td>2002</td>
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<td>Interactions of bark and ambrosia beetles with Phytophthora ramorum, in coast live oaks and their roles in tree failure (Co-PI)</td>
<td>USDA Forest Service, Pacific Southwest Research Station</td>
<td>2002-04</td>
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<td>Monitoring and evaluating health of ash trees on Michigan's rural forests (Michigan Tech Portion) (PI)</td>
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<td>Monitoring and evaluating health of ash trees on Michigan's rural forests (University of Michigan Portion) (Co-PI)</td>
<td>USDA Forest Service, Northeast Region</td>
<td>2003-04</td>
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<td>Research on pitch canker on the Monterey peninsula, CA (PI)</td>
<td>Pebble Beech Company</td>
<td>2002-03</td>
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<td>Biological control and impacts of exotic weeds (PI)</td>
<td>MTU Faculty Scholarship Grant</td>
<td>2003</td>
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<td>Development of detection and monitoring techniques for emerald ash borer (Co-PI)</td>
<td>USDA Forest Service, Forest Health Technology Enterprise Team</td>
<td>2003</td>
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<td>Risk assessment for sudden oak death in Michigan (PI)</td>
<td>Michigan DNR</td>
<td>2002</td>
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### William S. Breffle

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<td>Assessing the Carrying Capacity of the Great Lakes Natural Environment of Western Michigan (PI)</td>
<td>Colcom Foundation</td>
<td>2008-09</td>
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### Mark C. Roberts

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<td>MTU Faculty Scholarship Grant</td>
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<td>Travel for Energy Economics book Research (PI)</td>
<td>MTU School of Business &amp; Economics, Faculty Development Grant</td>
<td>2008</td>
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<td>Symposium on Economic Instruments for the Implementation of Zero Discharge of Persistent Toxic Chemicals in the Lake Superior Basin (Co-PI)</td>
<td>U.S. Environmental Protection Agency</td>
<td>1993</td>
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Proposal to Modify and Rename the “Senior Rule” Policy

Proposed Name for Modified Policy: “Integrated Undergraduate/Graduate Degree Programs” or “Undergrad/Grad Programs”

Goals:
- Develop a flexible policy framework that will allow individual departments/programs to offer Integrated undergraduate/graduate degree programs that meet the needs of their students, faculty, and academic discipline.
- Attract outstanding Michigan Technological bachelor’s students into our master’s and doctoral programs.
- Allow exceptional Michigan Tech students an early opportunity to become engaged in graduate-level research.
- Allow students to pay undergraduate tuition for a limited number of credits taken while an undergraduate student, and apply these credits toward a graduate degree.
- Allow students to double count a limited number of credits towards both the Bachelor’s and Master’s degrees

Limitations:
This program will only be available to undergraduate students who will complete a bachelor’s degree at Michigan Tech.

Current Policy:
The current “Senior Rule” Policy is:
(http://www.mtu.edu/registrar/students/registration/policies/senior-rule/)

“While finishing an undergraduate degree, students are allowed to take courses which could apply to a graduate degree. However, a course cannot be applied to both a graduate and an undergraduate degree.

A Senior Rule form must be completed and submitted to the Registrar’s Office prior to the end of the 6th week of class for the course semester. Upon submission, the student's academic record will be changed to show graduate status for the course designated. Once the academic record has been changed to show graduate status for a particular course, it cannot be changed back to count toward an undergraduate degree.

Senior Rule Guidelines
- A student so enrolled and carrying 6 credits or more in 5000 or 6000 level courses may carry no more than 16 credits of course work per semester.
- The total number of Senior Rule credits may not exceed one-third of the required non-research course credits.”
Proposed Policy:

Summary of Changes: Students will be allowed to use the modified senior rule Integrated Undergraduate/Graduate Degree Programs policy to accumulate up to one-third of the credits (of either coursework or research credits or a combination of both) while enrolled as an undergraduate. Changing this provision will allow students to earn a larger number of graduate credits while an undergraduate student, and. students can begin earning graduate credits at any time during their undergraduate career (with permission of the course or research credit advisor and the Graduate Program Director for the students intended graduate program). Students will also be allowed to double count up to six (6) credits toward both an undergraduate and graduate degree.

Revised Policy Statement:
While working toward an undergraduate degree, students are allowed to take courses which may be applied toward a graduate degree.

The total number of graduate credits earned while an undergraduate may not exceed one-third of the credits required for the graduate degree in the student’s intended graduate program. In most situations, this means that a student may accumulate a maximum of ten (10) credits as an undergraduate that can later be applied toward the graduate degree.

Up to six (6) credits of the graduate credits may be applied towards both an undergraduate and graduate degree.

Students who take six (6) credits or more in 5000 or 6000 level courses may carry no more than sixteen (16) credits per semester.

Undergraduate students who wish to apply courses towards a graduate degree must submit an Integrated Undergraduate/Graduate Degree Programs form <<Link to revised form; add signature line for Graduate Program Director; remove Department Chair signature; take out 12-month prior to graduation provision; add place to indicate courses/credits intended for double counting>> to the Registrar’s Office by Wednesday of the second week of the semester in which the graduate degree courses are taken. Once a student has submitted the form, the courses designated for use toward a graduate degree only cannot be applied toward an undergraduate degree.

Procedure:
Upon submission, the student’s academic record will be changed to show graduate status for the courses that are not intended to be double counted. The Registrar’s Office will then send a copy of the form to the graduate school, and the graduate school will keep the form with the student’s records. Students will be allowed to use all courses for which academic status is indicated, as well as the double counted courses, on their graduate degree schedule. Once the academic record has been changed to show graduate status for a particular course, it cannot be changed back to count toward an undergraduate degree.
Proposal for a
Doctor of Philosophy
Degree Program in
Geophysics

1. General Description of the Program

The faculty of the Department of Geological and Mining Engineering and Sciences (GMES) at Michigan Technological University seek to establish a Doctor of Philosophy program in Geophysics. Graduates of the program will have broad training in geophysics and develop expertise in one or more of the following specialties: earthquake seismology, exploration seismology, geomagnetism, and volcano seismology.

2. Rationale

The GMES department recently hired two new faculty members who have specialties in geophysics, bringing the total number of geophysics faculty to six (Suzanne J. Beske-Diehl, Jimmy F. Diehl, Wayne D. Pennington, Aleksey V. Smirnov, Roger Turpening, and Gregory P. Waite). While the department currently graduates PhD students with specialties in geophysics, their degrees are awarded in geology or geological engineering. These graduates are geophysicists by training, but their degree titles do not accurately reflect their expertise. In some cases, the lack of a Geophysics PhD program has been a deterrent for applicants or would-be applicants to the department. Having a PhD degree in geophysics is particularly important for enabling our new assistant professors to attract high-quality PhD students.

The GMES department has long had an undergraduate program in Applied Geophysics, and a Master of Science program in Geophysics. Both programs have traditions of successfully placing graduates in other graduate programs, or with positions in the public and private sectors. The new PhD program in Geophysics builds on the strengths of the existing geophysics programs. In addition to the Applied Geophysics B.S. and Geophysics M.S., the GMES department awards B.S., M.S., and PhD degrees in both Geology and Geological Engineering. We also offer graduate degrees in Mining Engineering. Our new Geophysics PhD program will provide continuity across all graduate programs within the GMES department.
3. Related programs

3.1. Related Programs at Michigan Tech

The programs most closely related to the new Geophysics PhD program are the Geological Engineering and Geology PhD programs offered through the GMES department. These programs have outlined specific criteria that have been used to assess their success: 1) upon graduation, PhD students in geology and geological engineering have demonstrated the ability to carry out an advanced and original research project, including its written and oral communication; 2) their projects have synthesized knowledge from different scientific disciplines; and 3) PhD students gain experience as research proposal writers. The department requires presentation and defense of a research proposal and students are expected to participate in the preparation and writing of proposals for internal and external funding. There are no specific coursework requirements for the PhD; the advisory committees design a program of study tailored to each student’s background and research interests. Additional courses may be added to the program of study based on the result of the comprehensive (qualifying) exam. Emphasis is placed on research and publication of research. The average student completes the PhD in 4-5 years.

3.2. Related Programs at Other Institutions

There are approximately 25¹ Geophysics PhD programs in the United States as of 2008. We conducted an informal survey of a subset of these programs in order to assure that our graduates will be competitive with those from other institutions. We found that many programs have requirements that are similar to those of our Geology and Geological Engineering programs. They generally require some combination of oral and/or written comprehensive examination, sometimes called a qualifying examination. Some programs (e.g., Caltech, Princeton) have specific coursework requirements with 45 or more credits, while other programs have no specific requirements. Instead, they allow their students’ committees to design course schedules tailored to students’ backgrounds and research interests. This flexibility is especially desirable for geophysics graduate programs. Most colleges and universities do not offer a B.S. degree in geophysics so geophysics graduate programs are likely to attract a large number of students with undergraduate degrees in physics, mathematics, or a related field, rather than geophysics.

3.3. Anticipated Enrollment

There are currently four PhD students who are being advised by geophysics faculty who would be affected by this new degree program. As the junior faculty members build their research programs, this number may increase to as many as 10.

4. Curriculum Design

Students entering geophysics graduate programs come from a variety of backgrounds. They are as likely to have bachelor degrees in physics or mathematics as geophysics or geology. Therefore it is up to the advisory committee to design curricula for students based on their experience and deficiencies.

As with the PhD programs in Geological Engineering, Mining Engineering, and Geology within the GMES department, no courses will be explicitly required for the PhD in Geophysics. Each student, in consultation with the thesis committee, will develop an appropriate program of study with courses that complement their research activities. A minimum of 30 semester credits beyond the master's degree or 60 semester credits past the bachelor's degree are required. Courses may be within the GMES department and in other departments. In addition, the committee may require additional courses following the comprehensive examination. There is no modern language requirement.

4.1. Course Offerings

The following is a list of existing courses within the GMES department that will count toward the course requirements for the PhD in Geophysics. This is not a comprehensive list, but demonstrates the breadth of existing courses available to students.

**GE 4050 - Advanced Structural Geology**
How rocks deform on a microstructural to hand specimen scale. Topics include dislocations, work hardening and recovery processes, annealing and recrystallization, slip systems, preferred orientation mechanisms, and foliation development. Credits: 3.0; Lec-Rec-Lab: (3-0-0); Semesters Offered: On Demand; Pre-Requisite(s): GE 3050.

**GE 4250 - Fundamentals of Remote Sensing**
This course focuses on the basic physics behind above-surface remote sensing and remote sensing systems. Topics covered include: properties of the atmosphere, absorption and scattering of electromagnetic radiation, instrument design, data acquisition and processing, validation, and basic applications. Credits: 3.0; Lec-Rec-Lab: (2-1-0); Semesters Offered: Spring; Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore; Pre-Requisite(s): PH 2200 and MA 2160.

**GE 4450 - Advanced Environmental Geophysics**
Covers the principles, design, and practice of geophysical site investigation utilizing electrical and electromagnetic techniques with emphasis on near surface application pertinent to the environmental consulting industry. Credits: 3.0; Lec-Rec-Lab: (2-0-3); Semesters Offered: Fall; Pre-Requisite(s): GE 3040

**GE 4500 - Plate Tectonics and Global Geophysics**
Plate tectonics and the internal structure of the earth using information from seismology, geomagnetism, gravity, and heat flow. Credits: 3.0; Lec-Rec-Lab: (0-3-0); Semesters Offered: Fall, Spring; Pre-Requisite(s): MA 3160 and PH 2200 and GE 2000.

**GE 4550 - Gravity and Magnetic Interpretation Methods**
Interpretation of gravity and magnetic anomalies based on forward modeling techniques, including space filtering to enhance anomalies of importance. Emphasis will also be given to the design of the gravity/magnetic survey based on cost, implementation, and interpretation methods used. Credits: 3.0; Lec-Rec-Lab: (0-3-0); Semesters Offered: Fall, Spring - Offered alternate years beginning with the 2004-2005 academic year; Pre-Requisite(s): GE 3040.
GE 4560 - Earthquake Seismology
Physics of earthquakes and seismic energy propagation including stress and strain, elastic wave equation, body and surface waves, anelasticity, anisotropy, earthquake location, earthquake sources, passive seismic imaging. Homework will require computer skills in Matlab or similar. Credits: 3.0; Lec-Rec-Lab: (3-0-0); Semesters Offered: Fall; Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore; Pre-Requisite(s): GE 3050 and PH 2100 and MA 3160.

GE 4600 - Reflection Seismology
Principles of reflection seismic techniques, including theoretical background and application, and hands-on computer projects. Included are acquisition, data processing, and 2D/3D data interpretation. Students conduct projects using actual commercial-quality seismic data. Credits: 3.0; Lec-Rec-Lab: (2-1-0); Semesters Offered: Spring; Pre-Requisite(s): GE 3040.

GE 4610 - Formation Evaluation and Petroleum Engineering
Principles and practice of formation evaluation, primarily through analysis of well logs and the principles and practice of petroleum engineering. Emphasizes reservoir engineering and simulation. Students conduct projects using actual field data. A three-day field trip is required. Credits: 3.0; Lec-Rec-Lab: (2-1-0); Semesters Offered: Fall.

GE 5195 - Volcano Seismology
Will prepare students, including those with no seismology background, to interpret seismic and acoustic signals from volcanoes. Topics: basic seismology, monitoring techniques, tectonic and volcanic earthquakes, infrasound, deformation over a range of time scales. Credits: 3.0; Lec-Rec-Lab: (2-0-1); Semesters Offered: Spring; Pre-Requisite(s): (MA 1160 or MA 1161 or MA 1135) and GE 2000 and PH 2100.

GE 5250 - Advanced Computational Geosciences
Introduction to quantitative analysis and display of geologic data using Matlab and Excel, covering basic Matlab syntax and programming, and analysis of one-dimensional (e.g. time series) and two-dimensional datasets (e.g. spatial data). Techniques are applied to geological datasets. Credits: 3.0; Lec-Rec-Lab: (2-0-1); Semesters Offered: Spring; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

GE 5400 - Global Geophysics and Geotectonics
Plate tectonics and the internal structure of the earth using information from seismology, geomagnetism gravity, and heat flow. A term project/report is required. Credits: 3.0; Lec-Rec-Lab: (0-3-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate; Pre-Requisite(s): MA 3160 and PH 2200 and GE 2000.

GE 5405 - Geophysics for Archaeology
Principles and practice of non-invasive archaeological geophysics (remote sensing) such as magnetometry, ground penetrating radar and resitivity. Data interpretation will involve basic computation, contouring, three-dimensional visualization programs, interpretation and archaeological significance. Activities include fieldwork, data analysis and presentation, and short reports. The mathematical content of the class will be minimal.
Credits: 3.0; Lec-Rec-Lab: (2-0-1); Semesters Offered: Fall - Offered alternate years beginning with the 2003-2004 academic year.

GE 5450 - Potential Field Theory in Gravity and Magnetic Applications
The fundamentals of potential theory and the application to gravity and magnetic studies of the crust and lithosphere. Topics include Newtonian & magnetic potential, magnetization, regional gravity fields, the geomagnetic field, forward & inverse modeling. Fourier-domain modeling and transformations. Credits: 3.0; Lec-Rec-Lab: (0-3-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate; Pre-Requisite(s): MA 3160 and PH 2200 and GE 3040.

GE 5500 - Paleomagnetism and Environmental Magnetism
Origin and interpretation of the natural remanent magnetism in rocks and its use in deciphering the geologic past. Applications studied are plate tectonic movements, environmental change, stratigraphic correlation, and the earth's magnetic field. Credits: 3.0; Lec-Rec-Lab: (3-0-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate; Pre-Requisite(s): GE 2000.

GE 5600 - Advanced Reflection Seismology
Principles and application of reflection seismic techniques. Includes acquisition, data processing, and 2D/3D data interpretation. Project and report required. Credits: 3.0; Lec-Rec-Lab: (2-1-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

GE 5610 - Quantitative Reservoir Characterization
Develop and integrate several aspects of reservoir characterization using data from actual oil and gas fields. The various aspects include well logs, seismic data, production data, and geologic/outcrop inference. Geostatistical routines and integrated software suites. Credits: 3.0; Lec-Rec-Lab: (1-2-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

GE 5650 - Special Topics in Petroleum Geology
The study of current topics in petroleum geology. Research papers and reports are required. Credits: variable to 4.0; Repeatable to a Max of 8; Semesters Offered: Spring Restrictions: Must be enrolled in one of the following Level(s): Graduate.

GE 5785 - Seismic Petrophysics
Seismic petrophysics describes the use of rock physics information and logging data in the interpretation of reflection seismic data. The theories and empirical models relating seismic properties to other properties of rocks will be reviewed, and the logging techniques responsible for identifying those properties discussed. Various approaches to the quantitative interpretation of seismic data are covered. For varying course credit, projects with real data will be conducted by students. Credits: variable to 3.0; Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

GE 5800 - Mathematical Modeling of Earth Systems
Introduction to numerical techniques for mathematical modeling of various earth-system
phenomena, including groundwater flow, heat transfer, and atmospheric transport. Numerical techniques covered include finite-difference, finite-element, collocation, and characteristic methods. Students write their own mathematical models. Prerequisite: experience in programming computer languages such as FORTRAN. Credits: 3.0; Lec-Rec-Lab: (3-0-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

**GE 5810 - Flow and Transport in Subsurface Systems**
Analysis of fluid flow in geologic materials, including groundwater flow, solute and contaminant transport, heat flow, and petroleum movement. Develops fundamental transport equations and numerical methods for solving these equations. Credits: 3.0; Lec-Rec-Lab: (3-0-0); Semesters Offered: On Demand; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

Students will be encouraged to enroll in relevant courses within other departments. The following list of courses is intended to provide examples of extradepartmental courses available to meet the interests and eliminate deficiencies of individual students. The list is not intended to include all courses that could be used to meet degree requirements.

**SU 4100 - Geodetic Positioning**
Introduces the instruments and procedures used in surveying projects that require a high order of accuracy. Discusses some conventional instruments and techniques but the greater emphasis is on GPS techniques. Credits: 3.0; Lec-Rec-Lab: (0-2-3); Semesters Offered: Fall; Restrictions: Must be enrolled in one of the following Class(es): Junior, Senior; Pre-Requisite(s): SU 4060(C).

**EE 4252 - Digital Signal Processing and its Applications**
Digital signal processing techniques with emphasis on applications. Includes sampling, the Z-transform, digital filters and discrete Fourier transforms. Emphasizes techniques for design and analysis of digital filters. Special topics may include the FFT, windowing techniques, quantization effects, physical limitations, image processing basics, image enhancement, image restoration and image coding. Credits: 4.0; Lec-Rec-Lab: (0-3-2); Semesters Offered: Fall; Pre-Requisite(s): EE 2150 and EE 3160.

**MA 4620 - Finite Difference Methods for PDEs**
Derivation, analysis, and implementation of finite difference methods; applications to fluid mechanics, elasticity, heat conduction, acoustics, or electromagnetism. Difference equations, Taylor series, stability, and convergence. Finite difference methods for partial differential equations; alternate methods (spectral, finite element, or particle) for discretizing space. Credits: 3.0; Lec-Rec-Lab: (0-3-0); Semesters Offered: Fall; Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160.

**PH 5110 - Classical Mechanics**
Lagrangian methods, symmetries and conservation laws, variational formulation, small oscillations, Hamilton's equations, contact transformations, Poisson brackets, Hamilton-Jacobi theory, Lorentz-invariant formulation. Credits: 2.0; Lec-Rec-Lab: (2-0-0); Semesters
Offered: Fall, Spring - Offered alternate years beginning with the 2002-2003 academic year; Restrictions: Must be enrolled in one of the following Level(s): Graduate.

4.2. Additional Requirements.

We plan to follow the model of the Geology and Geological Engineering PhD programs for the design of written comprehensive exams, public proposal presentation and defense, and final oral exam. The

4.2.1. Comprehensive exam

The comprehensive exam will be a written examination of fundamental and advanced topics in geophysics. The thesis committee chair will be responsible for soliciting the committee members for content and judging the exam.

4.2.2. Research proposal

Following successful passage of the comprehensive exam, students will be required to present and defend a research proposal. The proposal is intended to provide focus for research. The presentation is open to the public. Following the presentation, the student has an opportunity to defend the plan before both a public audience and audience made up of only the advisory committee.

4.2.3. Written dissertation

The dissertation will be written and prepared under the supervision of the chair of the advisory committee according to the requirements of the Graduate School. Students are expected to produce at least three quality journal publications from their PhD research. The dissertation may be comprised in part by journal articles.

4.2.4. Final oral examination

The final requirement is a public oral presentation. As with the proposal (4.2.2), the presentation is public and followed by a public examination. Following the public examination, the advisory committee may further question the student in order to better assess the validity of the methods and conclusions contained in the dissertation.

5. New Course Descriptions

No new courses are required specifically for this degree.

6. Computing Access Fee

Students enrolled in the Geophysics PhD program will be charged the same Computing Access Fee as other graduate students in the department. For the 2009-2010 academic year, the fee is $340.

7. Additional Resources Required

No new resources are required specifically for this degree.
8. Accreditation Requirements

There are no specific accreditation requirements.

9. Planned Implementation Date

We would like to make this degree available as soon as possible (Fall 2010). One student who is close to graduation would be affected in the short term.

10. Core Geophysics Faculty

The GMES department has six geophysics faculty members including one Research Professor (R. Turpening). The curricula vitae of these faculty members are available online as Appendix A: http://www.geo.mtu.edu/~gpwaite/GeophysicsPhD/AppendixA.pdf.

11. Affiliated Faculty

In addition to the six core geophysics faculty members, several other members of the GMES graduate faculty are likely to assist in educating the Geophysics PhD students. They are listed in the table below. The expertise of faculty members from other departments (e.g., Physics, Electrical Engineering, Mathematics, School of Technology) and other institutions will be sought as necessary on a case-by-case basis. In addition, the GMES department is conducting two faculty searches. We anticipate the new faculty members, who will have expertise in the related disciplines of Atmospheric Science and Geological Engineering, will provide additional assistance to train some of the Geophysics PhD students as well.

**GMES faculty with research interests in fields closely related to geophysics.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carn, Simon</td>
<td>Assistant Professor</td>
<td>Remote sensing, volcanology</td>
</tr>
<tr>
<td>Gierke, John</td>
<td>Professor</td>
<td>Hydrology, near-surface geophysics</td>
</tr>
<tr>
<td>Mayer, Alex</td>
<td>Professor</td>
<td>Hydrology</td>
</tr>
<tr>
<td>Rose, William</td>
<td>Professor</td>
<td>Remote sensing, volcanology</td>
</tr>
<tr>
<td>Shannon, Jeremy</td>
<td>Lecturer</td>
<td>Remote sensing, volcanology</td>
</tr>
<tr>
<td>Shuchman, Robert</td>
<td>Adjunct Professor</td>
<td>Remote sensing, volcanology</td>
</tr>
<tr>
<td>Viton, Stanley</td>
<td>Adjunct Associate Professor</td>
<td>Geomechanics</td>
</tr>
<tr>
<td>Watson, Matthew</td>
<td>Adjunct Assistant Professor</td>
<td>Remote sensing, volcanology</td>
</tr>
<tr>
<td>Wood, James</td>
<td>Professor</td>
<td>Remote sensing, subsurface visualization</td>
</tr>
<tr>
<td>Wu, Shiliang</td>
<td>Assistant Professor</td>
<td>Atmospheric chemistry</td>
</tr>
</tbody>
</table>
Proposal: 
Masters Program in Security and Medical Informatics

I. General Description
This proposal recommends the establishment of a Graduate Program in Security and Medical Informatics at Michigan Tech University. Marquette General Health System (MGHS), a prominent teaching medical institution located in the Upper Peninsula of Michigan, will partner with the School of Technology to provide a comprehensive education and research entity for this Graduate Program.

II. Rationale
Security and medical informatics are two rapidly developing fields in our society. Medical informatics is the intersection of information science, computer science, and healthcare. This field deals with the resources, devices, and methods required to optimize the acquisition, storage, retrieval, and use of information in health and biomedicine. Securing computer network systems has become a vital part of our global society. Many institutions and organizations depend on electronic data to conduct operations daily. This includes areas such as the healthcare, financial, military, and academic sectors. Established regulations such as the Health Insurance Portability and Accountability Act (HIPAA) and Graham-Leach-Bliley Act (GLBA) include specific security and compliance provisions for their respective sectors. With the advancement of technology in the medical field, accompanied by the need to keep this information confidential, a graduate program that addresses the education and research needs of these two closely related fields is critical.

Michigan Tech University has established strong and growing research in the areas of security and medical informatics. Likewise, the university has recently made a significant commitment to education and research in this field by supporting the strategic faculty hiring initiative in the area of Health. The addition of the Security and Medical Informatics Graduate Program would strongly support the Health initiative and align with the strategic plan of the university.

The Masters of Science in Security and Medical Informatics is designed to:
1. deepen students’ understanding and knowledge of medical informatics and security engineering;
2. provide students with research opportunities within the intersecting fields of medical informatics and security;
3. provide a flexible curriculum to allow for both traditional and nontraditional graduate students.

III. Related Programs
Graduate programs in medical informatics or closely related fields exist at a few other institutions, including South Dakota State University, Drexel University, Johns Hopkins, Stanford, and the University of Illinois Chicago. Most of the mentioned programs focus strictly on management and technical aspects of medical informatics. Johns Hopkins provides a similar security infrastructure to accompany their health related courses, but our program has a stronger emphasis on patient records, the electronic medical records system, and the interoperability of these systems.

IV. Projected Enrollment
We estimate the Graduate Program to have 15-20 students enrolled over the first three years with an anticipated steady-state enrollment of 30-40 students. We expect 25% of the students in the program to be traditional students and the remainder to be nontraditional students enrolled strictly through distance learning. An additional 15 non-degree seeking students are expected annually. These students would take courses that can be applied to professional certifications such as the Certified Professional in Heath Information Technology (CPHIT). These courses are highlighted in the next section.

V. Curriculum Design
The Security and Medical Informatics Graduate Program requires 33 credits of course work and research for graduation.
Course work – Minimum of 27 credits must be taken from the following courses:

1. TSMI 5111 - Security and Privacy* +
2. TSMI 5121 - The Healthcare System* +
3. TSMI 5131 - System Analysis and Design* +
4. TSMI 5141 - Electronic Health Records and e-Health Implementation*
5. TSMI 5151 - Application Integration and Interoperability*
6. TSMI 5161 - Database Management and Security*
7. TSMI 5211 - Java Security
8. TSMI 5221 - Protocols and Systems for Internet and Web Security
9. TSMI 5231 - Statistical Methods for Intrusion Detection
10. TSMI 5241 - Designing Security Systems
11. TSMI 5251 - Advanced Topics in Network Security
12. TSMI 5261 - Health Informatics Decision and Support
13. TSMI 5271 - HIPAA Implications for Public Health +

* HIT Certification course
+ Course instructed by Marquette General Health System

Research Thesis – 6 credits
15. TSMI 5999 - Master's Research

Course Descriptions:

1. **TSMI 5111 Security and Privacy**
   Examines key health information security, policy and procedures. Investigates how to distinguish elements of a security audit and key security policies. Analyzes the roles of people maintaining health information security and explains elements of these roles within the organization.
   Credits: 2.0   Lec-Rec-Lab: (2-0-0)
   Semesters Offered: Fall
   Restrictions: Must be enrolled in one of the following Levels: Graduate

2. **TSMI 5121 The Healthcare System**
   Provides an overview of healthcare’s transition from paper to electronic format and examines characteristics of healthcare organizations, the interrelationships among healthcare components, the role that government, regulatory, professional and accreditation agencies play within healthcare, and describes the roles of healthcare professionals and the organizational structure in which they work.
   Credits: 2.0   Lec-Rec-Lab: (2-0-0)
   Semesters Offered: Spring
   Restrictions: Must be enrolled in one of the following Levels: Graduate

3. **TSMI 5131 System Analysis and Design**
   Provides in-depth knowledge of tools that are available to perform systems analysis, examines the key factors to be considered in a systems design, emphasizes the importance of communication through both of these processes, and an understanding of the primary factors in measuring the benefits of systems implementation. Course will also examine strategies and key factors in purchasing systems. This includes analysis of opportunities and risk of integrating single vendor, hybrid, and other factors when examining system acquisition.
   Credits: 3.0   Lec-Rec-Lab: (3-0-0)
   Semesters Offered: Fall
   Restrictions: Must be enrolled in one of the following Levels: Graduate
4. **TSMI 5141  Electronic Health Records and e-Health Implementation**
   Explores the difference between Electronic Medical Record (EMR) and Electronic Health Record (EHR). Discusses challenges and implementation of both EMR and EHR. Provides security analysis of both types of records and the maintenance of these systems.
   Credits: 3.0  Lec-Rec-Lab: (2-0-1)
   Semesters Offered: Spring
   Restrictions: Must be enrolled in one of the following Levels: Graduate

5. **TSMI 5151  Application Integration and Interoperability**
   Defines and explains the role of interoperability in the development of a functioning EHR. Analyzes predominant standardization in the healthcare field such as ASTM and HL7. Examines the challenges to the development of interoperability in healthcare.
   Credits: 3.0  Lec-Rec-Lab: (2-0-1)
   Semesters Offered: Fall
   Restrictions: Must be enrolled in one of the following Levels: Graduate

6. **TSMI 5161  Database Management and Security**
   Identifies database solutions and key elements of an enterprise data warehouse. Explains how to apply best practices for development of data warehouses and distinguish between a clinical data repository and enterprise data warehouse. Investigates the role of Master Patient Index and the aggregation of patient data in databases. Finally, the course defines security practices for a database environment.
   Credits: 3.0  Lec-Rec-Lab: (2-0-1)
   Semesters Offered: Spring
   Restrictions: Must be enrolled in one of the following Levels: Graduate

7. **TSMI 5211  Java Security**
   This course provides comprehensive coverage of the security aspects of the Java platform. Java's security model and the VM and language features that support security are covered. Java APIs and Java Cryptography APIs are addressed in security in the Java 2 Enterprise Edition (J2EE). This course analyzes Java security platforms and Java APIs within the healthcare sector.
   Credits: 3.0  Lec-Rec-Lab: (2-0-1)
   Semesters Offered: Fall
   Restrictions: Must be enrolled in one of the following Levels: Graduate

8. **TSMI 5221  Protocols and Systems for Internet and Web Security**
   Course focuses on the most widely used systems and protocols for security on the Internet and on the Web. The Internet refers to the infrastructure or the underlying protocols and routing. The Web describes applications that run on the Internet. Detailed focus is on browsers, web servers, and communication protocols on the Internet, as well as how to deal with viruses and distributed denial of service attacks. Some of the protocols/systems covered in detail are TCP/IP, SSUTLS, IPSec, SSH, PGP, firewalls, IDS systems, and Kerberos.
   Credits: 3.0  Lec-Rec-Lab: (2-0-1)
   Semesters Offered: Spring
   Restrictions: Must be enrolled in one of the following Levels: Graduate
   Prerequisite: TSMI 5221

9. **TSMI 5231  Statistical Methods for Intrusion Detection**
   This course will provide an introduction to the data and methodologies of computer intrusion detection. The focus will be on statistical and machine learning approaches to detection of attacks on computers. Topics include network monitoring and analysis, network based attacks such as probes and denial of service attacks, host-based attacks such as buffer overflows and race conditions, and malicious code such as viruses and worms. Statistical pattern recognition methods will be described for the detection and classification of attacks.
   Credits: 3.0  Lec-Rec-Lab: (2-0-1)
   Semesters Offered: Fall
   Restrictions: Must be enrolled in one of the following Levels: Graduate
10. TSMI 5241 Designing Security Systems
This course provides an overview of techniques used in the design of secure systems. Primary focus of the course will be on real-world case studies. Students will examine attacks on deployed systems and then investigate how these vulnerabilities have been subsequently addressed. Additionally, the course will examine the practical advantages and shortcomings of several notions of provable security. Students will be expected to read, understand, and present recent research papers to the class.
Credits: 3.0  Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Levels: Graduate
Prerequisites: TSMI 5221 and TSMI 5111

11. TSMI 5251 Advanced Topics in Network Security
This course focuses on advanced research topics in communications security. The course is structured as a research seminar where students present research papers to the class. Topics include protocol analysis, security in inter-domain routing, broadcast authentication protocols, covert channels and anonymous communication, key management, advanced trace-back schemes, and attack propagation modeling. A course project is required.
Credits: 3.0  Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Levels: Graduate
Prerequisite: TSMI 5241

12. TSMI 5261 Health Informatics Decision and Support
This course addresses issues related to decision modeling based on health sciences data in terms of analysis, construction, and evaluation. Clinical decision support architectures are examined. An array of decision support tools is considered, and the knowledge representations employed in these tools are discussed.
Credits: 3.0  Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Levels: Graduate

13. TSMI 5271 HIPAA Implications for Public Health
This course focuses on the administrative and technical provisions of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) which mandates a variety of healthcare standards as well as rules for electronic transactions and code sets. This course is designed to provide system implementers in the public health field with an understanding of and hands-on experience with HIPAA regulations, implications, and a perspective of the impact on the future of the health care information infrastructure regarding the use of information technologies.
Credits: 3.0  Lec-Rec-Lab: (3-0-0)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Levels: Graduate

14. TSMI 5281 Healthcare Security Management
This course will address information security in the public health and medical fields, with special emphasis on clinical care, research and the role of the academic medical center. Course will also focus on disaster recovery and response, anonymization of records, billing, communication of public health information to EHRs, along with physical and administrative security.
Credits: 3.0  Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall
Restrictions: Must be enrolled in one of the following Levels: Graduate

15. TSMI 5999 Master’s Research
The study of an acceptable security and medical informatics research problem and the preparation of a thesis.
Credits: variable to 6.0; Repeatable to a Max of 6; Graded Pass/Fail Only
Semesters Offered: Fall, Spring, Summer
Restrictions: Permission of department required; Must be enrolled in one of the following Levels: Graduate
VI. Library and other Learning Resources
   To be defined

VII. Computing Access Fees
   A computer access fee of $210 per semester will be required for students enrolled in this program and additional Distance Learning fees may be required for on-line courses.

VIII. Faculty
   Key faculty members for this graduate program are listed below:
   - Yu Cai – Assistant Professor, School of Technology (http://www.tech.mtu.edu/people/yu_cai_CV.pdf)
   - Chunming Gao – Assistant Professor, School of Technology (http://www.tech.mtu.edu/people/chunming_gao_CV.pdf)
   - Guy C. Hembroff – Chair, CNSA Program/Assistant Professor, School of Technology (http://www.tech.mtu.edu/people/guy_hembroff_CV.pdf)
   - Liran Ma – Assistant Professor, School of Technology (http://www.tech.mtu.edu/people/liran_ma_CV.pdf)
   - Xinli Wang – Assistant Professor, School of Technology (http://www.tech.mtu.edu/people/xinli_wang_CV.pdf)

IX. Description of Available/Needed Equipment
   The following contains a list of hardware and software needed for this Graduate program:
   - Computer PCs/Laptops
   - Selected Software (i.e. EMR software, database software, virtualization software)
   - Routers/Switches/Firewalls
   - Biometric Devices
   - VoIP Technologies
   - Smart Cards

X. Program Costs
   Program Costs display the overall funding mechanism to illustrate a comprehensive budget and demonstrate forecasting to achieve revenue and sustainability for this graduate program. Steady state enrollment occurs in year four.

   Non-degree seeking students are individuals who are registered to take courses, possibly to obtain their CPHIT certificate, but are not registered in the Security and Medical Informatics Graduate program.

<table>
<thead>
<tr>
<th>PROGRAM REVENUE</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Years 4-n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment (MS students)</td>
<td>8</td>
<td>18</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Enrollment (non-degree seeking)</td>
<td>6</td>
<td>12</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Tuition revenue (MS students - 18 credits/year at $595/credit)</td>
<td>$85,680</td>
<td>$192,780</td>
<td>$214,200</td>
<td>$214,200</td>
</tr>
<tr>
<td>Tuition revenue (non-degree seeking - 16 credits/year)</td>
<td>$57,120</td>
<td>$114,240</td>
<td>$142,800</td>
<td>$142,800</td>
</tr>
<tr>
<td>Total tuition revenue</td>
<td>$142,800</td>
<td>$307,020</td>
<td>$357,000</td>
<td>$357,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROGRAM REVENUE (cont.)</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Years 4-n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive returned to program</td>
<td>$11,250</td>
<td>$22,500</td>
<td>$30,000</td>
<td>$41,250</td>
</tr>
<tr>
<td>Total annual revenue</td>
<td>$154,050</td>
<td>$329,520</td>
<td>$387,000</td>
<td>$398,250</td>
</tr>
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</table>
### PROGRAM EXPENSES

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Michigan Tech Faculty</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary ($80,000 x 1.4)</td>
<td>$112,000</td>
<td>$112,000</td>
<td>$112,000</td>
<td>$112,000</td>
</tr>
<tr>
<td><strong>MGH Faculty</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary ($65,000 x 1.4)</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
</tr>
<tr>
<td><strong>Total salaries</strong></td>
<td>$196,001</td>
<td>$196,001</td>
<td>$196,001</td>
<td>$196,001</td>
</tr>
<tr>
<td><strong>Journals (5% annual increase)</strong></td>
<td>$5,350</td>
<td>$5,618</td>
<td>$5,899</td>
<td>$6,194</td>
</tr>
<tr>
<td><strong>Graduate Assistantships ($20k/year)</strong></td>
<td>$40,000</td>
<td>$40,000</td>
<td>$60,000</td>
<td>$60,000</td>
</tr>
<tr>
<td><strong>Computer equipment ($5k/year towards replacement)</strong></td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td><strong>Total non-salary</strong></td>
<td>$50,350</td>
<td>$50,618</td>
<td>$70,899</td>
<td>$71,194</td>
</tr>
<tr>
<td><strong>Total annual expenses</strong></td>
<td>$246,351</td>
<td>$246,619</td>
<td>$266,900</td>
<td>$267,195</td>
</tr>
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</table>

### REVENUE – EXPENSES

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>82,901</th>
<th>$120,100</th>
<th>$131,055</th>
</tr>
</thead>
</table>

**One-time startup costs:**

<table>
<thead>
<tr>
<th>_attack</th>
<th>10,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library and Monographs</td>
<td>$ 3,000</td>
</tr>
<tr>
<td>Online Infrastructure</td>
<td>$ 50,000</td>
</tr>
<tr>
<td>Computer Equipment</td>
<td>$ 20,000</td>
</tr>
<tr>
<td>Graduate Computer Research/Course Lab</td>
<td>$215,000</td>
</tr>
</tbody>
</table>

**Total One Time Costs:** $298,000

**Potential Department of Labor (DoL) Grant Funding**

**Submitted October 6, 2009**

| Funding 2010 | $198,350 |
| Funding 2011 | $ 20,000 |
| Funding 2012 | $ 80,000 |

**Projected DoL Funding** $298,350

### XI. Space
Graduate Research/Course Lab (funding specifics listed above)

### XII. Accreditation
Not applicable

### XIII. Planned Implementation
This program would begin offering courses fall semester 2010.
XIV. Admission Criteria:

This graduate program is open to excellent candidates who hold a Bachelors degree with sufficient technical and health-related exposure to information technology as preparation for the core technology courses.

Recommended scores are as follows:

GRE General Test – combined score of 1200
TOEFL Test: 550 (For International applicants only).

These scores serve as general guidelines for admission. The Admissions Committee, in making its final decision, will consider the combination of professional knowledge, academic excellence, letters of recommendation, and the Statement of Purpose, as well as, GRE and TOEFL scores of the applicant.

XV. SMI Graduate Faculty Workload and Assignments:

Faculty Work Load with Graduate Program

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UG</td>
<td>GR</td>
</tr>
<tr>
<td>Cai, Yu</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gao, Chunming</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Hembroff, Guy</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ma, Liran</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Miller, Danny (lecturer)</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Wang, Xinli</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lecturer</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>New hire (MTU)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>New hire (MGHS)</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Faculty Work Load</th>
<th>UG</th>
<th>GR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

Faculty Graduate Course Assignments

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cai, Yu</td>
<td>TSMI 5251</td>
<td>TSMI 5221</td>
</tr>
<tr>
<td>Gao, Chunming</td>
<td>--------------</td>
<td>TSMI 5161</td>
</tr>
<tr>
<td>Hembroff, Guy</td>
<td>TSMI 5151</td>
<td>TSMI 5141</td>
</tr>
<tr>
<td>Ma, Liran</td>
<td>TSMI 5231</td>
<td>TSMI 5251</td>
</tr>
<tr>
<td>Wang, Xinli</td>
<td>TSMI 5211</td>
<td>---------------</td>
</tr>
<tr>
<td>New hire (MTU)</td>
<td>TSMI 5281</td>
<td>TSMI 5261</td>
</tr>
<tr>
<td>New hire (MGHS) -1st course</td>
<td>TSMI 5111</td>
<td>TSMI 5121</td>
</tr>
<tr>
<td>MGHS Faculty - 2nd Course</td>
<td>TSMI 5131</td>
<td>TSMI 5271</td>
</tr>
</tbody>
</table>
XVI. Security and Medical Informatics Course Sequence Flow Chart:

Masters of Science: Security and Medical Informatics
Recommended Course Sequence

<table>
<thead>
<tr>
<th>Course</th>
<th>Instruction on MTU campus</th>
<th>Instruction on MGHS campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSMI 5111</td>
<td>Sec. &amp; Priv. (2)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5121</td>
<td>The Healthcare System (2)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5131</td>
<td>System, Analysis and Design (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5141</td>
<td>EHRs and e-Health Implementation (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5151</td>
<td>App. Integration and Interoperability (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5161</td>
<td>Database Management and Security (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5211</td>
<td>Java Security (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5221</td>
<td>Statistical Methods for Intrusion Detection (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5241</td>
<td>Designing Security Systems (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5251</td>
<td>Advanced Topics in Network Security (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5261</td>
<td>Health Informatics Decision and Support (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5271</td>
<td>HIPAA Implications Public Health (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5281</td>
<td>Healthcare Security Management (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5999</td>
<td>Master's Research (3)</td>
<td></td>
</tr>
<tr>
<td>TSMI 5999</td>
<td>Master's Research (3)</td>
<td></td>
</tr>
</tbody>
</table>

Fall 1 (9-11)
Spring 1 (9-11)
Fall 2 (9-12)
Spring 2 (9-12)
Required Total 33

Color Reference Chart:
- Course Instruction on MTU campus
- Course Instruction on MGHS campus
General Questions and Concerns

1. Is the development of graduate programs part of the strategic plan for the School of Technology?

2. There is concern about the replication of B.S. programs between Schools and Colleges, such as

   | Mechanical Eng. Tech.         | Mechanical Eng. | (COE) |

3. What can MTU do to distinguish these programs from one another for its students?

4. It is generally not healthy for a research university to start graduate programs based on the background of the university's own graduates.

Proposal-Specific Comments

1. Medical “informatics” is an area of growing importance. MTU should address this need under appropriate circumstances.

2. The term “informatics” in the title may be inappropriate. It usually suggests using large data sets to do science, such as analyzing images or studying genomes. The proposed curriculum does not include courses in data mining, image analysis, sequence matching, etc. The proposed program focuses on the secure management of medical data. A more accurate title might be MS Program in Medical Database Security and Management.

   expected to have.

3. It is not clear whether a particular MS plan (A, B, ...) will predominate. For example, is this intended as a coursework-only MS or a research MS?

4. There is possible duplication of courses with other programs. (See other side.)

5. None of the proposed courses have prerequisites other than graduate standing.

6. The proposal does not mention any acceptable courses outside the School of Technology. (The Johns Hopkins program accepts course from engineering, business, computer science, and applied physics.)

7. Anecdotal information suggests that the School of Technology is very short of instructional resources. Can a quality program be started under these conditions?

8. No information is provided about the Marquette General staff that will be associated with the proposed program.
Examples of TSMI courses similar to other MTU courses

**TSMI 5131 System Analysis and Design**
Provides in-depth knowledge of tools that are available to perform systems analysis, examines the key factors to be considered in a systems design, emphasizes the importance of communication through both of these processes, and an understanding of the primary factors in measuring the benefits of systems implementation. Course will also examine strategies and key factors in purchasing systems. This includes analysis of opportunities and risk of integrating single vendor, hybrid, and other factors when examining system acquisition.
Credits: 3.0 Lec-Rec-Lab: (3-0-0)
Semesters Offered: Fall
Restrictions: Must be enrolled in one of the following Levels: Graduate

**BA 3220 - Systems Analysis and Design**
Provides an understanding of the IS development and modification process and the evaluation choices of a system development methodology. Emphasizes effective communication with users and team members and others associated with the development and maintenance of the information system. Stresses analysis and logical design of departmental-level information system.
Credits: 3.0
Lec-Rec-Lab: (0-3-0)
Semesters Offered: Spring
Pre-Requisite(s): BA 3200(C)

**TSMI 5221 Protocols and Systems for Internet and Web Security**
Course focuses on the most widely used systems and protocols for security on the Internet and on the Web. The Internet refers to the infrastructure or the underlying protocols and routing. The Web describes applications that run on the Internet. Detailed focus is on browsers, web servers, and communication protocols on the Internet, as well as how to deal with viruses and distributed denial of service attacks. Some of the protocols/systems covered in detail are TCP/IP, SSUTLS, IPsec, SSH, PGP, firewalls, IDS systems, and Kerberos.
Credits: 3.0 Lec-Rec-Lab: (2-0-1)
Semesters Offered: Spring
Restrictions: Must be enrolled in one of the following Levels: Graduate

**SAT 3812 - Network Security Engineering I**
Planning and managing system security in a TCP/IP converged enterprise network environment. Topics include security architecture, attack methods and counter-measures, patch management, performance monitoring, security management tools, best practices, policy management, virus scanning, security protocols, intrusion detection, firewalls, and SSL/TLS.
Credits: 3.0
Lec-Rec-Lab: (0-2-2)
Semesters Offered: Fall
Pre-Requisite(s): SAT 2511 and SAT 2711
Title of Proposed Program: Security and Medical Informatics

Well-documented definitions of Medical Informatics:
Allan H. Levy, 1977 - "...dealing with the problems associated with information, its acquisition, analysis, and dissemination in health care delivery processes." (1)

Morris F. Collen, 1977 - "Medical informatics is the application of computer technology to all fields of medicine - medical care, medical teaching, and medical research." (2)

Jan van Bemmel, 1984 - "Medical informatics comprises the theoretical and practical aspects of information processing and communication, based on knowledge and experience derived from processes in medical and health care." (3)

Jack D. Myers, 1986 - "...a developing body of knowledge and set of techniques concerning the organization and management of information in support of medical research, education, and patient care." (4)

Donald A.B. Lindberg, 1987 - "Medical informatics attempts to provide the theoretical and scientific basis for the application of computer and automated information systems to biomedicine and health affairs . . . medical informatics studies biomedical information, data, and knowledge - their storage, retrieval, and optimal use for problem-solving and decision-making. (5)

M.S. Blois and Edward H. Shortliffe, 1990 - "Medical informatics is the rapidly developing scientific field that deals with the storage, retrieval, and optimal use of biomedical information, data, and knowledge for problem solving and decision making." (6)

British Medical Informatics Society - "...the understanding, skills, and tools that enable the sharing and use of information to deliver healthcare and promote health" and "...the name of an academic discipline developed and pursued over the past decades by a world-wide scientific community engaged in advancing and teaching knowledge about the application of information and technologies to healthcare - the place where health, information and computer sciences, psychology, epidemiology, and engineering intersect. (7)

AMIA Education Committee - "The discipline that studies and applies information management and science in the context of biomedicine and health."

References:

(2) Preliminary announcement for the Third World Conference on Medical Informatics, MEDINFO 80, 1977.


Current Research Articles from Journal of the American Medical Informatics Association
The following is a list of selected articles that have been published in the latest Journal of the American Medical Informatics Association (January 2010 volume 17 issue 1).

Article from Perspectives on Informatics Section:
- Developing data content specification for the Nationwide Health Information Network Trial, Implementations

Articles from The Practices of Informatics Section:
- Improving newborn screening laboratory test ordering and result reporting using health information exchange
- MedEx: a medication information extraction system for clinical narratives
- Computerized clinical decision support for prescribing: provision does not guarantee uptake
- Development of an electronic public health case report using HL7 v2.5 to meet public health needs

Articles from Original Investigations Section:
- Quantifying clinical narrative redundancy in an electronic health record
- Openness of patients’ reporting with use of electronic records: psychiatric clinicians’ views
- The impact of computerized provider order entry on medication errors in a multispecialty group practice
GRADUATE SCHOOL | Graduate Faculty Council—Draft Agenda

January 19, 2009

NOTE: All links connect to a single pdf file

1. Review minutes of 12/01/2009

2. Old Business
   a. Graduate Certificates Proposal (B. Keen)
   b. Graduate Certificate for International Profile Proposal (B. Orr, W. Rose)
   c. Committee Reports:
      - Graduate Program Review (Dean Huntoon)
      - Dismissal/Appeal/Grievance Policy (Dean Huntoon)

3. New Business
   a. Masters Program Security and Medical Informatics (G. Hembroff)
   b. Proposal to Modify the "Senior Rule" Policy (N. Byers Sprague)
   c. Proposal for a Geophysics PhD Program