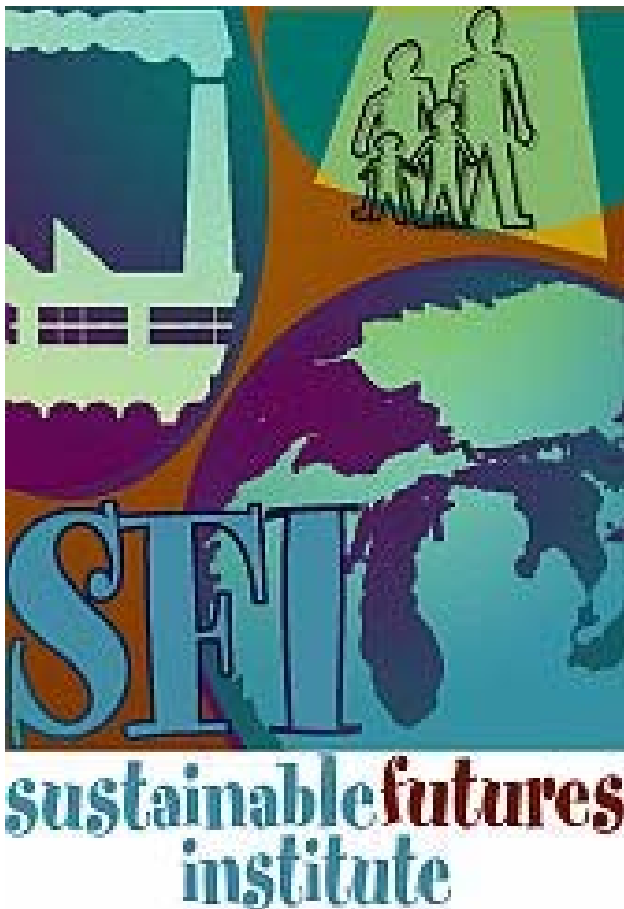


MichiganTech

PROSPECTUS

Sustainable Futures Institute



Benefits of Industry Participation

- Obtain solutions to technical problems
- Leverage corporate funding with government/university resources
- Establish network for valuable, diverse future employees
- Promote corporate visibility
- Stimulate innovation and improve competitiveness
- Generate corporate intellectual property through modest investment
- Enhance reputation as a good corporate citizen

www.sfi.mtu.edu

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SFI Purpose

The Sustainable Futures Institute (SFI) was established at Michigan Technological University in January 2004 to serve as an incubator for research, education, and outreach efforts related to sustainability. SFI focuses on the triple bottom line: industrial/ economic, environmental, and societal sustainability – this focus is provided by the Sustainable Futures Model.

SFI is also working to enhance classroom and workplace diversity by partnering with Michigan Tech's Office of Educational

Opportunity and Southern University and A&M College (Baton Rouge, LA).

The SFI acts as a vehicle for bringing industry challenges to the university community and facilitating collaborative responses to company needs. By undertaking mutually beneficial partnerships with industry, solutions to tomorrow's sustainability challenges are being identified.

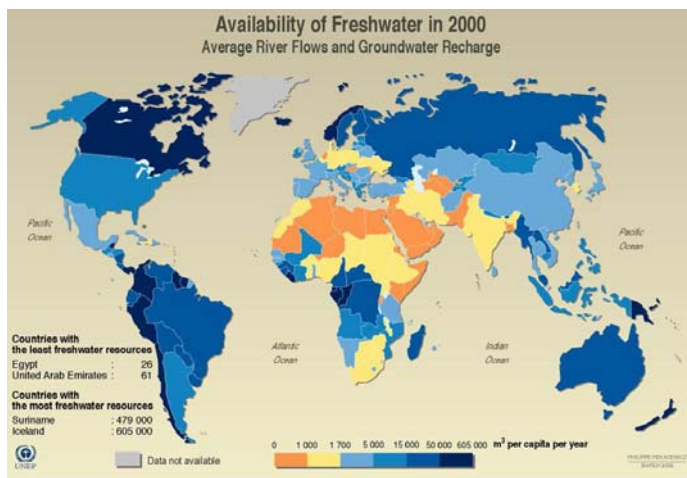
SFI Mission:

The mission of SFI is to create and disseminate new tools, methods, knowledge, and technologies that promote, enable, and support environmental, economic, and societal sustainability principles.



SFI's View of Sustainability

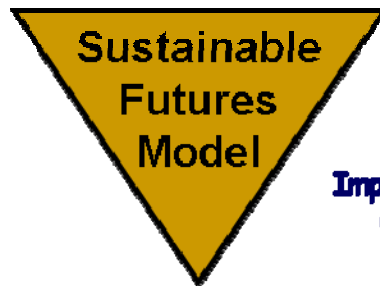
Definition of Sustainable Development: The design and use of human and industrial systems to ensure that humankind's use of natural resources and cycles do not lead to diminished quality of life due either to losses in future economic opportunities or to adverse impacts on social conditions, human health and the environment.



Economic/Industrial Sustainability

Productivity
Technological Growth
Profit and Employment

Eco-efficient manufacturing
Clean manufacturing
Design for environment
Product end-of-life



Environmental Sustainability

Human health
Ecosystem health
Biodiversity
Natural resources

Fate and transport mechanisms
Impact modeling & risk assessment
Geographic information systems
Sustainability metrics

Societal Sustainability

Informed citizenry
Stakeholder participation
Social justice, Equity

Risk communication
Public policy
Knowledge diffusion
Land use planning

SFI Emphasis and Structure

SFI Areas of Expertise. The SFI is undertaking research projects, educational offerings, and outreach activities in the following broad areas:

- Manufacturing / Chemical Processing
- Products / Life Cycle Considerations
- Public Policy / Societal Issues
- Environmental Systems
- Materials and Energy
- Integrated Sustainable Systems

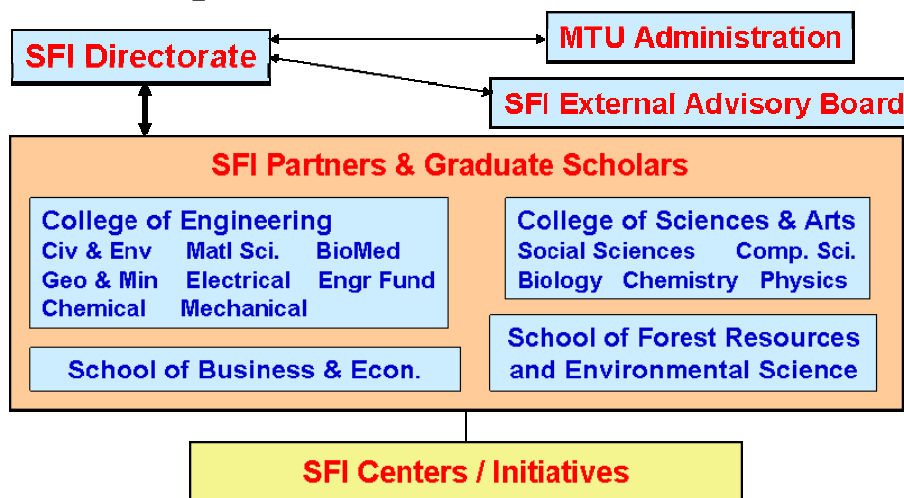
SFI Organizational Structure. The SFI builds upon the efforts of a variety of Centers and Initiatives, as described on the facing page. An SFI organizational structure (see chart below) has been established to:

- Coordinate the activities of focused Centers, faculty, undergraduate, & graduate students
- Provide a single point of contact for industry interactions related to sustainability
- Cultivate continuing growth of educational offerings related to sustainability
- Serve as a catalyst for development of interdisciplinary proposals
- Promote the diffusion of unbiased knowledge to all stakeholders

Education and Outreach. The SFI is working to make science relevant to the citizenry so that informed decisions can be made. Education (K-Gray) and technology transfer are key elements toward attaining this goal.

Educational initiatives include development of a middle school curriculum for energy and sustainability, incorporation of sustainability issues into summer pre-college programs, creation of numerous interdisciplinary courses, management of several graduate programs with a focus on international sustainable development, and establishment of a Graduate Certificate in Sustainability that recognizes curricular breadth in the areas of environmental, industrial, and societal systems. Outreach programs include assisting local governments on sustainable land use issues, advising diverse stakeholders in the Lake Superior Watershed, and assisting development of a set of sustainability indicators for the Great Lakes.

Organizational Structure



SFI Sponsors: Established in 2003, the SFI already involves millions of dollars in projects, with representative sources of support including numerous companies, the National Science Foundation, the U.S. Environmental Protection Agency, the U.S. Department of Energy, the Wege Foundation, the Dunn Foundation, the Americana Foundation, and the State of Michigan.

Examples of SFI Centers and Initiatives

Sustainable Futures IGERT: The overall goal of this program is to enhance doctoral education by integrating the disciplines of green engineering and social sciences to produce professionals who can serve as catalysts for achieving future environmental, industrial, and societal sustainability. The project is supported with an initial 3.6-million dollar grant from the National Science Foundation and partners include Southern University's College of Engineering and Nelson Mandela School of Public Policy and Urban Affairs.

Sustainable Manufacturing Center:

Faculty members and research teams in the Departments of Chemical, Environmental, and Mechanical Engineering research sustainable manufacturing practices. Areas of expertise include environmentally-conscious design of chemical processes, eco-efficiency, reducing manufacturing wastewater, life cycle analysis/assessment, lean manufacturing, manufacturing and indoor air quality, WEEE and RoHS directives, product end-of-life, and supply chain issues.

Center for Science and Environmental Outreach:

The Center for Science and Environmental Outreach is a team of professionals and volunteers who provide educational programs, technical expertise, and information to schools, organizations, governments, and individuals to promote awareness and informed personal actions and public policy concerning regional environmental issues. The Center has partnered with local school districts to form the Western Upper Peninsula Center for Science, Mathematics, and Environmental Education and is also developing several middle school curriculums for the State of Michigan's Department of Environmental Quality that are related to water quality, energy, and sustainability. The Developing Sustainability Committee of the Lake Superior Work Group, part of the Binational Program to Restore and Protect the Lake Superior Basin recently collaborated with the Center on a project to develop baseline data for a set of socioeconomic sustainability indicators.

Water Initiative: Faculty members and staff from the School of Forestry and Environmental Science and the Departments of Geological Engineering & Sciences, Civil & Environmental Engineering, Biological Sciences, Chemistry, and Social Sciences have recently formed an educational and research initiative devoted to aquatic science and development of sustainable engineered solutions

related to the water management, treatment and restoration. Areas of expertise include aquatic sciences and ecology, remote sensing, watershed management and restoration, water reuse, water and wastewater treatment, reservoir management, and issues related to global water conflict. Support comes from the university's Remote Sensing Institute and access to the university's research and education vessel, the 36-foot R/V Agassiz.

Renewable Energy Initiative: Individuals in the Chemical and Materials Engineering Departments are researching nanostructured materials to enhance development of hydrogen fuel cells. The Fuel Cells and Alternative Fuels Enterprise, a student research group, works on two projects annually for submittal to national conferences and competitions (Chem-E-Car and the MULE). The Electrical Engineering Department faculty mainly research energy conversion and power systems with a recent focus on wind power and other alternative forms of energy generation. Faculty and students in the Social Science Department explore the social acceptance of alternative energy forms through the Environmental Policy Program.

Sustainable Forestry Center: The Ford Forestry Center and Research Forest (Alberta, MI) is located in the heart of the Great Lakes ecosystem. Only forty scenic miles from the Michigan Tech campus, the Center is a 4,547 acre facility for research and education pursuant to the overall mission of the School of Forest Resources and Environmental Science. A modern dormitory and related facility provide year-round housing capability for 94 people. A dining hall, four classrooms, a large conference/meeting room, and office buildings provide support facilities.

Global Environmental Sustainability Initiative: Through several partnerships with U.S. Peace Corps, over 50 graduates students now work on international sustainable development projects as part of graduate programs in Environmental Engineering, Civil Engineering, Geological Engineering, Geology, and Forestry. These programs allow students to spend over two years overseas studying and incorporating the social and economic limitations of the developing world into their research and professional development. In addition, several undergraduate senior design engineering projects, an engineering enterprise, and specific exchange programs allow students to work on sustainable development projects outside the U.S.

SFI Faculty and Staff

John W. Sutherland, Ph.D., University of Illinois
SFI Director and Henes Chair Prof. of Mechanical Engineering
Environmentally responsible design/manufacturing, quality and applied statistics, industrial/production engineering.

James R. Mihelcic, Ph.D., Carnegie Mellon University
SFI Director and Prof. of Civil and Environmental Engineering
Director, Master's International Program in Civil & Env. Engrg.
Sustainability, industrial ecology, biological processes, application of appropriate technology in developing world.

David R. Shonnard, Ph.D., University of California-Davis
Associate Professor of Chemical Engineering
Chemical process design and optimization/environmental impact assessment; bio-based processes for fuels & chemical production, green engineering education.

Examples of additional SFI Faculty and Staff Participation. Listed by area: 1) Educational Opportunity; 2) Education/Outreach; 3) Manufacturing/Chemical Processing; 4) Public Policy/Societal Systems; 5) Business/Economics; 6) Materials/Energy; 7) Environmental Systems; 8) Computer Science/Engineering

1) Educational Opportunity

Chris Anderson

Executive Director of Educational Opportunity and Special Assistant to the President for Institutional Diversity

Develop partnerships with minority students serving institutions. Facilitate diverse participation via departmental links to a number of national minority and women's STEM organizations.

John Lehman

Coordinator of Youth Programs, Dept. of Educational Opportunity
Youth programs involving a diverse pool of students.

Shalini Suryanarayana

Associate Director, Director of Special Academic Programs and Undergraduate Research Programs in Dept. of Educational Opportunity and Co-chair of Campus Sustainability Initiative
Pre-college youth programs, undergraduate research, campus diversity, and the national student exchange.

2) Education/Outreach

Sheryl A. Sorby, Ph.D., Michigan Technological University
Professor of Civil and Environmental Engineering, Associate Dean for Academic Programs of the College of Engineering
Innovative education methods and spatial visualization.

Joan Chadde

Education Programs Coord., Ctr. for Sci. and Environ. Outreach
K-12 curriculum development and teacher professional development; coordinate after-school programs, family science nights, and field trips;

Kristine Bradof

Community Programs Coord., Ctr. for Sci. and Environ. Outreach
Societal sustainability indicators for the Great Lakes basin, research and outreach involving drinking water quality, land-use planning, sustainability indicators, eco-cultural tourism.

3) Manufacturing/Chemical Processing and Products/Life Cycle Considerations

Burhanettin Altan, Ph.D., Istanbul Technical University
Research Associate Professor of Mechanical Engineering - Engineering Mechanics
Micro-mechanical properties and testing.

Bruce A. Barna, Ph.D., New Mexico State University

Professor of Chemical Engineering
Development of decision support tools to evaluate economic and environmental sustainability simultaneously.

Bernhard Bettig, Ph.D., Arizona State University

Assistant Professor of Mechanical Engrg.-Engrg. Mechanics

Feature modeling in design and manufacturability analysis; geometric reasoning/artificial intelligence in design and manufacturing.

Roshan M. D'Souza, Ph.D., Univ. of California, Berkeley
Assistant Professor of Mechanical Engrg.-Engrg. Mechanics
Manufacturing planning and cost efficient manufacturing involving computer aided design (CAD).

William J. Endres, Ph.D., University of Illinois
Associate Professor of Mechanical Engrg.-Engrg. Mechanics
Machining dynamics, cutting mechanics, manufacturing processes, innovative tooling development, product/process architecture alignment

John K. Gershenson, Ph.D., University of Idaho
Associate Professor of Mechanical Engrg.-Engrg. Mechanics
Life cycle engineering, design for the environment, product and process architecture alignment.

Richard E. Gertsch, Ph.D., University of Missouri-Rolla
Assistant Professor of Mining Engineering
Mining process integration and optimization, zero environmental impact mining and resource recovery.

Joseph H. Holles, Ph.D., University of Virginia
Assistant Professor of Chemical Engineering
Nanoscale materials design and synthesis for catalytic applications.

Jason M. Keith, Ph.D., University of Notre Dame
Assistant Professor of Chemical Engineering
Heat and mass transfer fundamentals, chemical reactor analysis, fuel cells, and controlled release drug delivery.

Julia A. King, Ph.D., University of Wyoming
Associate Professor of Chemical Engineering
Polymers and composite materials focusing on thermally and electrically conductive polymer resins, adhesion, fuel cells.

Donald L. Kreher, Ph.D., University of Nebraska-Lincoln
Professor of Mathematical Sciences
Combinatorial mathematics and application to multidimensional representations of chemical structure.

Donna J. Michalek, Ph.D., University of Texas-Arlington
Associate Professor of Mechanical Engrg.-Engrg. Mechanics
Industrial air quality, computational fluid dynamics, energy systems, public policy, engineering education.

Michael E. Mullins, Ph.D., University of Rochester
Professor and Chair of Chemical Engineering
Environmental thermodynamics and kinetics and ceramics, particles, and engineered nanostructures.

Tony N. Rogers, Ph.D., Michigan Technological University
Associate Professor of Chemical Engineering
Environmental thermodynamics and physical property estimation based on chemical structure, green engineering, plant design, fuel cells.

Thomas J. Van Dam, Ph.D., University of Illinois
Associate Professor of Civil and Environmental Engineering
Pavement materials and design, concrete, sustainable materials for transportation and construction.

4) Public Policy/Societal Systems

Mary H. Durfee, Ph.D., Cornell University
Associate Professor of Political Science, Dept. of Social Sciences
Water policy and pollution prevention, international law, US foreign policy, and international environmental technology policy.
Hugh S. Gorman, Ph.D., Carnegie Mellon University
Associate Professor of Environ. Hist. & Policy, Social Sciences Dept.
Relationship between environmental regulations, industrial practices, and technological, socially defined environmental objectives.

Kathleen E. Halvorsen, Ph.D., University of Washington
Associate Professor of Social Sci. and Forest Res. & Environ. Sci.

Public participation in the policy making process and issues related to private residential land ownership.

Barry D. Solomon, Ph.D., Indiana University
Professor of Geography and Environ. Policy, Social Sciences Dept.
Ecological economics/market incentives/air pollution, energy efficiency, renewable energy sources, industrial ecology, ecolabeling.

5) Business/Economics

Anil B. Jambekar, Ph.D., Washington University-St. Louis
Professor of Operations Mangt., School of Business and Economics
Systems thinking and dynamic modeling.

Dana M. Johnson, Ph.D., Wayne State University
Assistant Professor of Operations Mangt., Sch. of Business & Econ.
Operations management, lean manufacturing, quality engineering and management, environmental management systems (ISO-14000).

Christa L. Walck, Ph.D., Harvard University
Professor of Organizational Behavior, Sch. of Business & Econ.
Interactions between organizations and the natural environment, integrating sustainability concepts into management systems.

Mark C. Roberts, Ph.D., University of Arizona
Professor of Mineral Economics, Sch. of Business & Econ.
Natural resources and mineral economics.

Gary A. Campbell, Ph.D., Pennsylvania State University
Professor of Mineral Economics, Sch. of Business & Econ.
Natural resources and mineral economics.

6) Materials and Energy

Leonard J. Bohmann, Ph.D., University of Wisconsin
Associate Professor of Electrical and Computer Engineering
Electric power systems including electric energy, wind, PV, fuel cells, micro-hydro, integration into the electric grid.

Stephen Hackney, Ph.D., University of Virginia
Professor of Materials Science and Engineering
Nanomaterials, PEM fuel cell operation; electrochemistry; and commercial production methods.

S. Komar Kawatra, Ph.D., University of Queensland, Australia
Professor of Chemical Engineering
Instrumentation for monitoring and control of chemical and particulate process plants, treatment/remediation of chemical and industrial wastes.

Marvin G. McKimpson, Ph.D., Ohio State University
Program Manager, Institute of Materials Processing
Materials technologies for more sustainable energy production.

Peter D. Moran, Ph.D., University of Wisconsin
Assistant Professor of Materials Science and Engrg. and Physics
Fabrication, characterization, and properties of nanoscale layered structures, integration of dissimilar materials, and sustainable energy.

7) Environmental Systems

Susan T. Bagley, Ph.D., Oregon State University
Professor of Biological Sciences
Environmental microbiology, toxicology, health-related microorganisms associated with air pollutants, carbon cycling in boreal systems.

Brian D. Barkdoll, Ph.D., University of Iowa
Associate Professor of Civil and Environmental Engineering
Water resources, dam decommissioning, stream rehabilitation, environmental hydraulics, sediment transport, sustainable water use.

David J. Flaspohler, Ph.D., University of Wisconsin
Assistant Professor of Forest Resources and Environmental Science
Conservation biology, avian ecology, and community and population ecology.

John S. Gierke, Ph.D., Michigan Technological University
Associate Professor of Geological & Environmental Engineering
Subsurface remediation, watershed characterization and hydrologic modeling.

David W. Hand, Ph.D., Michigan Technological University
Professor of Civil and Environmental Engineering
Physical and chemical processes for the recovery, removal, or destruction of organic compounds from air and water streams in industrial processes and the environment, water reuse.

Richard E. Honrath, Ph.D., University of Alaska-Fairbanks
Professor of Civil and Environmental Engineering
Global and regional atmospheric impacts of anthropogenic pollutants, especially in remote regions.

Casey J. Huckins, Ph.D., Michigan State University
Assistant Professor of Biological Sciences
Community ecology, species interactions and environmental conditions that influence distribution and abundance of organisms.

Jacqueline E. Huntoon, Ph.D., Pennsylvania State University
Associate Professor of Geological Engineering and Sciences
Thermal modeling of sedimentary basins, sediment transport, petroleum geology, sustainability educational initiatives.

Neil J. Hutzler, Ph.D., University of Wisconsin
Professor of Civil and Environmental Engineering, and Director of the Center for Science and Environmental Outreach
Industrial ecology and ground water quality modeling.

Ann L. Maclean, Ph.D., University of Wisconsin
Associate Professor of Remote Sensing/GIS, School of Forest Resources and Environmental Science
GIS, remote sensing and spatial analysis, land use planning.

Alex S. Mayer, Ph.D., University of North Carolina
Professor of Geological and Environmental Engineering
Groundwater flow and transport, sustainability of water resources at local, regional, and international scales, modeling of earth systems.

Kurtis G. Paterson, Ph.D., University of Iowa
Assistant Professor of Civil and Environmental Engineering
Urban air quality, specifically estimating source contributions, air quality in indoor environments, education initiatives.

David W. Watkins, Ph.D., University of Texas
Assistant Professor of Civil and Environmental Engineering
Application of decision theory/information technology to water resource problems characterized by uncertainty and conflicting objectives.

Christopher R. Webster, Ph.D., University of Wisconsin
Assistant Professor of Quantitative Ecology and Forest Management, Sch. of Forest Resources and Environmental Science
Sustainable forestry, silviculture for non-timber outcomes, impacts and control of invasive plant species.

Qiong Jane Zhang, Ph.D., Michigan Technological University
Postdoctoral Researcher of Civil and Environmental Engineering
Risk assessment, environmental multimedia fate modeling, industrial ecology, life cycle assessment.

8) Computer Science and Engineering

Phillip R. Merkey, Ph.D., University of Illinois
Assistant Professor of Mathematical Sci. and Computer Science, Director of the Computational Sci. and Engrg. Research Institute
Distributed and high-performance computing.

Nilufer Onder, Ph.D., University of Pittsburgh
Assistant Professor of Computer Science
Artificial intelligence involving plan generation, conditional planning, and decision theoretic planning.

Steven R. Seidel, Ph.D., University of Iowa
Associate Professor of Computer Science
Parallel computing, interprocessor communication algorithms.

Charles Wallace, Ph.D., University of Michigan
Assistant Professor of Computer Science
Software engineering, development of large-scale software systems, computational modeling of environmental phenomena.

About Michigan Tech

MTU is a public university that was founded in 1885 and has nearly 6600 students and 400 faculty with annual research expenditures of more than \$30M. The graduate student population was 880 in Fall 2003 (400 PhD and 480 Masters). MTU has one of the largest colleges of engineering in the U.S., with its Departments each among the top ten in the country in terms of enrollment. MTU is located in Houghton, Michigan, which lies in the heart of Upper Michigan's scenic Keweenaw Peninsula. The campus overlooks Portage Lake and is just a few miles from Lake Superior. The area's expansive waters and forests, including the University's 600-acre forest adjoining campus, offer students an unparalleled opportunity for outdoor recreation.



Facts and Figures

- Ranked one of the top 10 technological universities (*Money Magazine*)
- Ranked one of the 50 best public universities (*U.S. News and World Report*)
- Nationally ranked engineering graduate programs (*U.S. News and World Report*):
 - e.g., Environmental Engineering; Mechanical Engineering; Materials Engineering; and Civil Engineering
- Houghton is rated the safest college town in Michigan and the eighth-safest in the nation (*Crime at College: The Student Guide to Personal Safety*)
- Ranked one of the nation's top-ten summer sports meccas (*National Geographic Adventure Magazine*) and one of the top-ten best places in the country to live (*Men's Magazine*)



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