

**INTERDISCIPLINARY RESEARCH AND EDUCATION
UNIVERSITY OF MINNESOTA**

Background

The University of Minnesota is becoming one of the top three public research universities in the world. This ambitious agenda will require the highest level of collaboration and communication between those with responsibility for research and education, particularly interdisciplinary research and education.

The University of Minnesota's strategic positioning report (February 2005) lays out the complex interrelationships between research and education in the following set of strategies:

The University should continually aim to: create and nurture world-class research and information centers; function as an academic and economic talent magnet; support a diversity of ideas and communities; strategically align resources with intellectual and academic goals; serve as a catalyst for economic and cultural growth in Minnesota; and improve the quality of life for Minnesotans.

When we consider the characteristics of a world-class public research university, we include: serving the public good through nationally and internationally recognized research, teaching, and engagement; producing the next generation of national and international leaders in the sciences and social sciences, the arts and humanities, and the professions; integrating research, teaching, and outreach, including across disciplines and among the professions; encouraging diversity of ideas and academic freedom and actively creating a diverse community of faculty, students, and staff; renewing itself regularly to ensure that it continues to be responsive to the most compelling intellectual and social issues.

Of central importance to our status as a world-class public research university is the offering of exceptional graduate and professional programs and a distinguished, challenging undergraduate education focusing on those areas where students can experience teaching and research of national and international quality. Our incoming students should be intellectually curious, ambitious, motivated to learn, prepared to achieve in a challenging academic environment, and expect to graduate in a timely fashion. Our graduates should be able to research and evaluate information, think critically, solve problems, master knowledge, communicate effectively both orally and through written expression, understand research methodologies, understand the roots of civilization in order to function effectively as a global citizen in a continually transforming global society, and be prepared to become engaged citizens and life-long learners.

Strategic Investment in Interdisciplinary Research and Education

Interdisciplinary research, education, and outreach are not new to the University of Minnesota. The University has more than 300 interdisciplinary programs, centers, and majors. During his term as President, Mark Yudof identified six interdisciplinary priorities: agriculture, molecular and cellular biology, design, digital technology, new media studies, and continued attention to undergraduate education. Since 2003, the University has encouraged collaboration through the President's Interdisciplinary Initiatives, the President's 21st Century Interdisciplinary Conference Series, and incentives to colleges to develop the highest level of interdisciplinary and cross college initiatives. In every case these interdisciplinary activities developed from existing areas of strength and collaboration and were identified and nurtured through the budget compact process and ongoing assessment of the University's programs. The future will require more ambitious goals and sophisticated strategies for identifying, supporting, and sustaining the University's interdisciplinary endeavors and a flexible infrastructure that can respond to emerging needs with agility.

During the University's strategic positioning process, multiple task forces identified fostering interdisciplinary activity as a critical institutional priority. While continuing to channel resources to well-established disciplines with proven records of excellence, new attention must be brought to bear on emerging interdisciplinary fields that are promising sources of problem solving and knowledge creation; and the University of Minnesota must be poised to prepare its graduates in emerging fields of study. As a result, the University is sharpening its focus on interdisciplinary initiatives system-wide. In order to achieve the highest level of interdisciplinary work, the University will employ a number of strategies for success:

1) Central coordination and oversight of interdisciplinary research, education, and outreach

Fostering interdisciplinary activity requires coordination and collaboration across traditional administrative boundaries as well as academic silos. An important new collaborative strategy includes central leadership and system-wide coordination of interdisciplinary activities by the Provost's Interdisciplinary Team (Vice President for Research, Dean of the Graduate School and Vice Provost, Dean of Undergraduate Studies and Vice Provost, and Assistant Vice Provost) in consultation with the senior administration. The Provost's Interdisciplinary Team is developing a comprehensive plan for developing new interdisciplinary initiatives, supporting promising projects, and conducting rigorous assessment of both new and ongoing initiatives to ensure effective use of institutional resources. At the same time, the administration is committed to creating a culture that rewards outstanding interdisciplinary research, teaching, and outreach.

2) Interdisciplinary and Collaborative Research

The University of Minnesota will be known internationally for its innovation and excellence in collaborative research and scholarship and for the ease with which collaborations are established. This substantive and culturally supportive environment

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will attract highly talented investigators and team leaders from all over the world. This requires a new model which implements supportive policies and practices and an infrastructure with the necessary facilities, equipment, and resources to foster collaboration across disciplinary, college and institutional lines. Collaborative research will allow the University to: capitalize on the intellectual energy and synergy provided through these types of interactions; develop and provide national/international leadership in new fields; align with the increasing emphasis on these types of activities in major funding agencies and the increasing recognition of the complexity inherent in modern research.

3) Interdisciplinary Graduate Education

The University of Minnesota's leadership in fostering inquiry across disciplinary boundaries extends beyond the realm of research to include a wide array of academic and training programs. These education and training programs, particularly at the graduate level, prepare future faculty, as well as leaders in other sectors, to utilize the tools and methods of multiple disciplines to solve complex societal and intellectual problems. Indeed, these programs recognize that collaborative approaches to problem solving may be a critical competency for the creation and dissemination of knowledge in the 21st century. Training grants such as the National Science Foundation's IGERT (Integrative Graduate Education and Research Traineeship) support graduate students in science and engineering in the development of both deep knowledge of their chosen disciplines and collaborative research that transcends traditional disciplinary boundaries. The Graduate School supports the development of interdisciplinary education programs in areas of strength at the University of Minnesota, and provides matching funds that encourage faculty to apply for training grants that will support the implementation of best practices.

4) Interdisciplinary Undergraduate Education

Undergraduate education is inherently interdisciplinary as students explore a range of disciplines on the way to choosing a major or majors, and true interdisciplinary opportunities for undergraduates follow closely upon new developments in research and scholarship. Over the next year, the Provost's Interdisciplinary Team will explore new possibilities for undergraduate interdisciplinary research, seminars, and internship opportunities and work toward cutting edge opportunities for the University's undergraduate students.

5) Creating an Institutional Culture that Supports Interdisciplinarity

The traditional culture of the academy can present a number of barriers to interdisciplinary work. In order to ensure that interdisciplinary work can flourish at the University, the senior administration will work within the system of faculty governance to explore changes in institutional policies and practices needed to ensure that collaborative work is adequately valued, including a careful review of the tenure and promotion process. The Provost's Interdisciplinary Team will develop an interdisciplinary leadership development program and a Network of Interdisciplinary Initiatives to increase capacity in this area. In addition, the University will focus on recognition of collaborative as well as individual contributions to knowledge and incentives for faculty to participate in collaborative research and education.

6) Investment in Interdisciplinary Research, Education, and Training, and Outreach

The University of Minnesota currently has ten major interdisciplinary initiatives all of which have received investment from a central interdisciplinary pool of funds and a number of which have received state funds through biennial budget requests: the Institute for Advanced Study, Environment, Nanotechnology, Medical Devices, Law and Values, Neuroscience, Translational Research in Human Health, Healthy Foods/Healthy Lives, Children, Youth, and Families, and Biocatalysis. These initiatives are now assigned to senior officers for oversight, guidance, and evaluation.

The University will build on a tradition of focused investment in major interdisciplinary initiatives by several generations of University of Minnesota leadership at both the central and collegiate levels. The investment strategy will include substantial central investment with support from the state to position the University to address increasingly complex intellectual, scientific and social problems; incentives for cross-college collaboration as part of the budget compact process that guides central investments in the colleges; support for selected centers of interdisciplinary inquiry, such as the Institute for Advanced Study, which foster collaborative activity; and new investments to foster collaboration across the research, training, and graduate education functions.

New and Emerging Interdisciplinary Investments

Today's session will highlight four major interdisciplinary institutes: The Institute for Advanced Study, The Institute on the Environment, the Institute for the Advancement of Science and Technology, and the Institute for Translational Neuroscience.

Institute for Advanced Study

Ann Waltner, Director, Institute for Advanced Study

The Institute for Advanced Study (IAS) was established in Fall 2005 by the College of Liberal Arts and the Provost under the auspices of President Bruininks's Interdisciplinary Initiative on Arts and Humanities. An integrative venue for interdisciplinary collaboration, exploration, and scholarship, the IAS brings researchers from across the University into dialogue with one another. The Institute serves as an incubator of new ideas, a place where faculty, students, and community members take intellectual risks, challenge theoretical assumptions, integrate different forms of knowledge, and take on important questions aimed at reshaping our fundamental understandings of the human condition. It enables collaborative research and creative work among scholars, scientists, and artists at the University and in the broader community, and it provides opportunities for sharing that work with colleagues and the broader public. In these ways, the IAS endeavors to foster breakthrough discoveries that will enhance the frontiers of knowledge. The IAS also serves as the administrative home for two centers in the College of Liberal Arts, the Center for Jewish Studies and the Center for Medieval Studies. The IAS is also designated as the administrative home for the Humanities

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Institute, which has currently suspended operations. Humanities programming goes forward under IAS auspices.

The Institute's programming includes:

- **Research and Creative Collaboratives.** In academic year 2006-07, eleven research and creative collaboratives are funded. Each collaborative is given up to \$20,000 in funding and access to meeting space, with the expectation that the group would meet regularly throughout the semester and that their work will have some public component.
- **Thursdays at Four series.** These events involve faculty and invited speakers and performers from a wide range of fields, including music, art, Asian language and literatures, Jewish studies, history, English, anthropology, theater, film, Austrian studies, and ecology/evolution/behavior. Each Thursday at Four presentation offers a unique opportunity for engagement between presenter and audience.

University Symposium. The IAS developed the University Symposium, a new forum designed to explore a topic through a series of events held over the course of an academic year (or years). During the first year, the topic was "Politics of Populations"; this Symposium explored urgent concerns ranging from immigration policy to preparing for the next pandemic. The topic for the next two years is "Time" and will explore ways in which disciplinary boundaries and ways of thinking might be questioned and illuminated by alternative understandings of time.

- **Residential Fellows.** Each year, the Institute hosts up to 20 fellows from across the University in Nolte Center. Fellows are released from their teaching, and move into offices in Nolte Center to facilitate the formation of an intellectual community characterized by interdisciplinarity and collaboration.

Visiting Fellows. During 2005-06, the IAS hosted five faculty from New Orleans who had lost their homes and/or situations at their respective institutions. The IAS obtained funding from the University of Minnesota McKnight Arts and Humanities Endowment to fund two of the fellows in the spring semester. In 2006-07, the Institute is host to several fellows who have come with their own funding from institutions such as the University of Michigan, the University of Shiraz, and the Catholic University of Daegu in Korea.

- **Interdisciplinary Curriculum.** The IAS organized two courses associated with the first University Symposium and developed several courses associated with IAS events during Spring 2006 and Fall 2006 in collaboration with departments. Several more courses will be offered in Spring of 2007, which take advantage of Institute programming or high profile Institute visitors.

The IAS has been successful in fostering durable intellectual relationships. It was not at all clear in January that the first group of fellows, selected not on any criteria regarding coordination of projects but on the merits of their individual projects, would find discussions among the group rewarding or enlightening. Nevertheless, putting scholars from a wide variety of disciplines with a wide variety of interests into dialogue with one

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another was an important goal for the Institute. We began these dialogues during lunches held every other week, but soon the fellows requested the lunches be held weekly. These meetings provided an important site for the exchange of ideas, catalyzing several unexpected intellectual overlaps and some of the most durable relationships. Lunch discussions of individuals' projects were never dominated by just a few participants. Each person commented substantively on the work presented, frequently demonstrating connections to their own interests or interests of others in their field. The relationships and discussions begun over lunch frequently were fostered by the proximity of the fellows to one another in the offices on the second and third floor of Nolte Center. The IAS has been successful in establishing a reputation as a place and literally a space in which new ideas and conversations, new collaboratives, and unexpected communities can come together and grow. The IAS is also becoming an important nexus for partnerships between the University and community groups and organizations.

Institute on the Environment

Deborah Swackhamer, Interim Director, Institute on the Environment

Environmental issues will take center stage in the 21st Century. Over the past 50 years, human health, nutrition and per capita income have improved dramatically in much of the world, with some notable exceptions, because of increased supplies of food and energy and advances in technology, despite a more than doubling of human population. But this success has required a vast increase in the expanse and intensity of human use of the environment. In turn, this has resulted in large, but inadvertent, environmental impacts, including global climate change, local, regional and global air pollution, loss of biological diversity, invasions by exotic plant and animal species, and contamination of groundwater, lakes, rivers and oceans. During the coming 50 years, human population is on a trajectory to increase by 50%—to 9 billion people—and per capita consumption to increase by 140%, leading to further stress on the environment. Environmental issues are global and highly complex. Discovering and delivering solutions to our most urgent environmental problems will necessitate new ways of thinking and doing. This will require a national effort on the order of a “race to the moon” for environmental solutions, and the University of Minnesota’s Institute on the Environment will be at the forefront of this effort.

The University has the ability to harness its unique breadth and depth of intellectual resources and its capacity for innovation to tackle some of the most significant environmental issues facing our planet. Such environmental challenges can no longer be addressed as isolated and separate issues. They require a partnership of private, public, business, community, government, and university interests and talents. The Institute will approach these grand challenges in a fully interdisciplinary, team-based and integrated manner across a broad range of disciplines. The Institute’s primary objective will be to identify, organize, and support collaborative interdisciplinary research teams to develop and disseminate innovative and practical solutions to the most pressing environmental problems of our era. The Institute will focus its activities on selected research themes that will emerge from discussions among Institute Fellows, Associates, affiliates and external

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partners. The research teams addressing a particular theme will take a systems, or integrated, approach to addressing a particular environmental problem. Themes will not be permanent, but will change over time as problems are solved and new challenges emerge. A competitive Discovery Grants program will be initiated to assist in forming interdisciplinary teams of scholars.

An equally important function of the Institute is to facilitate and coordinate environmental programs, activities, and courses, and disseminate relevant information on environmental research and expertise of the University of Minnesota system. This facilitation role is intended to supplement, enhance and further promote ongoing activities at the University and not to supplant them.

A guiding principle of the Institute on the Environment is that it be a system-wide organization reporting to the Provost that assembles problem-solving expertise from across all campuses. In this spirit, a number of steps will be taken to maximize and facilitate participation in the Institute's research, outreach and coordination mission. There will be two primary forms of formal participation in the Institute: Institute Fellows and Associate Faculty with approximately 20 to 30 Institute Fellows at any given time who will hold joint appointments with the Institute and with their home departments. Tenure of faculty members will continue to reside in the home departments of the fellows; the Institute will not grant tenure. Associate Faculty will constitute the majority of active participants (on the order of 100), and will serve as collaborators on research projects, organize synthetic events, and advise graduate students. In addition, we envision Affiliates, Visiting Scholars, Postdoctoral Fellows and graduate students, and undergraduate research assistants and interns. Participants within the Institute will span a range of disciplines across physical, biological and social sciences, engineering, policy, law, design, public health, and the humanities.

To ensure turnover, flexibility, and vibrancy, there will be no permanent faculty membership in the Institute. Institute Fellows will hold term appointments of five years or less. These appointments would be eligible for renewal, but would be subject to rigorous review.

The Institute will identify major but tractable problems that are regionally relevant and globally significant, address the relevant scientific, economic and policy issues, and then ensure that the concepts and/or products that comprise the solution are delivered to legislators, governmental agencies, citizens' groups, and industry, as appropriate.

Institute for Translational Neuroscience

Deborah Powell, Dean
College of Medicine

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Institute for the Advancement of Science and Technology

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Professor Claudia Neuhauser, Chair
Howard Hughes Medical Institute Professor and Head
Department of Ecology, Evolution, and Behavior
College of Biological Sciences

Advances in the biological sciences will transform the physical sciences, engineering, biomedical research, agriculture, and the environmental sciences. Critical to this transformation are strong connections between biology and the physical sciences, mathematics, and engineering. The University of Minnesota seeks to be a leader in promoting these new connections among the sciences, engineering, and related disciplines.

Academia has become intensely competitive, from attracting the best faculty and students to securing research funds. Great universities must constantly strive to be at the leading edge. This requires faculty leadership in research, education, and administration. Without a culture of excellence and competition, in addition to aggressive strategic investments in highly promising areas and intensive pursuit of research funding, the University will fail to move forward and reach its goal to be among the top tier public research universities in the world within a decade. Faculty must step forward and shape and focus the intellectual landscape to a much greater extent than in the past. Far too often, the University community has responded to challenges years after our competitors have already determined the research and education agenda.

Senior Vice President and Provost Tom Sullivan has charged a faculty committee under the leadership of Professor Claudia Neuhauser to develop a world-class interdisciplinary Institute for the Advancement of Science and Technology. The committee will build on task force recommendations that called for an institute based on research excellence, faculty competitiveness, and focused investments.

The University's Science and Engineering taskforce recommended that the new institute should be a faculty-led, competition-driven, focused, interdisciplinary research environment unlike any currently existing at the University. An advisory board comprised of internal and external researchers would establish three or four research themes and faculty at the University would compete for resources and participation through a stringent external peer-review process. The programs and faculty of the institute will undergo regular and rigorous external reviews. Faculty will continue to teach in their home departments with an identical teaching load, and maintain their independent research laboratories supported by investigator initiated grants, but as members, they would be provided with cutting-edge space, support to hire research staff independent of their primary laboratories, and research infrastructure in this facility for the duration of the research activity. Interdisciplinary research teams should ideally combine faculty whose interests straddle biological, chemical, physical, and computational sciences. There will be no permanent membership in the Institute.

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The committee will develop ideas on what the institute must do to enhance academic synergies; promote development of large interdisciplinary grants; bring productive teams of interdisciplinary researchers together across the university; substantially increase communication and collaboration across science, medical, and engineering research; and to “add value” to the university’s research portfolio.