

# **University of Minnesota Board of Regents**

## **Educational Planning and Policy Committee**

**December 7, 2006**

### **Interdisciplinary Initiatives Report**

#### **Background**

The University of Minnesota is actively committed to maintaining and strengthening excellence by investing in its outstanding academic programs and building a culture that supports interdisciplinary research, education, and public engagement. Today, more than ever, pushing the boundaries of knowledge in one field often means crossing into other disciplines. Addressing the big questions that confront society in the 21<sup>st</sup> century requires interdisciplinary teams of researchers and scholars working together. In the last decade, the academy has begun to realize the untapped potential of interdisciplinary research, and increasingly funding agencies not only are encouraging interdisciplinary proposals, such proposals in some areas are preferred or even required.

Interdisciplinary research, education, and public engagement are not new to the University of Minnesota. The University has more than 300 interdisciplinary programs, centers and institutes, and other collaborative entities. In the late 1990s, the University identified six interdisciplinary priorities: agriculture, molecular and cellular biology, design, digital technology, new media studies, and continued attention to undergraduate education. More recently, 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. Additionally, the University 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.

An important new collaborative strategy includes central leadership and system-wide coordination of interdisciplinary activities by the Provost's Interdisciplinary Team. The team, which includes the Vice President for Research, the Vice Provost and Dean of the Graduate School, the Vice Provost and Dean of Undergraduate Studies, and Assistant Vice Provost, is formulating 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. During 2006-07, the Provost's Office is working with other academic and administrative units to create an accurate, easily updated, accessible, web-based database of interdisciplinary entities throughout the University; improve internal and external audiences' ability to learn about, locate, and access these interdisciplinary endeavors; and identify opportunities for collaboration between and among interdisciplinary entities with similar research, teaching, and public engagement interests.

The administration is committed to creating a culture that rewards outstanding interdisciplinary research, teaching, and outreach. To assist with these efforts, new offices for interdisciplinary and collaborative research and graduate education are being established. The present report will discuss the importance of interdisciplinary graduate education, and will highlight four major interdisciplinary research institutes: The Institute for Advanced Study, The Institute on the Environment, the Institute for Translational Neuroscience, and the Institute for the Advancement of Science and Technology.

### **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.

### **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 by providing a place where faculty, students, and community members can take intellectual risks, challenge theoretical assumptions, integrate different forms of knowledge, and take on important questions aimed at reshaping our fundamental understanding 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 also has become the administrative home for the Humanities Institute; humanities programming now goes forward under the auspices of the Institute for Advanced Study.

The Institute's programming includes:

- **Research and Creative Collaboratives.** For the 2006-07 academic year, eleven research and creative collaboratives have been funded. Each collaborative has been 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 literature, 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 uncertain whether 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 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 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 also is becoming an important nexus for partnerships between the University and community groups and organizations.

### **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 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**

Neuroscience is an interdisciplinary field ripe for development and investment. Developments in neuroscience and in new tools of inquiry, including modern genetics, molecular/cellular biology and state-of-the-art imaging techniques, have created remarkable opportunities for understanding the brain, how it develops and how those developments influence human health. The University of Minnesota has an extraordinarily strong base of active research in the area of brain function.

The Institute for Translational Neuroscience will enhance basic neuroscience discovery and form stronger, more productive interdisciplinary linkages with clinical sciences to translate basic science discoveries into treatments, therapies and tools that advance human health and well being. The Institute will engage basic scientists, translational scientists, physician scientists, and clinical researchers to steward scientific discoveries into cures and treatments for neurological and behavioral/psychiatric diseases and disorders. The Institute will leverage the University's significant strengths in areas such as medicine, psychology, engineering, genetics, imaging, education, child development, and pharmacy.

Beginning in 2004, faculty from across the university brought their expertise and vision to bear on the development of the President's Initiative on Brain Function Across the Lifespan. That initiative, overseen by Senior Vice President for Health Sciences Frank Cerra, provides the basis for the new institute. A faculty Leadership Advisory Committee chaired by Medical School dean Deborah Powell has advanced strategic planning for the institute. The committee has developed a flexible institute structure and has identified an initial set of programmatic initiatives for investment and development that leverage University strengths and that span the breadth of neuroscience. Funding to establish the Institute for Translational Neuroscience is part of the University's 2008-09 Biennial Budget.

The Institute will serve as an umbrella organization for translational neurosciences across the University. It will provide a flexible structure to build on existing strengths and develop new areas of research collaboration. It will house programmatic centers and will collaborate closely with a set of technology-focused centers that are essential to research in neuroscience, and with relevant academic departments across the University. The Institute will promote synergies across the centers, will promote inclusion of investigators from across the U in the centers' activities, and will ensure that translational work occurs and that the relationships that are key to translational work, including connections to the clinical research operation and clinical care, are healthy.

The Institute's first programmatic centers will include the following to-be-formed groups:

- *Neurodegenerative and Neuromuscular Diseases*: This area will bring together the neurodegenerative disease expertise of the Bob Allison Ataxia Research Center and the neuromuscular disease expertise of the Wellstone Muscular Dystrophy Center to foster interaction and collaboration. Each area will build on existing strengths and expand to other areas, including Parkinson's disease, ALS, movement disorders and novel therapeutic approaches for neuromuscular diseases.
- *Center on Neurodevelopment and Mental Health*: This center will bring together and build on the existing strengths at the University in neurodevelopment, psychology and behavioral science, mental illness and genetics. The center will investigate the neurodevelopmental origins (e.g., in utero, or during childhood or adolescence) of mental illness using research approaches ranging from the molecular to the clinical.
- *Center on Neuroengineering*: Bridging neuroscience and engineering, neuroengineering is an emerging field that translates research discoveries into technologies and tools for basic and clinical research and into new medical devices for enhanced patient care. Strong, highly recognized research groups in engineering, neuroscience and imaging will underpin this center.
- *Center for Memory Research and Care*: This center is focused on accelerating the pace of discovering a cure for Alzheimer's disease. It will build upon a successful existing research group and will engage the efforts of researchers in pharmacy, biology, and medicine.

The following technology-focused research centers are key partners in neuroscientific research and will be engaged in numerous projects of the Institute and the centers. Each maintains its own research programs and partners with researchers.

- *Center for Magnetic Resonance Research*: A research laboratory that provides state-of-the-art instrumentation, expertise and infrastructure to carry out biomedical research using the unique capabilities of magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS).
- *Stem Cell Institute*: The Institute's purpose is to advance the understanding of the potential of stem cells to improve health; stem cell research holds great promise for diseases tied to the nervous system.
- *Center for Orphan Drug Development*: This center is dedicated to developing drugs for rare, or "orphaned," diseases. The center conducts research—with a focus on translational and clinical research—at all phases of drug development.
- *Institute for Human Genetics*: The Institute of Human Genetics develops and fosters excellence in human genetic research and education, and provides a bridge between the basic and clinical sciences particularly as they relate to understanding and treating human diseases.

In addition to engaging the efforts of many existing faculty, new faculty hires in the four programmatic areas are required. The Institute will also require space for research and collaboration as well as administrative policies, structures, and incentives that nurture growth and interdisciplinary efforts. Realizing the vision for the Institute will require a long-term time commitment and significant resources.

## **Institute for the Advancement of Science and Technology**

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 strategic positioning 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.

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.