They say that if you don’t know where you are going, any road will do. At UND, we do know where we’re going — we’re on the road to move the University from great to exceptional. Part of that journey involves continual growth and maturation of an already significant enterprise of research, creative, and scholarly activity. This plan was developed collaboratively with UND faculty to provide some guidance on that journey over the next several years. We have identified some opportunities for growth of both existing research and new endeavors, and we want to increase collaborative work with other scholars here and at other institutions. We’ve also identified some areas that need improvement in terms of removing internal barriers to research and scholarly work by improving administrative processes and enhancing the overall infrastructure for research. It is my hope that this plan will be useful to faculty and administrators within the University and also to our external stakeholders.

Phyllis E. Johnson, Ph.D.
Vice President for Research and Economic Development
Aiming Over the Horizon:

The Great Plains and Beyond

A Strategic Plan for Research, Creative and Scholarly Activity

INTRODUCTION............................................................................................................................... Page 2
What Is a Research University?....................................................................................................... Page 3
MISSION & BACKGROUND ........................................................................................................ Page 4
FIVE MAJOR STRATEGIC GOALS
Goal I ............................................................................................................................................. Page 6
  Continue to build on areas of existing strengths in research, scholarly work, and creative activity.
Goal II............................................................................................................................................... Page 8
  Identify new areas of opportunity and leverage the ways in which UND is unique.
Goal III........................................................................................................................................... Page 8
  Increase institutional support for research infrastructure.
Goal IV........................................................................................................................................... Page 12
  Improve the campus climate for research and scholarly activity, and build a culture of excellence at all levels of the research endeavor.
Goal V........................................................................................................................................... Page 14
  Improve communication with the state and region about what we do and why it matters.
ECONOMIC IMPACT AND ECONOMIC DEVELOPMENT ........................................................... Page 14
MEMBERS OF THE WRITING COMMITTEE................................................................................. Page 16
FOOTNOTES................................................................................................................................ Page 16
It is widely acknowledged that research and other creative and scholarly activity are part of the core mission of a university. The involvement of both faculty and students in such work enhances learning by students, keeps faculty current within their fields, but, most importantly, creates new knowledge that is a public good. Research is listed as a critical part of the mission for the University of North Dakota:

_The University of North Dakota ... serves the state, the country, and the world community through teaching, research, creative activities, and service ... With other research universities, the University shares a distinctive responsibility for the discovery, development, preservation, and dissemination of knowledge. Through its sponsorship and encouragement of basic and applied research, scholarship, and creative endeavor, the University contributes to the public well-being._

During the past decade, the University has begun to make the transition from being an institution focused primarily on its teaching mission to being a full-fledged research university. Indeed, sponsored research funding tripled between 1997 and 2009. The University created the Division of Research in 2002; until then there had been an Office of Research and Program Development, but no vice-presidential position focused on leadership of the research enterprise. In 2009, the Division was renamed the Division of Research and Economic Development. At the end of FY2010, total Grants and Contracts awarded rose past the $100 million level for the first time, to $127.9 million.

Despite these significant changes, the University has not fully completed its transition to being a mature research university. This plan is intended to provide strategic guidance for the next five years, as our maturation continues.

“A university should wish to feed the mental leaders of the next generation. For this _nothing can take the place of contact with the living spirit of research, original work, creative authorship._”

G.B. Halsted

_Original Research and Creative Authorship the Essence of University Teaching_

*Science*, 1:203-207, 1895

(emphasis added above)
The Carnegie Institution classifies UND as a Research University (High Research Activity) (see sidebar below). For purposes of planning, more useful information about what constitutes a research university are contained in remarks made by Arthur Bienenstock, a physics professor at Stanford University, at a UNESCO meeting on research universities. He listed these as important characteristics of a research university:\n
- High-quality faculty committed to research and teaching
- High-quality graduate students who want to learn to perform research or function with advanced expertise
- An intellectual climate that encourages scholarship
- Facilities in which teaching and research can be performed effectively
- Funding for operations and instruction
- Research funding
- Research infrastructure

UND has all of these qualities in varying degrees. Naturally, we want to improve upon all of these points. This plan addresses all of Bienenstock’s criteria except funding for operations and instruction.

What is a Research University?

The Carnegie Foundation for the Advancement of Teaching classifies institutions of higher education into groups reflecting the range and number of degrees they offer and the extent of their research programs, among other factors.* The University of North Dakota is classified as a Research University (High Research Activity), meaning it awards at least 20 doctoral degrees per year. In FY2009, UND awarded 119 doctorates, not including medicine.**

Doctorate-granting institutions are assigned to one of three categories based on a measure of their level of research activity, not quality or importance. The Carnegie Foundation’s analysis takes into account research & development (R&D) expenditures in science and engineering (including social sciences); R&D expenditures in non-science and engineering fields; science and engineering research staff; and doctoral conferrals in humanities and social science fields, in science, technology, engineering, and mathematics (STEM) fields, and in other fields as well.


MISSION
The University of North Dakota focuses intensively on research, creative, and scholarly activities that lead to the creation of new knowledge, enhance student learning, and disseminate knowledge to the public.

BACKGROUND
The plan was developed with significant input from faculty across the University. Four daylong workshops were held, focused on life sciences, physical sciences and engineering, social and behavioral sciences, and arts and humanities. Material from the workshops was also made available to faculty on a blog set up for that purpose. Development of the plan has also drawn on the knowledge and expertise of a committee of faculty volunteers from diverse disciplines, as well as of the leadership of the Division of Research and Economic Development. This committee was instrumental in articulating the five major goals of this plan, based on the input from the four faculty workshops. The committee also identified the sub-goals listed under each of the major goals. The group then wrote the narrative that supports the five major goals. Before being finalized, the plan was posted on the Web to give faculty an opportunity to comment on the penultimate draft. The draft plan was also discussed with the deans of the various schools and colleges within the University.

Sponsored research funding will continue to be an area of focus. Our sponsored research funding at the outset of FY2011 is about $127 million. This is almost three and one-half times what it was in 1999. The portion of sponsored funding that returns “F&A” (facilities and administration) dollars (also known as indirect costs) to the institution is critical in supporting both the administration of research and the facilities in which it takes place. F&A funding is based on the prior year’s grants. These funds are normally associated only with federal grants; the state does not pay F&A. In FY2011, UND will receive about $18 million in F&A funds, which will be distributed to divisions, deans, departments, and faculty. The Division of Research and Economic Development will receive about $4 million in F&A in FY2011. The maximum F&A rate that the academic portion of UND receives on federal grants is 38 percent of the direct research costs; the EERC receives up to 42 percent. This rate depends significantly on the amount of research space at UND; space constructed with federal funds, while valuable because we need modern facilities to do our work, does not count in the space calculation that determines the federal F&A rate. Most research universities receive much higher F&A rates (rates of 60 percent or more are not uncommon) on federal grants than UND does; the average F&A rate in 2005-2006 was 51.2 percent.3

We remain committed to building our research infrastructure and to seeking any and all available resources from federal, state and private agencies. In recent years, UND has benefited from federal investments in facilities that have provided for the construction of the Northern Plains Center for Behavioral Research (NIH grant), a renovation of the Education Building (stimulus funds), and the Neuroscience Research Facility (NIH funds).

We will continue to work hard to increase the total amount of sponsored research funding at UND. This may be more difficult than in recent years due to the federal budget environment, and because stimulus funding is no longer available, but it is doable. Certainly, our success with grants and awards in FY2010 should position us well to garner significant funding in the future. The goals outlined below will also contribute greatly to our becoming more competitive in our efforts to secure such funding, and we expect that our total funding will grow as a result. We also trust that the state will continue to recognize the value of UND as a major research university and fund us accordingly.
“You could run the whole country on the energy in North Dakota, if we have the right policy.”

General Wesley Clark (retired)
June 12, 2010

http://www.kxnet.com/getArticle.asp?ArticleId=587769

**The fuel of the future**

Hydrogen could become the primary energy carrier of the future, which would enhance the energy security of the United States. UND’s Energy & Environmental Research Center (EERC) is leading the way in developing and demonstrating both hydrogen production and hydrogen utilization technologies. These technology advances are providing real hydrogen opportunities today that will pave the way for the hydrogen economy. For instance, the EERC is researching hydrogen production as a coproduct of power and synthetic fuels and from renewable resources, such as wind and biomass. It has partnered with the North Dakota Industrial Commission, Great River Energy, North American Coal Company, Rio Tinto, Luminant, Electric Power Research Institute, and the Porvair Filtration Group on hydrogen separation and purification. Since the National Center for Hydrogen Technology was formed in the autumn of 2004, the EERC has received contracts totaling more than $60 million for hydrogen and hydrogen-related projects with more than 85 partners.

**Electricity from wastewater**

Historically, wastewater has been a costly byproduct of the oil drilling process, a nuisance at best and an environmental liability at worst. Now, researchers who study geothermal energy are exploring ways to turn hot oilfield brine into carbon-free renewable electricity. “We could replace the use of an enormous amount of fossil fuels if this proves to be economical,” said Will Gosnold (Geology and Geological Engineering), who is leading a $3.5 million study to assess the use of oilfield wastewater to power drilling operations in North Dakota. He estimates as many as 1,000 wells in the state could be used to co-produce electricity, much of which could be used to power drilling operations in the Bakken Formation.
FIVE MAJOR STRATEGIC GOALS

1. Continue to build on areas of existing strengths in research, scholarly work, and creative activity.

   A. Environment, natural resources, and energy.

      1. Continue to expand research on both energy and the environment, and build on the natural opportunities that exist for related scholarly work in areas such as law, public policy, and rural sociology.
      2. Continue to leverage resources to conduct leading-edge research in such areas as biofuels, chemical feedstocks and materials, clean coal, and wind power.
      3. Investigate the impact of climate change on people and life on the Northern Plains.
      4. Further our understanding of factors affecting water quality and quantity, and how to manage them.

   B. Life Sciences.

      1. Build on existing excellence in delivering physical and mental health care to rural communities. Create a better understanding of behavioral factors that affect health and create new systems for delivery of remote care.
      2. Build on an established reputation in research on neurodegenerative diseases that afflict the elderly, a large demographic in North Dakota.
      3. Build on an emerging strength in investigating how humans, plants and animals adapt to a changing environment.

   C. Aerospace-related research.

      1. Be a national leader in work on Remotely Piloted Aircraft (RPA), also known as Unmanned Aircraft Systems (UAS), which are a new frontier in aviation, building this area on the foundation of UND’s expertise in conventional aviation.
      2. Develop innovative applications of Geographic Information Systems (GIS) technology.
      3. Develop novel remote-sensing payloads and applications for RPAs.
      4. Continue to expand understanding of human behavior and physiological factors that affect pilot success in both piloted and remotely piloted aviation systems.

   D. Arts and Humanities.

      1. Utilize UND’s geographic location in the Northern Great Plains as a focus for the study of community, resources, culture, history, demography and economy by building upon our strengths in American Indian studies, distance learning initiatives, linguistics and sociology of rural life.
      2. Maximize opportunities that exist for research with North Dakota’s indigenous languages, arts, cultures and histories.
      3. Take advantage of the opportunities for scholarly work that arise from such outstanding programs as the Writers Conference, the Institute for Philosophy and Public Life, and the Archaeology Field School.
      4. Enrich quality of life through performing arts and exhibitions, including such creative activities as theatrical productions, music performances, and gallery showings.
Learning with a little “wow”

Mark Guy (Teaching and Learning) and Tim Young (Physics and Astrophysics) study how a portable digital simulation learning environment — the GeoDome — may be a valuable educational tool for teachers and student teachers seeking to engage their students in science. Going beyond the “wow” factor associated with planetarium visits, they investigate how the GeoDome, integrated into a science unit, can impact students’ understanding of core concepts in science through an interactive simulation environment.

Sustainable energy

Researchers in Sustainable Energy Research Initiative and Supporting Education (SUNRISE) have developed technologies to convert vegetable and algal oils and animal waste fats into diesel and jet fuels. Under the correct combination of time, temperature, pressure, and appropriate catalysts, the long carbon chains in the oil or fat can be broken into smaller fragments that may yield high-value chemicals. This multidisciplinary consortium, led by Wayne Seames and Mike Mann (Chemical Engineering) and Mark Hoffmann (Chemistry), also works on clean coal technology, wind, and solar energy. Recently, SUNRISE signed a memorandum of understanding with a commercial client to further develop this technology and to construct a 10 million gallon-per-year commercial facility that will utilize North Dakota crops.

Neurological disorders

The Neuroscience Research Facility at the UND School of Medicine and Health Sciences houses a team of federally funded researchers dedicated to the study of Alzheimer’s and Parkinson’s disease, multiple sclerosis, traumatic brain injury, epilepsy, and HIV-1 associated dementia. The goal of these researchers is to better understand causes of and identify treatments for these devastating neurological disorders. This is particularly important to North Dakotans because many of these diseases increase with aging; North Dakota has one of the most aged populations in the United States, and we have disproportionately high incidence rates of many of these neurological disorders. Over the past decade, the federal government has invested about $30 million to support this group’s research enterprise.
E. Behavioral and Social Science.
   1. Build on strengths in understanding, assessing, and treating addictive behaviors.
   2. Further develop established strengths in research and evaluation of teaching and learning.
   3. Expand upon our expertise in criminal justice related to American Indian and rural populations.
   4. Enhance strategies to address unique problems affecting rural and vulnerable populations.

II. Identify new areas of opportunity and leverage the ways in which UND is unique.

A. Take advantage of UND’s uniqueness in having a law school, medical school, and an aerospace program all in one place.¹
B. Recognize the integral role of graduate students in the research enterprise and continue to strengthen UND’s already excellent graduate programs.
C. Leverage the nearby presence of a federal laboratory, the USDA Grand Forks Human Nutrition Research Center, and its mission to focus on obesity research.
D. Build on the region’s growing capacity in immunology and infectious disease.
E. Enhance scholarly work that recognizes North Dakota’s significant American Indian population and the University’s exemplary programs to support American Indian student success.
F. Capitalize on UND’s strong liberal arts tradition to foster integrated study across disciplines to examine research and policy questions related to all aspects of human life.
G. Recognize that UND’s location in a state of low population density makes it a natural site for scholarship related to remote delivery of programs and services.
H. Support the development of an incubator for the arts at UND.

III. Increase institutional support for research infrastructure.

A. Maximize recovery of indirect costs.
B. Upgrade and maintain core equipment, together with sufficient support staff, to keep pace with growth of research.
C. Add administrative support commensurate with growth of the research endeavor.
D. Develop a ten-year plan for upgrade of existing and construction of new buildings that meet current and future needs with the following points in mind:
   1. Identify areas where research growth is constrained by building capacity.
   2. Create a physical structure (or utilize an extant one) to place individuals in creative connection to each other, not only to foster communication but additionally to encourage collaborative research.
E. Identify ways to improve start-up packages for faculty.
F. Fund libraries to meet diverse research needs.
G. Provide access to adequate statistical software for diverse research needs and provide professional statisticians for consultation and research support.
H. Increase computational and network resources.
I. Increase support for Graduate Research Assistantship positions.
UND researchers are paving the way for the development of the Unmanned Aircraft Systems (UAS) industry. A major challenge facing the UAS industry is safely operating unmanned aircraft in the nation’s busy airspace, which makes the uncrowded sky of North Dakota an ideal testing ground for this innovative technology. As a way to demonstrate safe operations, researchers led by Mark Askelson (Atmospheric Sciences) and Al Palmer (Director of UND’s UAS Center of Excellence) are working with civil authorities on the use of UAS during natural disasters. With special permission from the Federal Aviation Administration (FAA), the Scan Eagle UAS was deployed to monitor flooding of the Red River of the North in the Oslo, Minnesota, region in 2010. Missions focusing on safe operation of the Scan Eagle in the National Airspace System are developing data that will help the FAA eventually approve wider use of UAS. Civilian applications of UAS (such as monitoring oil pipelines, evaluating crop health, or aiding law enforcement) will not be possible without critical new research. This work will have a major impact in fostering the growth of private UAS industry around the Grand Forks Air Force Base and throughout the state.

**Scan Eagle UAS**

Archaeology at Cyprus and Corinth

Since 2005, the UND Department of History has maintained an archaeological presence in the Mediterranean. Bill Caraher has led international, transdisciplinary teams of archaeologists near Corinth, Greece, and on the Island of Cyprus. Each project has documented previously unknown or undocumented sites and made important contributions to our understanding of periods of Mediterranean history from the fifth century B.C. to the 19th century A.D. These projects have relied upon both traditional archaeological field techniques and high-tech software and hardware. Every artifact and building discovered, for example, is entered into a custom-designed relational database and plotted using state-of-the-art GPS receivers and Geographic Information System software. This research is accessible to the world through a robust Web presence that combines interactive maps, professional museum management software, academic and student-led blogging, and integrated social networking. The fieldwork has been a model for integrating sophisticated methods of data collection in the field with the latest tools for the electronic publication and dissemination of the results.

At work with the project is Paul Federer, who received his M.A. in history from UND in May 2010. Photo by Ryan Stander.
The burgeoning graduate program at UND bodes well for research growth. UND’s final fourth-week enrollment figures for Fall 2010 reflected a 14 percent growth in graduate enrollment to more than 2,500 students. UND has the most comprehensive array of graduate school offerings between the Twin Cities and Seattle, and is increasingly becoming a school of choice for graduate students. This has significant impact on the research enterprise because one of the major elements of graduate study in most fields is doing original research. A growth in graduate student enrollment translates into a larger research workforce and greater research productivity. One common metric for research productivity is the number of scholarly publications produced; indeed, for Ph.D.-granting institutions in chemistry, the number of scholarly publications per year is equal to the sum of graduate students plus postdoctoral fellows.5

EPSCoR is a program first funded by the National Science Foundation (NSF) to increase institutional research capacity in science and engineering. Following NSF’s lead, the Department of Defense, the Environmental Protection Agency, the Department of Energy (DOE), the U.S. Department of Agriculture, the National Aeronautics and Space Administration (NASA), and the National Institutes of Health (NIH) began their own EPSCoR programs. Nationally, NSF and NIH currently have the largest EPSCoR programs. NSF awarded the state of North Dakota its most recent Research Infrastructure Improvement (RII) award in September 2008. Since 1986, the state’s investment of $32.5 million in matching federal EPSCoR funding has resulted in over $264 million in merit-based extramural grants — an 8:1 return on investment. The current EPSCoR grant provides $15 million over five years (2009-2013) to strengthen the state’s capacity in two research initiatives. One initiative, focused on sustainable energy, is led by UND researchers, while the other is led by NDSU researchers.

The key research infrastructure elements funded by ESPCoR, developed and informed by the state’s Science & Technology vision, comprise a multifaceted program. Besides the two major research initiatives, there is funding to improve our ability to hire and retain outstanding chairs and faculty by supplementing start-up and retention packages. Other programs help to increase faculty competitiveness via workshops on grant writing and project management, and fund both competitions for internal grants and travel awards to international and national conferences. This funding allows visits to agency program directors so we can better understand what kinds of grant proposals might be funded. EPSCoR encourages collaborative projects that establish relationships with other universities. Another key feature is a plan to enhance cyber-infrastructure at the research universities and other colleges in the North Dakota University System. EPSCoR also includes a comprehensive set of programs designed to broaden participation of North Dakotans, particularly American Indians, in science, technology, engineering, and mathematics (STEM) activities and careers. There is also a focus on programs that will continue to generate strong partnerships with the private sector.

Other EPSCoR programs funded by agencies such as NIH, DOE, and NASA are much more narrowly focused on building research capacity in specific areas. Despite a long track record of EPSCoR funding in North Dakota and the state’s generous match, there are aspects of research infrastructure within the University that are still lacking; many of these cannot be provided with EPSCoR funding.

In the past decade, the research enterprise at UND has grown dramatically and now consists of more than $127 million in grants and contracts. During this same period, however, the quality and quantity of research infrastructure have lagged behind the growth in research grant funding. Research infrastructure consists of physical resources, including buildings to house research labs and the people doing the work, research lab spaces, instrument core facilities and information technology, as well as human resources such as graduate and undergraduate students, postdoctoral research scientists, technical research assistants, support staff to administer grant applications and compliance with granting agency regulations, department administrators to manage grant expenditures, and legal consultants to manage intellectual property and commercialization.

While research grants sometimes provide funding to hire laboratory technicians, postdoctoral fellows or other staff, some critically needed human resources cannot be funded by federal grants. For example, UND has less than half the number of administrative staff at the department level to help scientists manage grants than comparable research institutions. This means that the university ends up paying Ph.D.s to do bookkeeping and other administrative tasks, at the expense of their devoting more time to research. Such administrative support is
Investing in research

Why does infrastructure matter?
Most people think of “laboratory animals” as rats and mice, sometimes hamsters or rabbits. Turk Rhen (Biology) uses turtles. It turns out they are excellent models for studying development of the reproductive system. To be useful for research work, turtles need to be raised in a temperature-controlled environment, and those temperatures need to be different at different times of year and at different developmental stages. A modest investment by the Division of Research and Economic Development in modifying the animal facilities in Starcher Hall has made him more competitive for further major funding from the National Science Foundation. The provision of an adequate research facility also increases the likelihood that UND will be able to retain this outstanding faculty member.

Unique partnerships
Obesity is one of the most serious health concerns for the populations of our region and nation. In North Dakota, 25 percent of adults and 15 percent of children are obese. Research directed towards the prevention of obesity has become the central focus for the USDA Grand Forks Human Nutrition Research Center (GFHNRC). Located adjacent to UND, this federal facility is the only nutrition research center in rural America. The proximity of GFHNRC and UND creates opportunities for synergy with the potential to lead to a better understanding of the behavioral, psycho-social and physiological factors contributing to obesity and related health risks such as diabetes, heart disease, depression and cancer.

Behavioral research
A collaborative effort between UND’s College of Nursing and Department of Psychology, the Northern Plains Center for Behavioral Research (NPCBR) creates opportunities to bring together researchers with varied backgrounds, knowledge and expertise necessary to address the complex behavioral issues that contribute to human health and illness. Since 2008, the federally funded NPCBR has provided essential state-of-the-art facilities required by multidisciplinary scientists to study behaviors contributing to disease, including sleep, gaming, nutrition, coping and care giving among individuals, families, groups and communities. Scientists also study behaviors that enhance vitality and well-being, contributing to quality of life.
normally funded at the institutional level. Most research universities also support some permanent technical staff, at least for core research facilities. For example, the University of Kentucky (a peer/aspirant institution) has 19 staff and 35 faculty in its chemistry department; UND has 3.75 staff for 15 faculty in its Department of Chemistry. The lack of such administrative and technical support is an important constraint on UND’s research productivity.

Indeed, a recent national survey found that of the time that faculty committed to federal research, 42 percent was devoted to pre- and post-award administrative activities — not to active research. Ninety-eight percent of respondents reported that at least some of the time they spent managing federal grants could be conducted by administrative personnel. On average, faculty anticipated that having research-project assistance would save 28 percent of the time they typically invested in grant management. Sixty-five percent of the respondents believed that they could devote at least two additional hours each week to active research if they had more assistance with administrative tasks. Given the limited support staff at UND, the research program would realize even greater than average gains in productivity if staff support were increased.

The absence of new state-funded construction of research buildings at UND has stretched physical resources to the limit in many departments. Many campus research spaces were constructed in the 1970s and 1980s or earlier, and are in need of substantial renovation to provide casework, electrical and water service, safety cabinets, lighting, heating and cooling to support the equipment and activities associated with state-of-the-art research. As a result, new faculty members often commit a large proportion of start-up funds towards such building infrastructure at the cost of purchasing needed equipment or hiring students and staff to do the work. Furthermore, although several instrument core facilities are now available on campus (e.g., microscope imaging in Biology; a 500 MHz NMR and low-temperature X-ray facility in Chemistry; mass spectrometry, and proteomics in the School of Medicine), UND still lags behind major research universities. These facilities provide shared access to essential equipment that might otherwise be too expensive for individual researchers to purchase. Research universities generally provide core equipment and fund both its maintenance costs and permanent support staff to operate these sophisticated instruments. In addition, granting agencies consider the availability of such communal research equipment when reviewing the competitiveness of grant applications from individual scientists.

**IV. Improve the campus climate for research and scholarly activity, and build a culture of excellence at all levels of the research endeavor.**

A. Recognize both individual and collaborative work.
B. Remove barriers and clarify policies and procedures to enhance collaboration across departments and colleges.
C. Maintain and build upon UND’s strong record of undergraduate participation in research and scholarly work.
D. Streamline and clarify processes for review and approval of grants through the Grants & Contracts office.
E. Enhance effectiveness and funding support for the Seed Grant Program.
F. Increase opportunities for faculty presentation and discussion of scholarly and creative activity on campus to enhance awareness of each other’s work.
G. Provide more training and assistance on grant writing.
H. Increase gender and ethnic diversity in STEM (Science, Technology, Engineering and Math) faculty.
I. Create policies and procedures for supporting spousal/partner employment.
J. Identify strategies to improve retention and continued development of outstanding mid-career faculty.
Nurturing new scientists

The new faculty start-up program of North Dakota EPSCoR (Experimental Program to Stimulate Competitive Research) helps to attract and develop core groups of scientists capable of conducting nationally competitive research.

Julia Zhao was recruited in 2004 to bring nanoscience and nanotechnology expertise to the University of North Dakota. An EPSCoR start-up package helped her build a nanochemistry lab and establish a nanotechnology team at UND. As a principal investigator, she has received NSF grants within the past six years totaling more than four times the amount of her start-up grant, and she has become a key collaborator with colleagues in Chemistry, Physics, Chemical Engineering, and Biochemistry and Molecular Biology.

Steven Ralph was recruited in 2007 as part of a broader initiative to establish genome biology research at UND. He is an expert in plant genomics and investigates the genetic basis for plant resistance against native and invasive insect pests. In just three years, EPSCoR has received an excellent 8:1 return on the initial investment toward start-up funds for his lab. He is the lead investigator on an NSF grant studying genetic mutations in poplar that enhance resistance to insects. Together with colleagues in Biology and Mechanical Engineering, Ralph received funding from NSF to establish a genome biology core facility at UND.

Eating for two?

Babies depend on their mothers to provide a healthy environment for them to grow and develop during pregnancy. Nutrition has always been considered an important factor in the health of the developing infant, but today scientists recognize that the quality of the maternal nutritional environment is central to health and disease of mothers and their children later in life. Cindy Anderson (Nursing) began her research career with a UND faculty seed grant and now has obtained ten times that in external research funding. In studies describing how maternal nutrition contributes to future heart disease for mothers and their children in both animals and human research participants, she has shown that poor maternal nutrition contributes to chronic changes in the blood vessels of mothers and their children, increasing the risk of hypertension across generations. Her study of the causes for inherited cardiovascular risk has the potential to lead to novel prevention and treatment strategies, improving the health of generations.
V. Improve communication with the state and region about what we do and why it matters.

A. Gather information about what is needed from stakeholders and constituencies.
B. Enhance understanding of the value to the State of North Dakota of research, scholarship, and creative activity.
C. Engage partners in collaborative endeavors.
D. Improve technology transfer to promote commercialization and economic development.

ECONOMIC IMPACT AND ECONOMIC DEVELOPMENT

Economic development is one of many significant outcomes of research and scholarly activity at a university, though certainly not the only one. Universities have economic impact on their communities, states, and regions in a number of ways:

- Putting their research power to work by developing new ideas that will strengthen the country’s competitive edge in the new economy — and then by helping to deploy those innovations into commercial use;
- Providing a wide range of knowledge-focused services to businesses and other employers, including customized job-training programs, hands-on counseling, technical help, and management assistance;
- Embracing a role in the cultural, social, and educational revitalization of their home communities;
- And, most fundamentally, educating people to succeed in the innovation age.

Each year, the University prepares a report summarizing its economic impact on the city, state, and region. In FY2009, the approximately $95.39 million in sponsored program expenditures at UND had an economic impact of $195 million in economic output, 1,648 jobs, and over $19.3 million in local, state, and federal tax revenue. As we continue to grow our portfolio of sponsored research, these figures will also increase. With the growth in grants and contracts awarded in FY2010 to $127 million, compared to $89 million in FY2009, we can expect commensurate growth in UND’s economic impact in the future.

The University has acknowledged the importance of economic development as an outcome of research by adding this term to the name of the Research Division. This plan is focused on other goals and issues related to the broad research and scholarly enterprise of the University. Michael Moore joined UND as Associate Vice President for Intellectual Property Commercialization and Economic Development on October 4, 2010. With his participation, it is our intent to prepare a separate plan for University involvement and approaches to economic development that will complement this plan for research and scholarly activity per se.
Digital Northern Great Plains

Growers in the Northern Great Plains are eager to adopt modern technology to improve productivity and income. The use of information derived from remote sensing satellites to better manage farms and rangelands while reducing environmental impacts has gained popularity in recent years. However, prohibitive costs and non-availability of near real-time remote-sensing imagery have slowed the adoption of this technology for in-field decision making. Digital Northern Great Plains (DNGP), a Web-based remote-sensing data dissemination system, was developed by researchers at UND’s John D. Odegard School of Aerospace Sciences to address these drawbacks. It provides end users easy and free access to a variety of imagery and products in near real time. With delivery of archived and current data, DNGP has helped farmers and ranchers reduce operational costs and increase productivity through a variety of innovative applications. Moreover, negative environmental impacts have been lessened.

The usefulness of game play

Richard Van Eck (Teaching and Learning), Dmitri Poltavsky (Psychology), and Dave Biberdorf (School of Medicine) are studying the connection between visual processing, cognitive style, and video game play. Because some visual skills can be improved through intervention, this collaborative work may yield critical findings for cognitive functioning and education, including the need for visual testing in K-12 schools. This work is being done in a new, federally funded building, the Northern Plains Center for Behavioral Research.

Left: Specialized laboratory equipment facilitates monitoring and measurement of voluntary and involuntary responses to situations and stimuli.

The importance of art

Lucy Ganje and Art Jones of UND’s Department of Art and Design are the editors of a new book, Storytelling Time: Native North American Art from the Collections of the University of North Dakota. In addition to Jones and Ganje, the book’s authors also include Nelda Schrupp, a UND alum, nationally known Native artist and enrolled member of the Pheasant Rump Nakota First Nation. The book features poetry by Denise K. Lajimodiere, an enrolled member of the Turtle Mountain Band of Chippewa. UND has an extensive collection of Native American art, making it a significant resource not only for understanding the culture and history of the area but also for instruction in the appreciation of art, an important component of higher education’s mission of motivating men and women toward high ideals and citizenship.
MEMBERS OF THE WRITING COMMITTEE

Cindy Anderson, Associate Professor and Associate Dean for Research, College of Nursing
Mark Hoffmann, Assistant Vice President for Research for EPSCoR and Chester Fritz Distinguished Professor of Chemistry
Phyllis E. Johnson, Vice President for Research and Economic Development
Cindy Juntunen, Professor of Counseling and Associate Dean for Research and Graduate Studies, College of Education and Human Development
Kathleen McLennan, Professor and Chair, Theatre Arts
Jonathan Geiger, Professor and Chair, Pharmacology, Physiology, and Therapeutics; and Interim Chair, Anatomy and Cell Biology
Barry Milavetz, Associate Vice President for Research Development and Compliance; and Professor of Biochemistry and Molecular Biology
Michael Poellot, Professor and Chair, Atmospheric Sciences
Kimberly Porter, Professor of History
Steven Ralph, Assistant Professor of Biology
Richard Schultz, Professor and Chair, Electrical Engineering*
Julia Zhao, Associate Professor of Chemistry

*Professor Schultz, our widely esteemed colleague, passed away on September 30, 2010. His remarkable record of accomplishment and service to the University is appreciated by all.

FOOTNOTES

1 UND Mission Statement
http://www.und.nodak.edu/aboutund/mission.html

2 A. Bienenstock, Stanford University (no date)

3 Survey of 2005-2006 Facilities and Administrative Rates

4 UND is one of only 47 public universities with both a law school and a medical school.
http://www.und.edu/aboutund/index.html
Together with its premier aerospace program, this makes UND unique.

5 Michael Doyle, “Research with Undergraduates: How to Win Friends and Influence Students,” NSF workshop exploring the concept of undergraduate research centers, 2003

6 Faculty Burden Survey
http://sites.nationalacademies.org/PGA/fgd/index.htm (accessed 8-10-10)

www.rockinst.org

8 “The Economic Impact of Research at the University of North Dakota: Fiscal Year 2009,” UND Division of Research and Economic Development
http://www.und.edu/dept/research/docs/Economic%20Impact%20