



FISCAL YEAR 2017

ANNUAL REPORT

# NDSU OFFICE OF RESEARCH AND CREATIVE ACTIVITY

Higher education research aims to improve lives by fueling natural curiosity which drives discovery. The results that are possible when individuals are allowed to find the answers to their questions and to follow the path of their curiosity span a spectrum of providing greater good through broader impact to the people of the world. While these results may answer our basic questions about environment, they may also tell us how we can solve the riddles of disease, provide us new strategies about learning from each other, or show us how we can build new amazing structures. They may also simply provide an answer to a profound question that we have not yet asked.

The state of research is alive and well at North Dakota State University. The NDSU Office of Research and Creative Activity (RCA) supports and enhances the institution's research activity through specialized teams designed to support researchers including finding and sharing grant opportunities, building an environment most conducive for research, providing the necessary oversight to protect and enable grant applications, and connecting discoveries to companies that can bring them to market.

The last year has been a time of uncertainty for federal science funding with increased oversight into the stewardship of the country's science and health investments. NDSU researchers have consistently pushed forward delivering amazing discoveries across the disciplines of health professions, agriculture, engineering, education, science and mathematics, business, and arts and humanities. As part of our strategic Grand Challenges initiative, NDSU researchers have continued developing collaborative efforts to address needs currently found in North Dakota, including food systems and security, healthy populations and vital communities, and societal infrastructure.

The advances by the NDSU Grand Challenge research teams include the groundbreaking discovery of creating metastasized tumors outside of a patient's body on bone scaffold test beds. **These tumors mimic those found in patients' bodies allowing the most effective drug combination to be determined prior to delivery to the patient.** This collaborative team of researchers has pushed their research forward during the past months and is now creating both pancreatic and breast cancer tumors.

The American Indian Public Health Institute and Sustainability Project has made progress on the North Dakota health initiatives grand challenge. This team was awarded a \$1.16 million grant from the Leona M. and Harry B. Helmsley Charitable Trust for a multiple year project housed at NDSU's American Indian Public Health Resource Center in the Department of Public Health within the College of Health Professions. The center addresses American Indian public health disparities through technical assistance, policy development, feasibility analysis, education, research and programming in partnership with tribes in North Dakota, across the Northern Plains and the nation with the goal to improve health systems, access to services, and health outcomes in rural, impoverished communities.

RCA supported research through the introduction of funding opportunities for conference travel, research resources, seed awards, and equipment repair funds.

Infrastructure investment in NDSU's Center for Computationally Assisted Science and Technology (CCAST) in 2017 laid the foundation for the center to become a regional leader in a high performance computing services. Upgrades included preparation for membership in national distribution groups Open Science Grid (OSG) and Extreme Science and Engineering Discovery Environment (XSEDE), the addition of new hardware upgrades, and additions to the staff of professional and student technicians. While these upgrades have allowed the Center to better serve the needs of the University's researchers, they also lay the groundwork for the option to partner with researchers across industry.

NDSU's leadership in EPSCoR has continued with the university hosting the state's office. Since 1985, North Dakota EPSCoR has received more than \$60.5M in NSF EPSCoR Track-1 awards and includes the state's four primarily undergraduate institutions and the five North Dakota tribal colleges in research, outreach, education, and diversity activities.

An important aspect of the ongoing business of research at NDSU is the ability to provide the results of research to various industries who can utilize the discoveries. The Technology Transfer Office works with researchers, faculty, staff and students to provide access to inventions and patents they have developed. This results in profits for both the University and the patent holder researcher.

An important aspect of nurturing our research at NDSU is growing the number of graduate students conducting their work at the university. A key to accomplishing this goal is the work that the Office of Research and Creative Activity conducts with undergraduates. These students are reached through a number of activities including NDSU Explore, a program that encourages and celebrates the scholarly accomplishments of NDSU undergraduate students. In FY17, more than 100 undergraduate students from each of the academic colleges presented projects about topics ranging from spider silk to media coverage of the presidential election.

I invite you to take a moment to read about some highlights and successes of the year.



A handwritten signature in blue ink, appearing to read 'K. Rusch'.

Dr. Kelly A. Rusch  
Vice President  
NDSU Office of Research and Creative Activity



# NDSU ASSISTANT PROFESSOR LYDIA TACKETT RECEIVES NATIONAL SCIENCE FOUNDATION CAREER AWARD

North Dakota State University assistant professor of geosciences Lydia Tackett received an award bringing more than \$500,000 to the geosciences department at NDSU and providing research opportunities for students.

The five-year Faculty Early Career Development, or CAREER, award from the National Science Foundation focuses on the paleoecology (the study of the ecology of fossil animals and plants) of shelled marine animals from the Late Triassic period, which occurred between 250 million and 199 million years ago when many of the first dinosaurs also appeared. The award will help fund Tackett's study into Late Triassic marine animals with shells.

Tackett's study is entitled "A Late Triassic Origin for Modern Marine Predator-prey Dynamics" and examines the role of predator-prey interactions in building modern ecosystems during a time of dramatic environmental change. The research could help unlock the reasons for the physical features of both predators and prey, helping scientists better understand when and why some marine life developed certain

characteristics such as shell-crushing behavior, which forced prey to develop subsequent defenses.

The study also provides more detailed information to help scientists predict how the disappearance of predators might affect modern marine ecosystems.

Tackett's project includes research opportunities for NDSU geosciences undergraduate and graduate students, as well as students from North Dakota tribal high schools. While she has previously studied the topic on a smaller scale, the CAREER award will help fund two trips to New Zealand over the next five years to gather valuable new information on a wider variety of Late Triassic marine animals. Students will accompany her to New Zealand in 2018 and again in 2020.

Students from North Dakota tribal high schools will develop research projects which look to solve environmental problems using the skills learned as part of Tackett's study. NDSU undergraduate students will mentor the high school students.

Tackett said students will play a vital role in the research, and will come away with valuable knowledge that could help push them forward in geoscience research.

Tackett has been an assistant professor at NDSU since 2014. She received her doctorate in earth sciences from the University of Southern California, Los Angeles.







## NEW INSTRUMENTATION ENABLES RESEARCH IN ELECTRICAL AND COMPUTER ENGINEERING

NDSU researchers were awarded a \$362,865 grant from the National Science Foundation for a project titled "II-NEW: Probe Station to Characterize Body Area Network Sensor ICs for Cyber Physical Systems Applications." Dr. Debasis Dawn, assistant professor of electrical and computer engineering, is the project's principal investigator. Department colleagues Dr. Scott C. Smith, professor of electrical and computer engineering, Dr. Na Gong, assistant professor, and Dr. Jinhui Wang, assistant professor, are co-principal investigators.

This equipment allows research on topics such as System-on-Chip, called SoC; integrated silicon-based radio frequency and millimeter-wave integrated circuits for wireless body or personal area network communication; and communication radar and sensors. Applications could range from hand-held scanners for biomedical imaging to portable, wearable weapon scanners for military use. Other applications include logic circuits for ultra-low power computer chips, extreme environment integrated circuits for use in outer space and high temperature power electronic applications, side-channel attack-resistant integrated circuits, radio frequency nanotechnology and sub-millimeter wave and terahertz frequency integrated circuits.

According to Dawn, the instrumentation allows precise characterization of devices and circuits to understand their behavior and to successfully design new classes of ultra-low-power body area network sensors and integrated circuits that are adaptable to body movements or environmental changes.

# FACULTY ACHIEVEMENTS

## NDSU BARLEY BREEDER NAMED CROP SCIENCE SOCIETY OF AMERICA FELLOW

Richard Horsley, NDSU professor and department head for plant sciences, was honored as a fellow in the Crop Science Society of America (CSSA). The fellow award is given to only 0.3 percent of the CSSA membership and rewards outstanding contributions to agronomy. During his tenure as the lead barley breeder for the NDSU department of Plant Sciences barley breeding and genetics research project and coordinator of the malting barley improvement program, five barley cultivars approved as malting barley varieties by the American Malting Barley Association were released. In addition to extensive service to professional associations like the CSSA, the Wheat Quality Council, and the United States Wheat and Barley Scab Initiative, he has advised 23 graduate students and written more than 150 professional publications.



## DEPARTMENT CHAIR NAMED AMERICAN SOCIETY OF AGRICULTURAL AND BIOLOGICAL ENGINEERS FELLOW

Sreekala Bajwa, NDSU professor and chair of agricultural and biosystems engineering, was named a fellow of the American Society of Agricultural and Biological Engineers. Fellows have a minimum of 20 years of active practice or teaching of engineering and have been organization members for at least 20 years. Bajwa's areas of expertise include remote sensing, precision agriculture, unmanned aerial systems and bio-composites, and she works to address the global challenges of food, water and energy security.



## FACULTY MEMBER NAMED FULBRIGHT SCHOLAR

Seth Rasmussen, NDSU professor of chemistry and biochemistry, was named a Fulbright Senior Scholar by the Australian-American Fulbright Commission and he will conduct research in Australia in early 2018. Rasmussen's application was titled "New Design Models for Low Band Gap Polymers and their Application to Organic Electronics." The award will fund his January-to-May stay at the University of Newcastle in New South Wales, where he will conduct materials research. The project uses semiconducting organic plastics developed by Rasmussen's research group and studies their application as active materials in organic or plastic solar cells and near-infra-red light detectors, technology which could one day allow everyday objects like clothing to convert sunlight into energy to power electronics such as cell phones.





#### NURSING FACULTY MEMBER NAMED FELLOW IN ADOLESCENT HEALTH

Molly Secor-Turner, associate professor in the NDSU School of Nursing, was designated a fellow in the Society of Adolescent Health and Medicine. Secor-Turner was selected for her local and global health leadership efforts, specifically, her commitment to the health and welfare of adolescents. She co-founded the group, For the Good Period, providing health education to girls in Kenya and opportunities for NDSU nursing students to learn about global healthcare and practice cultural competence. In collaboration with Brandy Randall, NDSU associate professor in human development and family science, and funded by a \$1.2 million, three-year competitive grant from the U.S. Department of Health and Human Services Administration for Children and Families, Secor-Turner also implemented Reach One Teach One, a program to help prevent teen pregnancy among Fargo youth while conducting research on the potential impact of the program on at-risk youth.



#### NURSING FACULTY MEMBER HONORED BY AMERICAN ACADEMY OF NURSING

Kelly Buettner-Schmidt, associate professor in the NDSU School of Nursing, was selected as a nurse leader by the American Academy of Nursing in its 2016 class of academy fellows. Buettner-Schmidt is the only inductee from North Dakota into the academy for 2016. Selection is based on the extent a nominee's nursing career has influenced health policies and the health and wellbeing of all. Buettner-Schmidt was recognized for her contributions to nursing and health care through her research. Her research interests include health policy, public health, health promotion, disease prevention, and tobacco cessation, prevention and control. Her research has been published in the Journal of Pediatric Nursing, Research in Nursing & Health, Tobacco Control, Public Health Nursing, Journal of Advanced Nursing, and appeared in U.S. News and World Report and WebMD, among others.

### NSF CAREER AWARDS

Since 1996, 22 NDSU faculty members have received National Science Foundation CAREER awards.

Overall, National Science Foundation CAREER awardees at NDSU have received more than \$10 million in grants to conduct research.

NSF career awardees currently at NDSU include faculty members Gregory Cook, Stuart Haring, Seth Rasmussen, Wenfang Sun, and Uwe Burghaus in chemistry and biochemistry; Sanku Mallik in pharmaceutical sciences; Xuefeng Chu and Kalpana Katti in civil and environmental engineering; Kendra Greenlee in biological sciences; Robert Brueggeman in plant pathology; Peter Bergholz in veterinary and microbiological sciences; and Lydia Tackett in geosciences.

The National Science Foundation CAREER program recognizes and supports the early career-development activities of scholars who are likely to become the academic leaders of the 21st century. Recipients are chosen on the basis of creative career development plans that integrate research and education within the context of their university's mission.

# THE GRAND CHALLENGES

NDSU's Research and Discovery Vision is focused on achieving national and international recognition as a premier public Research University, committed to solving complex and evolving Grand Challenges. The Vision centers on three Grand Challenges which leverage current and emerging strengths of NDSU researchers, are inclusive of creative activity and innovation, and align the university with the needs of the state, the nation, and the world.

- **Food Systems and Security**
- **Healthy Populations and Vital Communities**
- **Sustainable Energy, Environment, and Societal Infrastructure**

## AMERICAN INDIAN PUBLIC HEALTH PROGRAM WORKS TO IMPROVE RURAL COMMUNITIES

The Leona M. and Harry B. Helmsley Charitable Trust awarded NDSU a \$1.16 million grant for the "American Indian Public Health Institute and Sustainability Project." The grant runs through June 30, 2020. The project is housed within NDSU's American Indian Public Health Resource Center, located in the Department of Public Health within the College of Health Professions.

The project is part of the university's Grand Challenge Initiative, which is designed to use NDSU's role as North Dakota's land-grant, research university to create innovative research that will improve the lives of people in the state and around the world.

"We are very grateful to the Helmsley Charitable Trust for the additional resources for the center at NDSU. They were the primary funding agency for our initial work over the last three years in providing technical assistance and expanding collaborations with tribes and American Indian communities to improve public health," said Dr. Donald Warne, chair of public health and Mary J. Berg Distinguished Professor of Women's Health.

The center addresses American Indian public health disparities through technical assistance, policy development, feasibility analysis, education, research and programming in partnership with tribes in North Dakota, across the Northern Plains and the nation. Its goal is to improve health systems, access to services, and health outcomes in rural, impoverished communities.

"With the new grant, we plan to take this work to the next level and join the



National Network of Public Health Institutes. In this capacity, we will continue to enhance our funding opportunities to promote sustainability, and we will be able to access new partners in promoting public health in underserved populations,” Warne explained.

By joining the national network, the center anticipates increased external funding via grants and contracted services, elevating American Indian public health issues in national prominence and bringing greater focus on American Indian public health issues in the seven-state region.

The Leona M. and Harry B. Helmsley Charitable Trust improves lives by supporting effective nonprofits in health, place-based initiatives, and education and human services. Since 2008, when the trust began its active grant making, it has committed more than \$1.6 billion to a wide range of charitable organizations.



# THE GRAND CHALLENGES

NDSU's Research and Discovery Vision is focused on achieving national and international recognition as a premier public Research University, committed to solving complex and evolving Grand Challenges. The Vision centers on three Grand Challenges which leverage current and emerging strengths of NDSU researchers, are inclusive of creative activity and innovation, and align the university with the needs of the state, the nation, and the world.

- **Food Systems and Security**
- **Healthy Populations and Vital Communities**
- **Sustainable Energy, Environment, and Societal Infrastructure**

## GRAND CHALLENGE INITIATIVE CREATES CENTER FOR CANCER RESEARCH

The Center for Engineered Cancer Test Beds will link several of NDSU's top minds in an effort to significantly reduce testing time and costs to develop new cancer drugs and drug delivery systems. The project will focus on prostate and breast cancer, which have a high rate of spreading to bones.

The Center is part of the university's Grand Challenge Initiative, which is designed to use NDSU's role as North Dakota's land-grant, research university to create innovative research that will improve the lives of people in the state and around the world.

"Zeroing in on the appropriate anti-cancer drugs and drug combinations for a patient is challenging for both the physician and the patient, and it requires iterative practices," said Kalpana Katti, University Distinguished Professor of Civil and Environmental Engineering and the center's lead. "This project will attempt to significantly accelerate patient-specific treatments."

The project is a spinoff of NDSU research that already has received national recognition. Katti previously led a group of researchers who pioneered a way to regenerate bone that closely resembles human bone using the type of clay found in Fargo's Red River Valley.

The project includes NDSU researchers from the College of Engineering; College of Health Professions; College of Science and Math; College of Business; and the College of Arts, Humanities and Social Sciences. Together, they will develop ways to build the test beds, manufacture drug delivery systems, market the final product and gauge reactions of patients and the medical community.

The Center uses Katti's innovation in nanomaterials to grow human bone, combined with cancer cell seeding to generate cancer tumors. The tumors will mimic human tumors that have reached the metastasis stage. NDSU researchers will use the tumors to test new anti-cancer drugs and drug delivery systems. The project also will closely study the biology of cancer and its growth onto bone.

The time it takes to test and bring new cancer drugs to market could be significantly decreased due to the Center's ability to conduct several trials at a time on the test-

beds. According to the American Cancer Society, new cancer drugs are studied for an average of six years before they enter clinical trials. It takes another eight years for a drug to go through clinical trials and get approved.

Trials are currently done in a petri dish or with the use of animals, which slows progress because neither method resembles human biology as closely as NDSU's cancer test-beds.

"We are not mice and we are not petri dishes," Katti said. "The number of people who can benefit from the cancer test-beds will be tremendous."

One benefit could be targeted medical care using a patient's stem cells to create cancer tumors on test-beds. This would enable researchers to find the most effective medications for that patient's cancer without causing pain for the patient.

The Center could help lighten the heavy economic burden for patients dealing with the disease. The National Institutes of Health estimates the annual cost of cancer could reach more than \$200 billion by 2020.

Katti said she plans to add several graduate students, additional faculty and undergraduate students when the Center opens.

She expects innovative scientific discovery will help the Center grow and become nationally competitive.

"We hope to initially find our niche with unique, creative ideas and with synergy," Katti said. "Scientific discovery will be paramount for us. We'll always need to be at the cutting edge of discovery. That's where all of the big national centers started. And that's where we will start."





## NDSU OFFERS FIRST DRONE PHOTOGRAPHY CLASS

NDSU first offered a drone photography class in 2017. Developed by Meghan Kirkwood, a studio art instructor whose expertise is photography, the class was part of the NDSU Honors Program. Kirkwood's vision for the class was focused on a deep exploration of this emerging field of photography and its real-world applications and issues.

In the past, capturing aerial footage required an airplane or satellite. The technology to create aerial images for recreational and professional purposes today is more accessible than ever. It has also opened up a whole new set of questions about air space and privacy. "People feel nervous about seeing things flying around," Kirkwood said. "Who is operating it? What are they looking at? People are excited, but also apprehensive."

Kirkwood compares the use of drones to the first aerial photography from air balloons in the mid-1800s. "It's a powerful moment that changes how people see space."

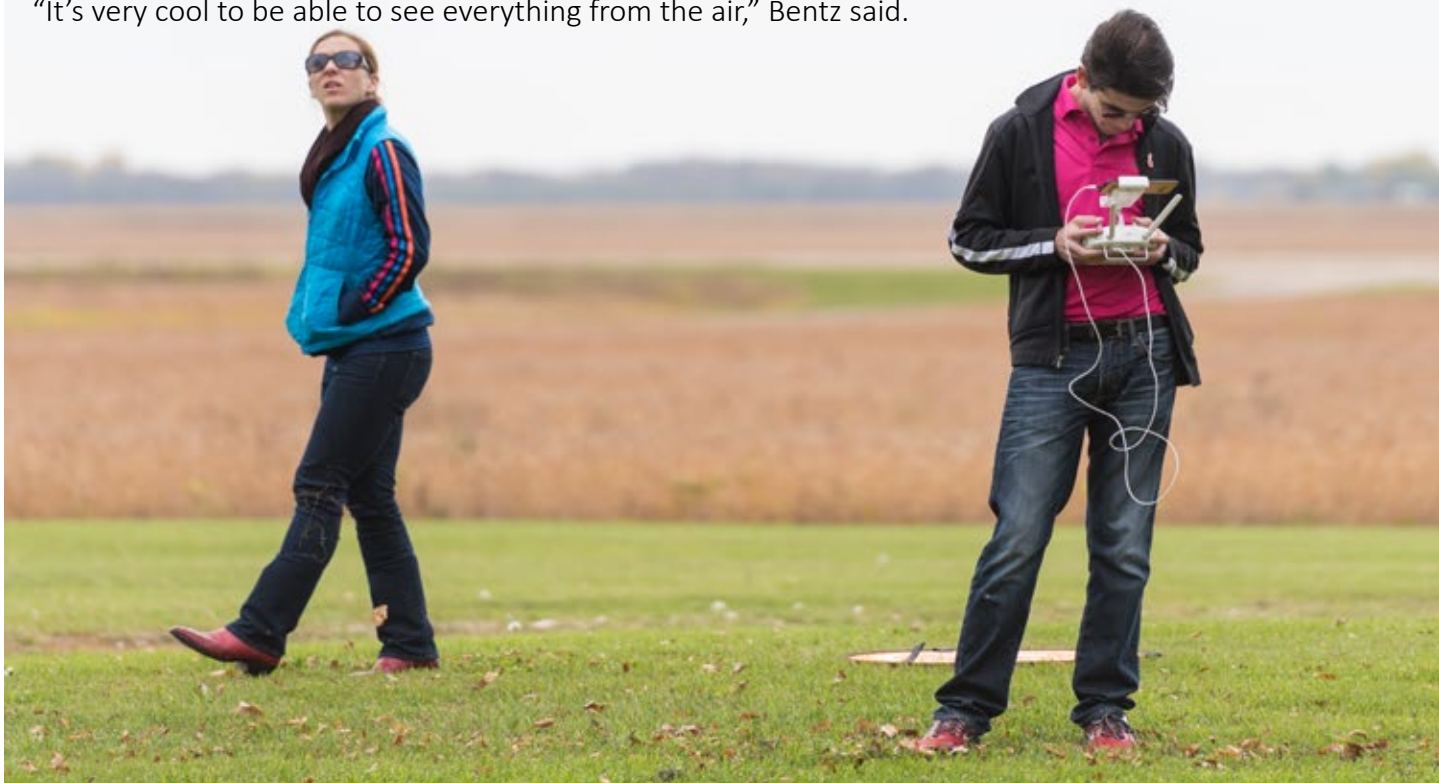
Overall objectives of the class were to develop an informed set of ideas about the technology, whether it's used for recreation now or in a student's future career. The class covered the history of aerial photography, the rapidly-changing rules governing drone operations, and how to take high-quality photos and video with professional drone applications. Disciplines where the technology could be used include agriculture, art, journalism, law enforcement, architecture and landscape architecture.

Students were attracted to the hands-on experience. "I've never flown a drone before, and it sounded really interesting," said Kylie Bentz, a junior majoring in biochemistry.

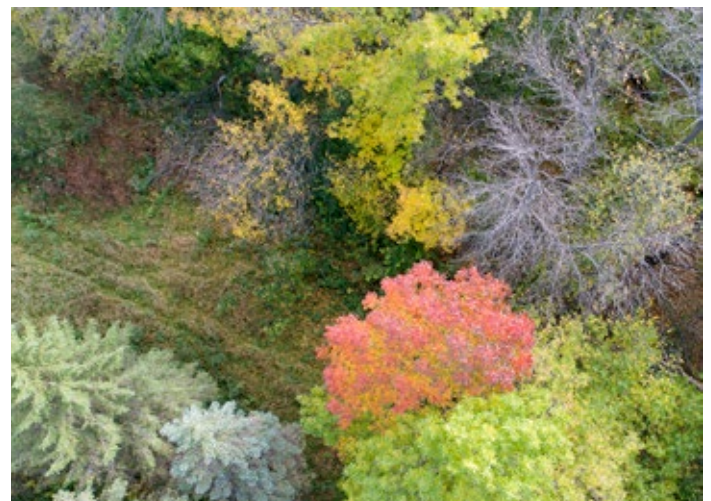
Bentz was among the 18 students in the class, which includes students from many majors, including English, engineering, computer science, finance and biochemistry. It also included Minnesota State University Moorhead students through Tri-College.

One of Bentz's favorite parts of the class was a real-world application. The class took a field trip to Bismarck, her hometown, to take aerial photos of historical sites along the Missouri River. The photos will be used by an environmental planning class at NDSU that is working on plans for a visitor's center.

"It's very cool to be able to see everything from the air," Bentz said.







# MOVING TOWARD INDIVIDUALIZED MEDICINE IN CARING FOR OBESE PATIENTS

Dr. Kristine Steffen, associate professor of pharmaceutical sciences, received a \$3.7 million, five-year National Institutes of Health grant award for a study that examines how biological and behavioral factors interact in determining the success of bariatric surgery. Steffen serves as co-principal investigator in the study with collaborators from the Cleveland Clinic Lerner College of Medicine, Neuropsychiatric Research Institute, Sanford Eating Disorders and Weight Management Center, the University of North Carolina at Chapel Hill, Kent State University, and Brown University.



The research team is investigating factors for each of the two most common bariatric surgery procedures—Roux-en-Y Gastric Bypass and Sleeve Gastrectomy. Data from the study may allow doctors to better identify bariatric surgery candidates who are at risk for sub-optimal outcomes after surgery. Information from the study also may help clinicians target risk factors that can be modified.

The research includes investigating the inter-relationships between the bacterial composition of the gut and problematic eating behaviors, physical activity, mood symptoms, and cognitive function. Data and analysis from the study will be instrumental in moving toward individualized medicine in caring for patients with obesity who seek bariatric surgery.

# ALZHEIMER'S DISEASE IS FOCUS OF NIH-FUNDED RESEARCH TEAM

An NDSU research team is focusing on designing a gene delivery carrier that efficiently delivers neurotrophic growth factor to the brain in an effort to prevent and treat Alzheimer's disease. The most common type of dementia in elderly populations, Alzheimer's disease accounts for 60 to 80 percent of such cases. More than 46 million people worldwide live with dementia, and numbers are expected to increase to 131.5 million by 2050. Global costs to manage dementia will reach \$1 trillion, according to a 2015 report from Alzheimer's Disease International.

Dr. Jagdish Singh, chair and professor of pharmaceutical sciences in the College of Health Professions, received a \$1.89 million grant award for the Alzheimer's disease study. The R01 grant from the National Institute on Aging of the National Institutes of Health spans five years. The research team includes Dr. Takahisa Kanekiyo of Mayo Clinic, Jacksonville, Florida, as co-principal investigator. Research will be conducted in vitro and in vivo in Alzheimer's animal models.





“Although gene therapy possesses potential to treat various neurodegenerative diseases, its clinical application is limited, primarily by methods that efficiently deliver the therapeutic gene across the blood brain barrier,” said Singh.

The brain possesses what amounts to its own security system. The blood brain barrier protects the brain from substances that may injure it. That same mechanism can provide challenges when treating Alzheimer’s and other diseases. The blood brain barrier lets some materials cross, but prevents others from doing so. Drugs or gene therapy that might help treat certain diseases such as Alzheimer’s may not breach the barrier, or may not cross the blood brain barrier in amounts that are therapeutic. Singh uses nanotechnology-based delivery systems to deliver the Nerve Growth Factor gene across the blood brain barrier to assist in treatment and prevention of Alzheimer’s disease.

## BOOK PUBLICATION

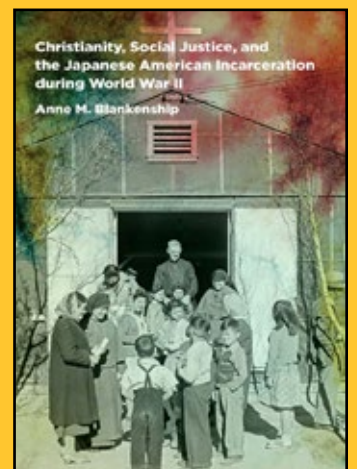
### CHRISTIANITY, SOCIAL JUSTICE, AND THE JAPANESE AMERICAN INCARCERATION DURING WORLD WAR II

BY ANNE M. BLANKENSHIP

Examining how church leaders ministered to the sizable Christian minority among the Japanese Americans incarcerated in camps during World War II, this book discusses how these Christians were forced to assess the ethics and pragmatism of what they saw as an unjust social system.

Blankenship came up with the idea for the book when she stumbled upon an archive of material at the Jerome County Historical Society while visiting her grandmother in Idaho. “Their basement was a mess of dusty stacks of newspapers and folders full of documents about Minidoka Relocation Center, a Japanese American incarceration center that operated nearby during World War II,” Blankenship commented. “I didn’t end up using more than one document from the Jerome archive, but it led me to investigate how much had been written about religious practices in the camps.”

Blankenship added that her book explores both religious practices among incarcerated Japanese Americans and the response from sympathetic white Christians. “Many progressive Protestants and Catholics voiced their immediate support for the minority after December 7. Only Quakers sustained that public protest once the government announced the removal of more than 115,000 people—the majority of whom were U.S. citizens—from the West Coast and confined them in remote camps,” she said. “Christian groups were the only national organizations that worked to alleviate conditions in the camps, help with resettlement or change public opinion about the minority. My book will begin to fill the gap in our knowledge of the incarceration and also demonstrate the diversity of social justice programs among mainline Protestants at the time.”



## SANFORD HEALTH SEED GRANTS

Sanford Health launched a program with NDSU to develop faculty research collaborations in human nutrition, weight management and other dietary related areas. Sanford is providing \$250,000 annually for five years for the seed-grant program. The following faculty members were awarded grants in 2016 and 2017:

*Low Cost Acetone Sensor for Early-Stage Diabetes Diagnosis and Daily Monitoring*

PI: Danling Wang, Assistant Professor, Electrical and Computer Engineering

*Colon Cancer Reduction and the Gut Microflora: Effect of Flavonoids from Red Wheat*

PI: Senay Simsek, Associate Professor, Plant Sciences

*Nanocapsule-mediated Dietary Delivery of Arginine for Acute Wound Healing*

PI: Mohiuddin Quadir, Assistant Professor, Coatings and Polymeric Materials

*Protein Intake and Muscular Health with Aging: Effects of Increased Physical Activity*

PI: Kyle Hackney, Assistant Professor, Health, Nutrition & Exercise Sciences

*Downregulation of D5D to Exploit Anti-cancer Effects of omega-6 Diet Supplementation for Colon Cancer Treatment*

PI: Steven Qian, Associate Professor, Pharmaceutical Sciences

*The Effect of Nutrient Intake and Probiotic Administration on Weight and Glucoregulation Before and After Bariatric Surgery*

PIs: Kristine Steffen, Associate Professor, Pharmaceutical Sciences  
Co-PI: Amanda Brooks, Assistant Professor, Pharmaceutical Sciences

# BIOINFORMATICS SEED GRANT PROGRAM

Through the North Dakota National Institutes of Health IDeA Networks of Biomedical Research Excellence (INBRE) program, Bioinformatics Seed Grants are provided to launch promising new research seed projects and bring them to the point where they can attract additional funding from external sources. Two projects were awarded in 2016:

*Development of a Proteomic Workflow Analysis Platform for Evaluating Pancreatic Cancer Therapies*

PI: Katie Reindl, Associate Professor, Biological Sciences

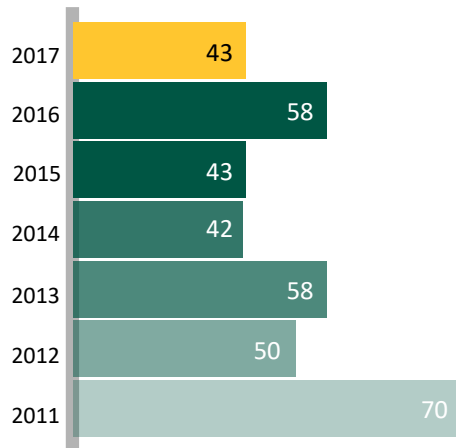
Co-PI: Simone Ludwig, Associate Professor, Computer Science

*Understanding the Role of Trophoblastic Giant Cells in Placental Function*

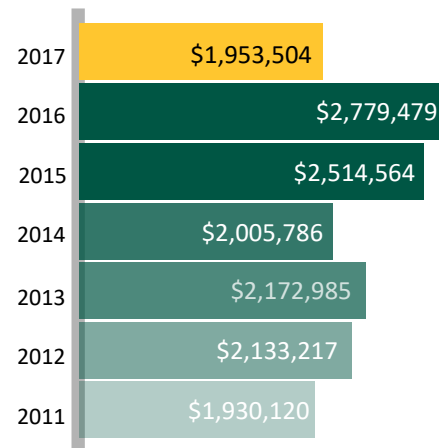
PI: Kim Vonnahme, Professor, Animal Sciences



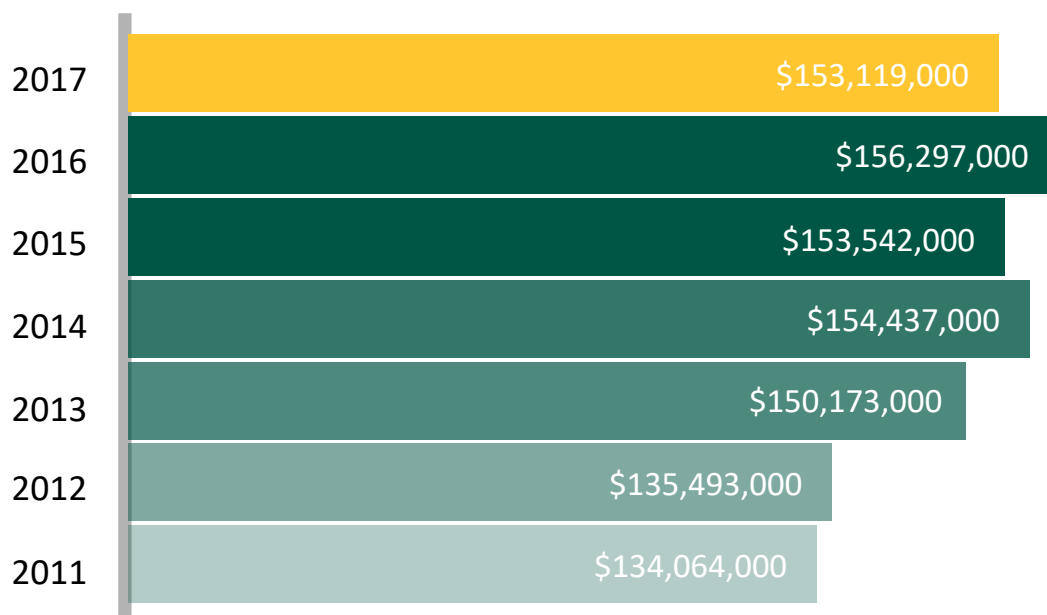
### INVENTION DISCLOSURES



### LICENSING INCOME



### NDSU HIGHER EDUCATION R&D EXPENDITURES

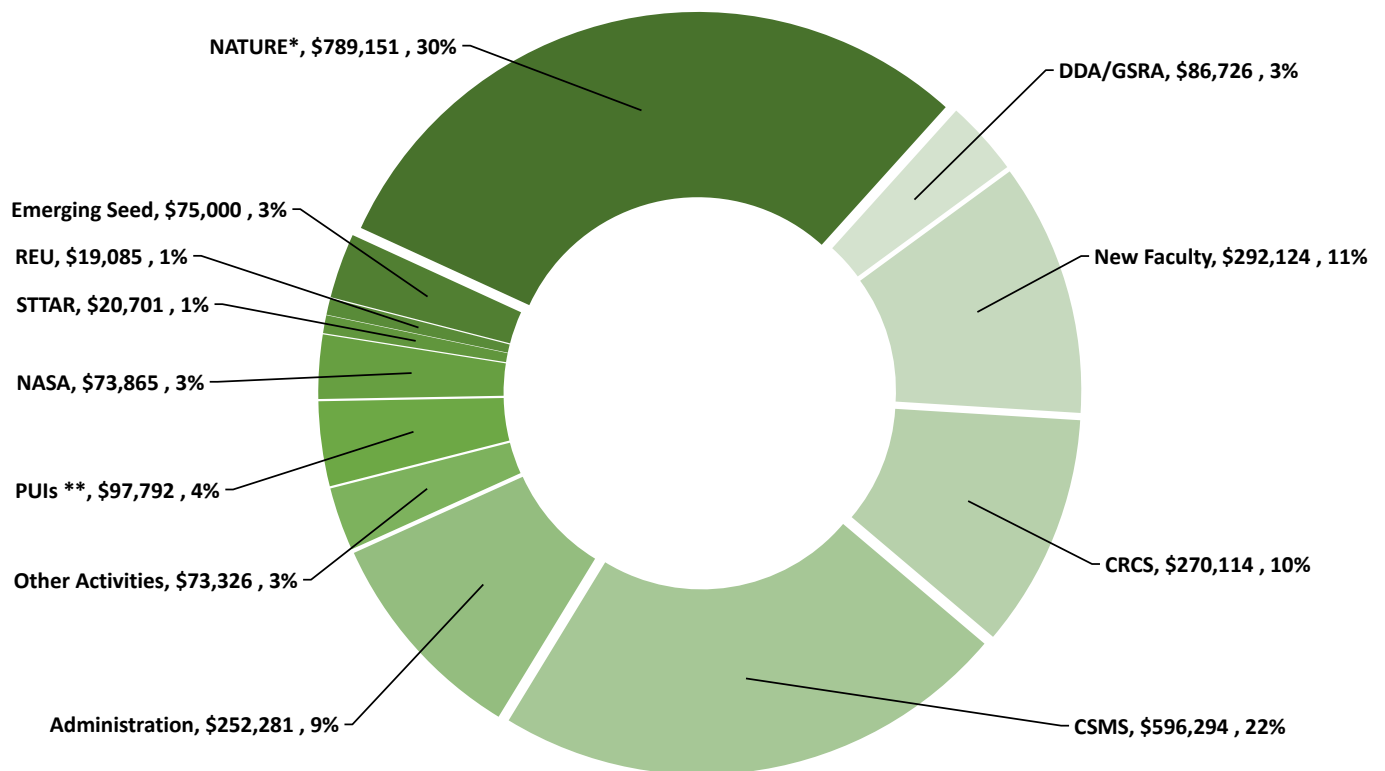


## EXTERNAL AWARDS BY SOURCE



Commodity	\$ 8,021,977	\$ 6,327,352	\$ 7,054,503
Federal	\$43,828,337	\$48,693,023	\$41,084,039
Foundation/Non-Profit	\$ 3,943,861	\$ 3,943,861	\$ 3,124,033
Other	\$ 408,479	\$ 156,230	\$ 1,606,226
Other Government Office	\$ 332,013	\$ 272,052	\$ 428,728
Private	\$ 2,856,041	\$ 2,331,270	\$ 2,653,175
State	\$ 6,095,949	\$ 9,775,621	\$ 5,766,860

## FY17 NDSU EPSCoR FUNDED PROJECTS



\*includes funds spent directly at the five Tribal Colleges; \*\*Includes funds spent at PUIs

CRCS - Regional Climate Studies Cluster  
 CSMS - Sustainable Materials Science Research Cluster  
 DDA - Doctoral Dissertation Assistantship  
 GSRA - Graduate Student Research Assistantship  
 NATURE - Nurturing American Tribal Undergraduate Research and Education

PUI - Primarily Undergraduate Institution  
 STTAR - Students in Technology Transfer & Research  
 UG STEM - Undergraduate STEM Program  
 WISE - Women in Science and Engineering

NSF HIGHER EDUCATION RESEARCH AND DEVELOPMENT 2016 DATA

**\$156,297,000**

Overall expenditures

**124 of 640**

NDSU overall ranking

**86 of 393**

Among public institutions only

**167**

Federal funds received ranking

**19**

State and local funds  
received ranking

**92**

Ranking with medical school  
expenditures excluded

NDSU category rankings  
(among all 640 institutions)

Agriculture Sciences

**14**

Natonal Resources  
and Conservation

**24**

Chemistry

**85**

Material Sciences

**17**

Psychology

**87**

Social Sciences

**54**



[www.ndsu.edu/research](http://www.ndsu.edu/research)