



## Report on MnDRIVE initiative to Minnesota State Legislature

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### Report Preparation Costs:

Per the requirements set forth in Minnesota Statute 3.197, the cost to prepare this report was \$95.

### Background

MnDRIVE – Minnesota’s Discovery, Research, and InnoVation Economy – is a landmark partnership between the University of Minnesota and the State of Minnesota that aligns areas of University research strength with the state’s key and emerging industries to address grand challenges. Beginning in FY 2014, the state began investing approximately \$18 million annually in four research areas identified by University faculty and deans and corporate partners as the most promising areas for partnership: Robotics, sensors and advanced manufacturing; Global food ventures; Advancing industry, conserving our environment; and Discoveries and treatments for brain conditions. The University of Minnesota Informatics Institute (UMII), which fosters and accelerates data-intensive research, receives partial funding from MnDRIVE and provides key support to these projects. In its 2017 session, the Minnesota Legislature passed additional funding (\$4 million annually) for a MnDRIVE cancer initiative, Cancer Clinical Trials.

MnDRIVE represents a unique, collaborative research model involving interdisciplinary research projects across the University that address grand challenges and include industry partnerships as a key component. The University of Minnesota’s Office of the Vice President for Research (OVPR) provides accountability measures for the initiative and serves as an advocate for the program at the Legislature. Each of the five research areas have committees and advisory boards to oversee project implementation and outreach.

### Metrics & Results

During the third biennium of MnDRIVE funding (July 1, 2017 through June 30, 2019 covering fiscal years 2018-2019) the OVPR worked with principal investigators of each of the five MnDRIVE areas projects to gather data every six months. OVPR requested information on:

1. Number of people hired
2. Invention disclosures to the Office of Technology and Commercialization
3. Funding acquired from external grants (e.g., NSF, NIH, USDA, corporate funding)
4. Success stories resulting from MnDRIVE research and participation

**To conduct research, MnDRIVE researchers hired 348 people. MnDRIVE researchers acquired more than \$141 million in external funding and submitted 133 disclosures for inventions to Tech Comm.**



## Success Stories

Professor Michael McAlpine's team is using one-of-a-kind 3D printers to create life-like organs that can be used in surgery practice and a bionic eye with sensor that could someday help the blind to see.

Researchers in the BioTechnology Institute are developing a sustainable method to remove toxic metals, such as arsenic, from contaminated soil using plants paired with a soil microbe that incorporates the toxins into the plant tissue. Plants can then be harvested and burned to collect the metal instead of much more costly methods of soil removal and long-term storage.

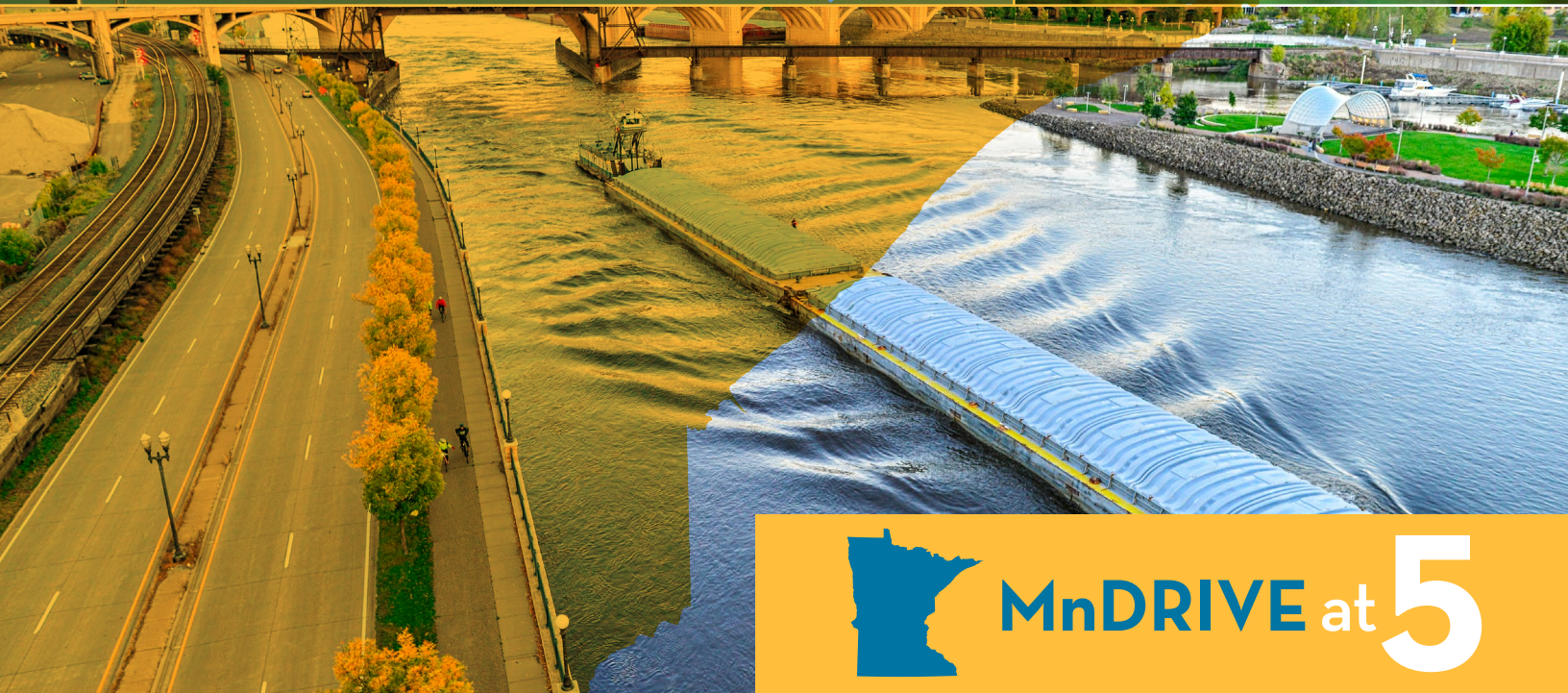
Neuromodulation Fellow Dr. David Darrow is leading a clinical trial that is researching ways to restore voluntary movement and control of autonomic function to people with spinal cord injury (SCI). The study involves an implanted stimulating device and app tools to collect data and allow the team to optimize the stimulation protocol for each patient.

An invention originally developed to detect contamination in food led to the creation of UMN startup Claros Technologies, which uses the technology in a filtration system that removes toxins, such as mercury, phosphorus, and PFAS chemicals from waterways.

By the end of 2018, Minnesota Masonic Charities, Cancer Clinical Trials sites had enrolled a total of 95 patients onto 22 unique cancer clinical trials. The trials span lung, breast, GI, prostate, and other cancers.

**The attached MnDRIVE at 5 document, prepared for different purposes, highlights the accomplishments of MnDRIVE-supported researchers over the program's first five years.**





**MnDRIVE** at 5

Five Years of Minnesota's Discovery,  
Research, and InnoVation Economy







Robotics, Sensors, and  
Advanced Manufacturing



Global Food Ventures



Advancing Industry,  
Conserving Our Environment



Discoveries and Treatments  
for Brain Conditions



Minnesota Cancer  
Clinical Trials Network

## Research With Impact

**MnDRIVE (Minnesota's Discovery, Research, and InnoVation Economy)** is a unique, collaborative research partnership between the University of Minnesota and the State of Minnesota that aligns areas of research strength with the state's key and emerging industries, as well as some of its most important challenges.

In 2013, the State of Minnesota authorized an \$18 million recurring annual investment in four research areas: Robotics, Global Food, Environment, and Brain Conditions. In 2017, the state appropriated another \$4 million per year for a fifth research area: Cancer Clinical Trials. Each of the research areas have committees and advisory boards to provide guidance on research objectives and resource distribution.

Nearly \$100 million in state funding was allocated to MnDRIVE in its first five years, helping to attract faculty who are leaders in their fields, hire research staff, renovate lab spaces, purchase equipment, and conduct world-class research with direct relevance to the residents and industries of Minnesota. In that same period, MnDRIVE supported over 400 interconnected research projects





involving more than 1,200 researchers and leading to more than 300 new inventions.

To help catalyze collaboration among the research areas, in 2014, nearly \$6 million in MnDRIVE funding was awarded to 12 transdisciplinary research projects (each project had to involve at least three of the research areas) that addressed big questions in areas such as bioremediation, wearable technologies, monitoring disease outbreaks, and brain conditions. Approximately 90 researchers in 16 colleges and 50 departments across three UMN campuses participated in the transdisciplinary projects. More than 30 external partners were involved, including state agencies and industry leaders. Since the program ended, MnDRIVE researchers have continued to work across areas on topics such as soil microbes and filtration.

In many cases, MnDRIVE projects produce early results that then set researchers up to attract additional funding, allowing them to continue their work and move it in new directions. During the program's first five years, MnDRIVE-supported researchers secured an additional \$360 million from federal agencies like the National Institutes

of Health, NASA, and the Department of Energy and industry leaders like 3M, Boston Scientific, the Midwest Dairy Association, and PepsiCo.

MnDRIVE has also bolstered University-community connections and the University's research rankings. In a recent survey, MnDRIVE-supported researchers reported increased connections with the public and industry in Minnesota, as well as a greater willingness to take risks to achieve higher societal impacts. The program has supported the University's climb up the rankings in natural sciences research, while also providing opportunities to educate tomorrow's high-tech workforce, including a successful partnership with the North Star STEM Alliance, which provides research internships for students from underrepresented minorities.

The MnDRIVE model of interdisciplinary collaboration provides a worthy template for future research investments and partnerships between the University and Minnesota.

**“As a land-grant university, the University of Minnesota is dedicated to supporting the people of Minnesota. We are excited and encouraged by elected leaders’ support of University research through MnDRIVE and how that support has driven meaningful progress not only in addressing some of the state’s largest challenges, but in bolstering its key industries. MnDRIVE also provides a proven model for future research partnerships with the State of Minnesota.”**

Christopher J. Cramer, Vice President for Research

## Measures of Success

*Data represents MnDRIVE activity from 2014 - 2019*

**\$97M**

total investment by the State  
of Minnesota

**1,200**

UMN researchers involved with  
MnDRIVE projects

**150**

UMN departments across  
three campuses

**750**

UMN faculty, students, and  
staff hired

**\$360M**

in external funding leveraged by  
MnDRIVE supported researchers

**400+**

projects funded

**60+**

MnDRIVE students graduated

**800+**

external partners

**35,000+**

members of the public engaged  
through outreach efforts

**300+**

inventions disclosed by  
MnDRIVE researchers

### **Selected startup companies founded by MnDRIVE researchers:**

CoreBiome, Farm Vision, Jord BioScience,  
Claros Technologies, Resynergi, Yonder

### **CoreBiome Acquired by Leading Diagnostics Company**

CoreBiome, based on UMN technology that analyzes communities of microbes for human health, agricultural, and environmental applications, was purchased in 2019 by OraSure Technologies, a developer of medical diagnostic devices. CoreBiome was founded by UMN researchers Dan Knights, Daryl Gohl, and Kenny Beckman.

# University of Minnesota Participants

More than 150 departments in 35 colleges/units across three campuses have participated in MnDRIVE, including:

## Duluth

Labovitz School of Business and Economics  
Natural Resources Research Institute  
Swenson College of Science and Engineering

## Morris

Science and Math Division  
West Central Research and Outreach Center

## Twin Cities

Bell Museum of Natural History  
BioTechnology Institute  
Clinical and Translational Science Institute  
College of Biological Sciences  
College of Continuing and Professional Studies  
College of Design  
College of Education and Human Development  
College of Food, Agricultural, and Natural Resource Sciences  
College of Liberal Arts  
College of Pharmacy  
College of Science and Engineering

College of Veterinary Medicine  
Earl E. Bakken Medical Devices Center  
Global Programs and Strategy Alliance  
Humphrey School of Public Affairs  
Institute on the Environment  
Law School  
Masonic Cancer Center  
Medical School  
Minnesota Agricultural Experiment Station  
Minnesota Robotics Institute  
Office for Equity and Diversity  
Office of Information Technology  
Office of the Vice President for Research  
Office of Undergraduate Education  
Regional Sustainable Development Partnerships  
Research Computing  
School of Dentistry  
School of Public Health  
Senior Vice President of Academic Affairs/Provost  
Technology Commercialization  
UMN Extension  
University Libraries

## University of Minnesota Informatics Institute

Another MnDRIVE partner, University of Minnesota Informatics Institute (UMII), provides key support to the research areas for data-intensive projects. In addition to providing grants for faculty research, UMII has awarded more than \$3 million to 72 graduate students through its MnDRIVE fellowship program, helping to develop the next generation of data scientists in the state.







## Robotics, Sensors, and Advanced Manufacturing

*Leveraging strengths in STEM fields to develop innovations and industries that propel the state's economy forward and fulfill workforce needs.*

The MnDRIVE Robotics, Sensors, and Advanced Manufacturing initiative is driven to provide solutions to many grand challenges using technological innovations and tools. It is leveraging the University of Minnesota's strengths in science, technology, engineering, and mathematics (STEM) fields to advance current and emerging research in robotics technology and artificial intelligence, as well as to educate the next generation of STEM leaders for Minnesota and beyond.

MnDRIVE funds have introduced robotics and engineering to more than 10,000 K-12 students, many from underrepresented groups, statewide.

Undergraduate and graduate students from the College of Science and Engineering on the Twin Cities campus continue to work closely with local schools and community groups to plan, run, and improve interactive programs for school-aged children.

MnDRIVE-supported researchers are pairing up with corporate partners in many areas, including health care, precision agriculture, and industrial markets. They're pushing boundaries in myriad projects, including:

- Solar-powered drones to give local farmers "eyes in the sky" to monitor pests and increase crop yields
- Pint-sized humanoid machines that spot early signs of autism and neuropsychiatric disorders, like Tourette's Syndrome, in children
- Smart clothing for astronauts
- 3D-printed bionic eyes for the visually impaired
- More dexterous prosthetics for amputees

Two key initiative outcomes are the 20,000-square-foot Gemini-Huntley Robotics Research Laboratory and the Minnesota Robotics Institute (MnRI). The \$13 million lab—made possible by private support leveraged from a \$2 million MnDRIVE investment—is expected to further enhance many ongoing faculty-student projects on ground, water, and aerial robots. The new Master of Science in Robotics at MnRI brings together the knowledge and expertise from more than 30 faculty in nine departments across five different University of Minnesota colleges, plus visiting researchers from across the US and the world.



### Educational K-12 Outreach Programs

MnDRIVE scholars perform significant outreach in grade schools for extracurricular Lego League and Tech League teams, as well as in a summer Tech Camp on campus.



## Highlights

**20,000** square foot Gemini-Huntley Robotics Research Laboratory, seeded by MnDRIVE and funded by private donors

**40** highly sought robotics engineers will graduate annually from a new degree-granting robotics institute

**10,000+** children have been introduced to science and engineering through robotics summer camps and outreach programs

UMN ranks **5th** in robotics research in the US, according to Computer Science Rankings



### **Gemini-Huntley Robotics Lab**

UMN students are thriving in a new space dedicated to robotics, the Gemini Huntley Robotics Lab. The space promotes cross fertilization of ideas between aerospace engineering, agriculture, environmental monitoring, and mechanical engineering. A \$2 million MnDRIVE investment helped attract \$11 million in private funds for the lab.



### **Talking Robots Detect Early Signs of Autism**

Professor Maria Gini's team is using talking robots to collect data on how children interact with their surroundings and to help diagnose autism in children 2 to 4 years old. Earlier detection increases the opportunities health professionals have to step in and begin treatment when children's brains have more plasticity and are more responsive.

### **External project partners include:**

Boeing, Boston Scientific, Honeywell, Innotronics, Kansas DOT, Medtronic, Minnesota Corn Growers Association, Minnesota DOT, Nextern, PaR Systems, Seagate, Sentra, Toro



## Global Food Ventures

*Partnering research, agriculture, and industry to develop sustainable solutions for securing the global food supply.*

The world's population is expected to grow to more than 9 billion people during the next 40 years, requiring a 70 percent increase in food supply. Despite today's abundance, nearly one billion people are undernourished, and, even in Minnesota, more than 10 percent of our residents lack sufficient food. The economic and human toll of hunger and malnutrition not only affects countries that are food and nutrition insecure, but also the global economy. Foodborne illness and obesity caused by non-nutritious food drive increasing rates of chronic disease and add to health care costs.

Since the MnDRIVE initiative launched, researchers in Global Food Ventures have focused on addressing challenges related to food safety and supply through three research focus areas:

- *Precision agriculture*—Drone technology used to detect nitrogen deficiency in crops, developed by researchers in the College of Food, Agricultural, and Natural Resource Sciences and the College of Science and Engineering, and licensed to Senterra, a Minnesota agritech company.
- *Informatics and crop/animal health*—A collaboration with industry partners and food producers that explores ways to address the problem of oat rust, a plant pathogen that can reduce yields by up to 40 percent.
- *Innovations focused on multiple dimensions of food safety for animals and humans*—The development of an accurate, cost-effective test to detect pathogens that cause foodborne illnesses, resulting in six US patents and the potential to improve food safety in Minnesota.

### Can Microbes Help Farmers Be More Productive AND More Sustainable?

MnDRIVE resources have supported UMN Plant Pathology professor Linda Kinkel's work to commercialize microbial inoculants for enhancing crop yields.

"Kinkel envisions a day in the not too distant future when farmers will test their soil for microbes, as they do now for nutrients. Then, perhaps, they will grow a certain plant that feeds the good microbes or add more good microbes to the soil." (MPR, 11/26/2018)







## Food Safety Research Leads to New Clean Water Tech

Claros Technologies, a UMN startup company, is developing water filtration systems that safely remove toxins, such as mercury and phosphorus, from our lakes, rivers, and waste streams. According to a 2014 report, 44 percent of Minnesota's waters are impaired. The technology stems from an earlier invention to rapidly detect contamination in food.

## Highlights

Supported **41** graduate students in global food areas

Consortium of **18** universities organized by UMN for oat production research

Developed **5** small-scale deep winter greenhouse pilot sites in Greater Minnesota communities

### External project partners include:

Archer Daniels Midland, Cargill, General Mills, Land O' Lakes, PepsiCo, United Soybean Board, USDA



### Is Aquaponics a Viable Agricultural Model?

Nick Phelps, formerly with the College of Veterinary Medicine, who now leads the Minnesota Aquatic Invasive Species Research Center (MAISRC), and collaborators from the College of Food, Agricultural, and Natural Resource Sciences, spent two years researching the viability of aquaponics as a sustainable food source. As part of the project, Phelps and his team explored the market potential for aquaponically raised fish and whether it makes economic sense for farmers to grow aquaponic products for the commercial market.





## Advancing Industry, Conserving the Environment

*Research-based solutions to environmental remediation challenges in support of sustainable economic growth.*

From the treatment of municipal wastewater and agricultural runoff to the remediation of contaminated soils, University of Minnesota researchers are partnering with stakeholders from various industry sectors, state and municipal agencies, and nonprofit organizations to develop research-based solutions to pressing environmental challenges.

Since its inception, MnDRIVE Environment funds have helped create and now support a world-class hub for bioremediation at the University. Hiring five bioremediation experts across five departments and two campuses has provided core expertise, and investments in equipment, students, and postdocs have helped advance innovative bioremediation projects and research. The MnDRIVE Environment Seed Grant Program has supported over 65 pilot “lab-scale” research projects that are training the

next generation of undergraduate, graduate, and postdoctoral researchers, while simultaneously engaging industry partners in solution generation. The Demonstration Grant Program has supported the next level of promising and scalable research by funding proven lab-based projects that are ready to be deployed and tested in the field.


Recently, MnDRIVE Environment expanded its scope of research beyond bioremediation to include chemical remediation strategies. In 2020, as part of a new engagement strategy designed to build research capacity across the University community, increase impact for industry and government partners, and move promising new technologies from the lab to the field, Environment launched a newsletter, and will be publishing an annual impact brief that showcases research outcomes and statewide impact.

### Removing Contaminants from Agricultural Runoff

In Willmar, MN, UMN researchers Gary Feyereisen, Carl Rosen, and Satoshi Ishii have developed a field scale demonstration project using woodchip bioreactors to decontaminate agricultural drainage before it enters our waterways. The process they have developed uses microorganisms found in nearby soil to convert nitrates from nitrogen fertilizer into a nitrogen gas compound that is no longer an environmental contaminant. Current testing looks to determine which microbes are most effective in Minnesota’s colder climate. This solution has the potential to decrease the number of large algal blooms and thereby diminish “dead zones,” which adversely affect local environments.







### New Solutions for Biocorrosion

Duluth's shipping industry is vital to Minnesota, but its port infrastructure is at risk from biocorrosion and biofouling. MnDRIVE researchers Randall Hicks (UMD) and Mikael Elias (UMTC) have identified an anti biocorrosion enzyme as an alternative to widely used but toxic copper oxide paints. Field scale testing in coordination with project partner Duluth Seaway Port Authority has indicated long term efficacy, and researchers are currently exploring commercialization opportunities. This research has also led to development of a partnership with BASF on technologies for bacterial control.

## Highlights

**65** pilot research projects supported by the MnDRIVE Environment Seed Grant Program

**\$1.74M** invested in six field-scale bioremediation demonstration projects

Testing for nontoxic solutions for the **\$9B** annual global market for antifouling coatings

### External project partners include:

American Peat, Dow, Dupont, Geosyntec, Minnesota Pollution Control Agency, Potato Growers Association, Second Harvest Heartland



## Discoveries and Treatments for Brain Conditions

*Partnering with industry to develop new treatments for brain conditions that improve human health and quality of life.*

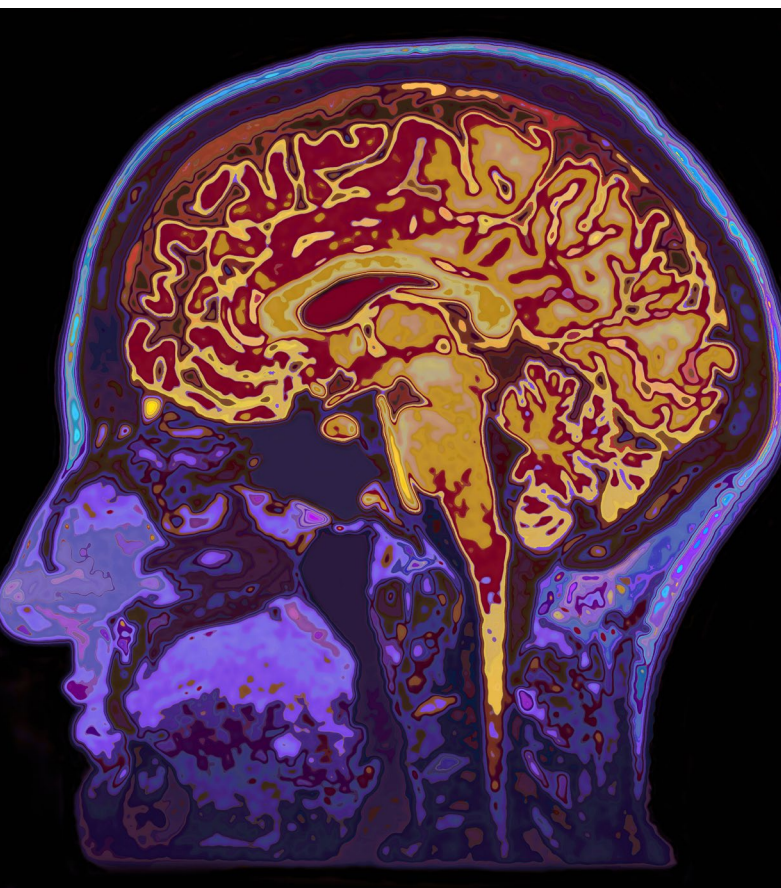
Brain conditions, including Parkinson's disease, stroke, epilepsy, and mental illness, are chronic afflictions that diminish a person's quality of life and affect one in five Americans. The social and economic impacts are devastating, with annual US

health care and lost productivity costs estimated at nearly \$500 billion.

Recognizing the University of Minnesota's existing research strengths in neurosciences and neuroengineering (particularly neural circuit research), MnDRIVE Brain Conditions is building capacity for world-class neuromodulation research that is relevant to patients with brain conditions and to key biomedical industries in the state working to advance neuromodulation therapies.

Brain Conditions has made strategic investments in three mutually reinforcing areas:

- *Faculty hires*—Hiring scientists and clinician-scientists with expertise that extends and complements existing research strengths in neuromodulation at the University.
- *Core infrastructure*—Building and staffing core laboratories to support cutting-edge neuromodulation-related research, including cores for deep brain stimulation (DBS), non-invasive neuromodulation, and optogenetics.
- *Training*—Training the next generation of scientists and clinicians to sustain and amplify the advancements made through the MnDRIVE Brain Conditions initiative and contribute to Minnesota's growing workforce of neuromodulation specialists.



### National Leader in Parkinson's Research

MnDRIVE Brain Conditions funding helped the University land an NIH Udall Center of Excellence for Parkinson's Disease Research, one of eight such centers around the country, funded at \$9.7 million over five years. Since the center's founding in 2016, data and infrastructure from Udall Center projects have been leveraged into \$7.7 million in additional external sponsored projects that advance the center's work on behalf of people with Parkinson's disease and related conditions.



### Fine Tuning Neuromodulation Techniques

UMN psychiatrist and biomedical engineer Alik Widge (L) is developing personalized brain stimulation treatments, particularly new “closed loop” devices, that sense brain signals in real time and respond to a particular patient’s brain abnormalities. Widge’s laboratory prototypes new stimulation models and targets in rodent models, conducts clinical trials of these new technologies, and searches for biomarkers of illness and recovery to guide next generation therapies.



## Highlights

**62** neuromodulation fellows trained in specialized procedures and techniques to evaluate and manage patients with neuromodulation-amendable disorders

**\$17.4M** in grants and leveraged funding associated with the Udall Center of Excellence for Parkinson’s Disease Research

Awarded **\$9.9M** for a National Institute on Drug Abuse Core Center of Excellence for Neural Circuits in Addiction

**\$54M** in leveraged funding for neuromodulation-relevant projects since 2018

### External project partners include:

Abbott, Boston Scientific, FemPulse, HCMC, Lodging Plus Residential Treatment, Medtronic, SynerFuse, Ultran Group



## Minnesota Cancer Clinical Trials Network

*Improving cancer outcomes for all Minnesotans through greater access to cancer clinical trials in prevention and treatment.*

Nearly half of all Minnesotans will be diagnosed with a potentially life-threatening cancer during their lifetimes; one out of four Minnesotans die of cancer, and cancer is the leading cause of death in our

state. To impact these grim statistics, local health care providers need equitable knowledge of cutting-edge cancer research as well as access to the full menu of options for patient care.



The Minnesota Cancer Clinical Trials Network (MNCCTN) is a MnDRIVE-funded partnership between several of the state's largest health care systems to bring cutting-edge cancer clinical trials closer to home for more Minnesotans. Led by the Masonic Cancer Center, University of Minnesota, the MNCCTN aims to remove barriers for clinics that have not had the resources to establish the infrastructure to conduct clinical trials, allowing more providers in Greater Minnesota to offer clinical research opportunities to their patients.

Since its launch in 2018, the MNCCTN has enrolled 451 Minnesotans into 48 unique clinical trials, including prevention, symptom management, and cancer treatment protocols, at 18 partner sites in Greater Minnesota.

Looking ahead, MNCCTN will continue to focus on opening up new sites and expanding access, as well as increasing the number and types of trials available at these sites, to further engage researchers at the University and other research partners to develop studies specifically tailored to challenges in Greater Minnesota, and continue to help build a culture of comfort with research at sites and around the state.

### Can Ginger Extract Help Prevent Cancer?

A significant accomplishment for MNCCTN has been the network's first clinical trial, the GINGER study. Led by Masonic Cancer Center member Anna Prizment, PhD, the study examines the effects of ginger extract on the microbiome of those at risk for colorectal cancer and how the anti inflammatory properties of ginger may reduce the risk of developing colorectal cancer. Specifically, she believes that the anti inflammatory properties impact gut bacteria in a way that reduces one's risk for developing the disease. The study, which closed in late March 2020, enrolled a total of 69 participants at 12 different sites throughout Greater Minnesota. In the process of opening the first study, the MNCCTN team and its partners and sites learned many lessons and developed a model and process for all future clinical trials for the network.



## Highlights

**18** partner sites offer cancer clinical trials throughout Greater Minnesota

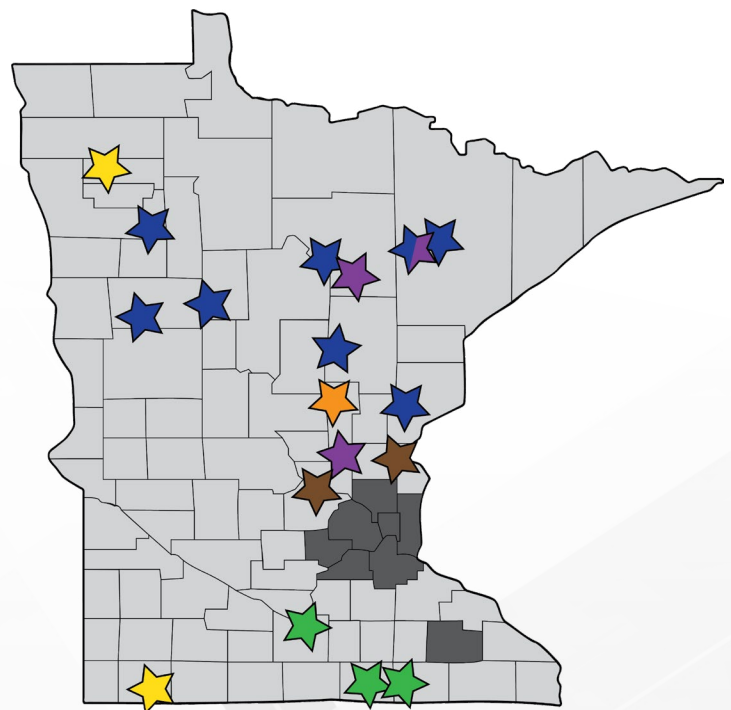
**451** Minnesotans enrolled in clinical trials near their homes

**48** unique clinical trials offered through MNCCTN, its research partners, and national programs

**87** personnel engaged at MNCCTN partner organizations including 26 nurse or research coordinators located at newly enrolling sites

### Expanding Access to Cancer Clinical Trials

Led by the Masonic Cancer Center, University of Minnesota, MNCCTN has helped 18 partner sites to establish and maintain the necessary infrastructure to offer cancer clinical trials to their patients who previously did not have access to clinical research. These clinical partners include: Essentia Health, M Health Fairview, Mayo Clinic Health System, Metro Minnesota Community Oncology Research Consortium, Mille Lacs Band of Ojibwe, and Sanford Health. Actively enrolling sites include: Albert Lea, Aitkin, Austin, Cambridge, Deer River, Detroit Lakes, Fosston, Grand Rapids, Hibbing, Mankato, Monticello, Park Rapids, Princeton, Sandstone, Thief River Falls, Virginia, and Worthington. Seven additional sites are planned to open by the end of 2021.



- Essentia Health
- M Health Fairview
- Mayo Clinic Health System
- Metro-Minnesota Community Oncology Research Consortium
- Mille Lacs Band of Ojibwe
- Sanford Health

# MnDRIVE Leadership

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[mndrive.umn.edu](http://mndrive.umn.edu)





## MnDRIVE

Minnesota's Discovery,  
Research, and InnoVation  
Economy

# MnDRIVE at 5

**MnDRIVE (Minnesota's Discovery, Research, and InnoVation Economy)** is a unique, collaborative research partnership between the University of Minnesota and the State of Minnesota that aligns areas of research strength with the state's key and emerging industries, as well as some of its most important challenges.

## \$22M

MN Legislature's annual investment  
joining UMN research with key  
and emerging state industries

In 2013, a little more than five years ago, the State of Minnesota began an annual investment in the following interdisciplinary research areas:



**Robotics, Sensors, and Advanced Manufacturing**



**Global Food Ventures**



**Advancing Industry, Conserving our Environment**



**Discoveries and Treatments for Brain Conditions**



**Minnesota Cancer Clinical Trials Network\***

\*Launched in 2018.

## 1,200

UMN researchers  
involved with  
MnDRIVE projects

## 150

UMN departments  
across three  
campuses

## 750

UMN faculty,  
students, and  
staff hired

## \$360M

External funding  
leveraged by MnDRIVE  
supported researchers

A recent survey of MnDRIVE-supported researchers reported a willingness to take risks for greater societal impacts (versus following more traditional funding paths), increased connections with the public and industry, and a greater sense of belonging and pride in Minnesota.

**Partnering with industry  
to discover solutions to  
our greatest challenges.**

[mndrive.umn.edu](http://mndrive.umn.edu)

## 5 YEARS

**\$97M** Total state investment

**400+** Projects funded

**60+** MnDRIVE students graduated

**303** Inventions disclosed by MnDRIVE researchers



UNIVERSITY OF MINNESOTA  
**Driven to Discover<sup>SM</sup>**

Crookston Duluth Morris Rochester Twin Cities



## MnDRIVE Robotics, Sensors, and Advanced Manufacturing

- 10,000** Children reached by outreach programs
- 40** Degrees/yr. expected, new Robotics Institute
- 5TH** UMTC national rank, robotics research
- \$10M** Private funds for new Gemini-Huntley Robotics Lab leveraged from \$2M MnDRIVE investment

### Talking Robots Detect Early Signs of Autism

Professor Maria Gini's team is using talking robots to collect data on how children interact with their surroundings and to help diagnose autism in children 2 to 4 years old. Earlier detection increases the opportunities health professionals have to step in and begin treatment when children's brains still have plasticity and are more responsive.



## MnDRIVE Global Food Ventures

- 41** Global food graduate students supported
- 18** Universities in oat research consortium led by UMN
- 5** Deep winter greenhouse pilot sites in Greater MN

### Food Safety Research Leads to New Clean Water Tech

Claros Technologies, a UMN startup company, is a water filtration system that safely removes toxins, such as mercury and phosphorus, from our lakes, rivers, and waste streams. According to a 2014 report, 44 percent of Minnesota's waters are impaired. The technology stems from an earlier invention to rapidly detect contamination in food.



## MnDRIVE Advancing Industry, Conserving our Environment

- \$60B** Global market, anti-biocorrosion coatings
- 11** Inventions disclosed, FY2019
- \$1.74M** Invested in 6 field-scale bioremediation demonstration projects

### New Solutions for Biocorrosion

Duluth's shipping industry is vital to Minnesota, but its port infrastructure is at risk from biocorrosion. UMTC & UMD researchers have identified an anti-biocorrosion enzyme as an alternative to widely used toxic copper oxide paints. Field scale testing has been promising, and researchers are currently exploring commercialization opportunities in partnership with BASF.



## MnDRIVE Discoveries and Treatments for Brain Conditions

- 62** Neuromodulation fellows trained
- 9** Inventions disclosed, FY2019
- 3** Core facilities for neuromodulation research created
- 1** Major NIH center brought to UMN

### National Leader in Parkinson's Research

In 2017, the University of Minnesota was designated a Udall Center of Excellence for Parkinson's Disease Research by NIH (one of eight) to advance clinical, multidisciplinary, translational, and basic research into Parkinson's. Udall Center researchers are leading the development of new treatments for the disease using deep brain stimulation (DBS).



## MnDRIVE Minnesota Cancer Clinical Trials Network

- 15** New locations open for enrollment across MN
- 227** Minnesotans enrolled in cancer clinical trials
- 3** Trials enrolling, with 5 in the pipeline
- 3** Additional sites enrolling soon

### Expanding Access to Cancer Clinical Trials (est. 2018)

Cancer is the leading cause of death in Minnesota, where nearly half of all people will be diagnosed with some type of cancer in their lifetimes. The MN Cancer Clinical Trials Network removes barriers for clinics that have not had the resources to establish the infrastructure to conduct clinical trials, allowing providers in the metro area and Greater Minnesota to offer clinical research opportunities to their patients.