

University Research Update

Scott Snyder, VP Research & Economic Development



University Research

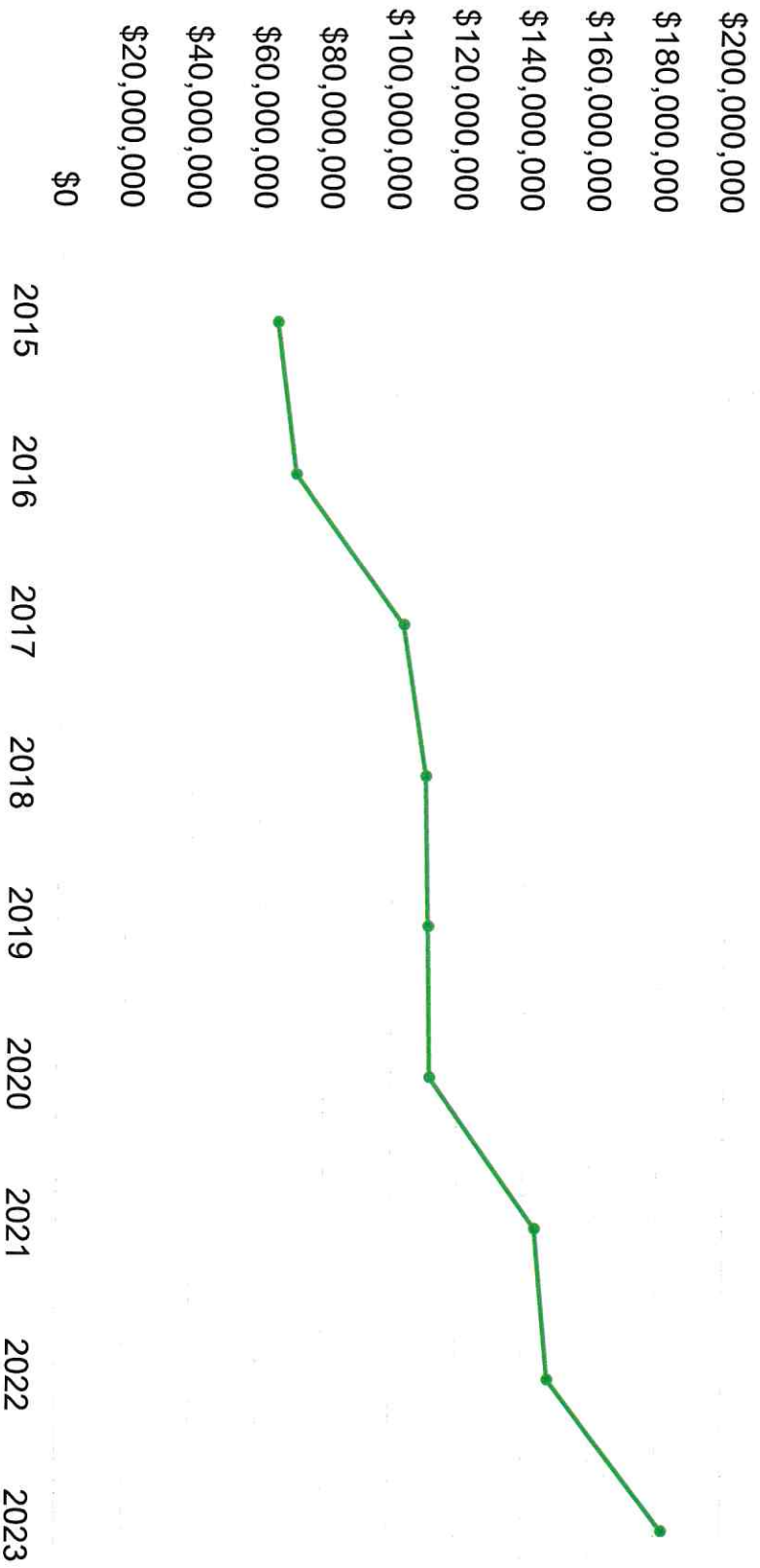
North Dakota gains by critical research discoveries
Medical care, new technologies

Students gain by experiential learning provided from strong faculty research

Quality education is enhanced by the research enterprise

North Dakota communities are improved by strong economic activity
underpinned by commercialization of research discoveries and university
development of a well-paid, skilled workforce

Total Research Expenditures: 2015-2023



Expenditures According to NSF HERD Survey

	FY23	% of FY23 Total
Total Research Expenditures According to HSF HERD Survey	\$182,195,000	—
Federal Research Expenditures*	\$65,890,000	36.1%
State Research Expenditures*	\$46,885,000	25.7%
Industry Sponsored (Business) Research Expenditures*	\$17,438,000	9.6%
Total Award Amount	\$149,921,088.33 510 Awards	—
PhD Conferrals in NSF-Funded Fields	76	—

*As compared to overall total research expenditures.



Grand Challenges

Energy & Environmental Sustainability

Human Health

Rural Health & Communities

Autonomous Systems

Computational & Data Science

National Security & Space

State Research Support ROI



State Investment in National Security & Space

\$23M to Date at UND

National Security Corridor

Satellite Design, Engineering & Assembly

Digital Design and Engineering

Nanofoundry & Materials Research Labs

Satellite Operations Center

Satellite and Space Debris Tracking

High-Speed Laser for Optical Communications

UND National Security Initiative

DoD & DHS Grand Funding

FY2015 – FY2019

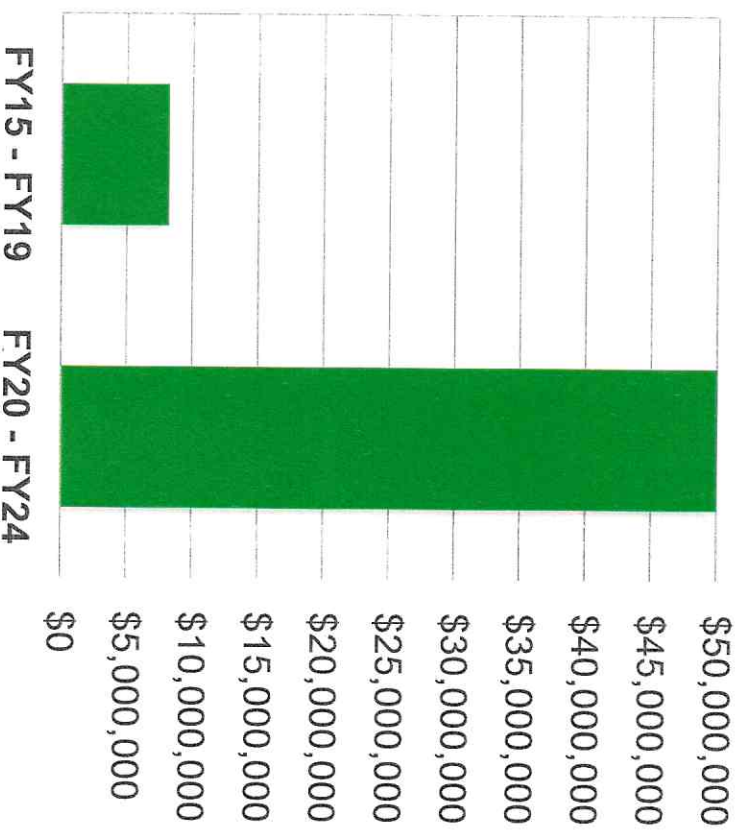
Total Awards – 31

Total Amount – \$8,178,376

FY2020 – FY2024

Total Awards – 97

Total Amount – \$50,275,608.33



Nanofoundry-Related Grants

Epitaxial Growth of Vanadium Nitride (Important for Hypersonics)

Air Force Office of Scientific Research (\$327,000.00)

Dr. Deniz Cakir, Physics & Astrophysics

Spectrally-Multiplexed Photon-Pair Sources for Quantum Sensing and Networking

National Science Foundation (\$800,000.00)

Dr. Marcus Allgaier, Physics & Astrophysics

Design and Understanding Single-Atom Bimetallic and High-Entropy Catalysts for Oxidative Propane Dehydrogenation

American Chemical Society (\$110,000.00)

Dr. Weixin Huang, Chemistry

Economic Diversification Research Fund





Meeting Legislative Intent of the EDRF

...“stimulate economic activity across the state through innovation of new technology, concepts, and products; to promote job creation and career and wage growth; to enhance health care outcomes; to address loss of revenue and jobs in communities with economies that depend primarily on the fossil fuel industry; and to provide experiential learning opportunities for students.”

EDRF Funding Programs

AI Infrastructure	\$1,210,000
Accelerating Technology Readiness Levels	\$300,000
Postdoctoral Fellows	\$255,000
Early Career Faculty Competition	\$280,000
University Research Collaboration	\$201,000
UND Connect – Community Engaged Research	\$91,000
Undergraduate Research	\$66,000

EDRF Funding Programs: Highlights

AI Infrastructure

- Acquisition of a NVIDIA Cluster to fast-track UND's AI capabilities in accelerating vital research areas focused on energy, national security, and biomedicine.

Accelerating Technology Readiness Levels

- Extraction of Rare Earth Elements from Lignite
- Design of Extreme Environment Materials for Space Applications (ISS Mission)
- Device to Predict Catheter-based Urinary Tract Infections
- Design of Bioplastics for Automobile and Energy Applications

Early Career Faculty Research Development

- Novel Measurement Diagnostics for Experimental Hypersonics
- Propulsion and Orbit Management Technologies for Constellations of Low Earth Orbit Satellites
- Machine Vision for Proactive Traffic Safety Assessment at High-Risk Intersections
- Geopolitical and Geo-Economics Implications on Recent Advances in Space Propulsion and Hypersonic Technologies

EDRF Funding Programs: Highlights

Undergraduate Research

- 68 faculty-mentored research projects have provided students with invaluable, hands-on skills that readily transfer to the workforce

UND Connect – Community Based Research

- Decreasing Teacher Burnout Through Action Research
- Flight Data Monitoring Program for North Dakota Air Ambulance Operators
- Creating Ribbon Shirts and Skirts with Dakota Students: Sustaining Dakota Oyate Cultural Pride
- Developing a Digital Radon Detector Library Lending Program in Fargo

EDRF Funding Programs: Highlights

University Research Collaboration

UND, NDSU, and Dickinson State University: Accelerating the development of low-cost ammonia to produce less expensive agricultural fertilizers.

NDSU, UND, and United Tribes Technical College: Implementing technology to efficiently remove PFAS (“forever chemicals”) using nanostructured materials.

UND, NDSU, and United Tribes Technical College: Novel approaches to split water molecules to develop new battery and fuel cell technologies.

NDSU, UND, Minot State, and Turtle Mountain College: Reinforcing food security with new approaches to understanding pollinator success in North Dakota.

EDRF: Moving Forward

NDUS is requesting \$25 Million in the 2025 legislative session for the EDRF. This scale up in funding will help NDUS institutions meet the vision of the EDRF.

North Dakota's two research universities have made rapid progress in developing funded research, but additional resources are necessary to channel research productivity into substantial additional economic activity in the state.

North Dakota Ranks

#49

In higher education
R&D performance

#51

in Small Business Innovation
Research* (SBIR) awards*

#47

In utility patents issued to
North Dakota residents

*Small Business Innovation Research (SBIR) awards provided by the US Small Business Association



EDRF: Directions Moving Forward

Technology Transfer Infrastructure

Building capacity to move IP to market

Innovation of New Technology Readiness Level

Increased award size and scope

University Research Collaboration

Serving North Dakota through partnerships

Early Faculty Research Development

Further emphasize IP as part of a successful research portfolio

Undergraduate Research

Experiential learning and workforce-ready skills

Prof. Kouhyar Tavakolian

BioInnovation Zone

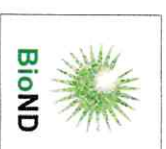


BioInnovation Zone

Vision: Empower innovation and collaboration to cultivate 'Medical Valley' as the pioneering epicenter of cutting-edge **medical device technology development in North Dakota**, fostering breakthroughs that redefine healthcare standards.

Mission: To leverage Innovation-Based Learning (IBL) to nurture a specialized workforce of graduate and undergraduate student levels, driving innovation, forging robust industry partnerships, and propelling societal advancement.

Current Company Affiliates



Nutrient Delivery in Space Agriculture (EDRF)

Consistent, controlled delivery of water and nutrients to plants – mitigating the effects of microgravity

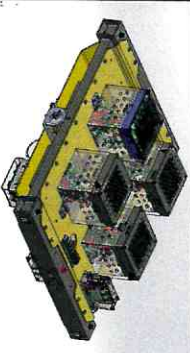
Scalable cultivation to higher yield farming for long term and permanent space habitat

Evaluates growth and stress in microgravity simulated environments

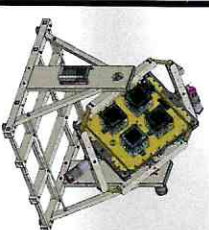
Growth chamber + Automated plant stress monitoring

Wireless reporting to reduce crew time in space

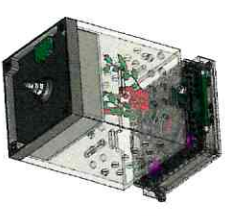
Test setup to grow and monitor stress



2-Axis Gravity Simulator



Growth & Monitoring chamber + MHD pump



Compact Optomechanical system for control and reporting

