The Transformative Impact of Research

A Discussion with the Board of Trustees
September 17, 2021
Penn State’s $1.01B Research Enterprise

• Drives progress impacting all aspects of society locally and worldwide.
• Inspires and attracts innovators with diverse perspectives and talent.
• Crucial for standing among AAU, Big Ten, and other world-class institutions.
• Has transformative impact: fundamental discovery, innovative applications, knowledge creation, sustainable implementation, economic development, and national security.
Penn State Research Impacts

- State and Local Economies
- Knowledge and Discovery
- Students and Workforce
Impact on the State and Local Economies
Penn State is the Top Public University in PA for Industry-Sponsored Research

- Penn State conducts more industry-sponsored research than any other PA public college or university.
- Received more than $20M per year for the past five years from industries sponsoring our research.
- About 200 companies sponsor projects every year.
Penn State serves as a:

- Critical and strategic partner.
- Collaborator in specialized, high-end facilities.
- Source of economic impact by reducing expenses and creating jobs.
196 Inventions Disclosed to the Office of Technology Management

49 U.S. Patents Issued

$2.5M in Licensing Revenue

15 Licensing Agreements/Options Executed

THE PROCESS FOR BRINGING YOUR INVENTIONS TO THE MARKET

- Indirectly supported more than 2,500 jobs.
- Generated nearly $200M in economic impact since 2015.

Source: Science Coalition, Sparking Economic Growth Report, 2021
Example: Industry Sponsored Research – Volvo

• Penn State is Volvo’s first and only Academic Preferred Partner (APP) for Research in the US; one of two designated U.S. university APPs for talent.

• Just renewed a second 5-year Master Research Agreement.

• Volvo has only two on-site university research park locations: Penn State and Sweden.

• Sponsored research focuses on: hydrogen fuel and production; batteries, charging stations, and infrastructure; and digitization, AI, and machine learning.

“The Penn State–Volvo partnership is delivering prosperity through transport and infrastructure solutions.”
– Chris Smith, VP, Quality & Customer Satisfaction NA, Volvo Group Trucks Technology
Example: Industry Sponsored Research, Leading the Financial Sector with Solutions at Scale

• NASDAQ, JP Morgan, and Wells Fargo are sponsoring research.

• Harnessing big data to support equitable entrepreneurship with a cohort of over 30,000 entrepreneurs.

• Tailoring solutions to support female and minority entrepreneurs.

• Penn State is leading cohort including Stanford, Harvard, Duke, Pitt, and Yale.

Co-PIs: Max Crowley, Associate Professor HHD
Meg Small, Assistant Research Professor, HHD
Commonwealth Campuses Serve as Regional Research Hubs

- 75.2% of PA residents live within a 15-mile radius of a campus.
- 95.6% of PA residents live within a 30-mile radius of a campus.
- Campuses disseminate research; magnets for collaboration.
Impact on Knowledge and Discovery
Most Disciplines Ranked in U.S. Top 10 for Research

- Retained top position (tied) of having the most disciplines (16) ranked in top 10 nationally for research expenditures.
- Consistently ranks near the top in annual spending on science and engineering research.
- 110+ faculty members in the National Academies: Engineering, Science, and Medicine; American Academy of Arts and Sciences; and American Association for the Advancement of Science.
Alignment with National Research Priorities Results in a Record $633M in Federal Funding

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2D Crystal Consortium is Nationally Renowned; Receiving 1 of only 4 Awards in U.S.

• National Science Foundation renewed funding for Penn State’s Two-Dimensional Crystal Consortium (2DCC).
• $20.1M over 5 years, an increase of 13% above the initial award in 2016.
• Led by Joan Redwing, professor of materials science and engineering and electrical engineering.

"2DCC has established itself as a premier facility for the synthesis of wafer-scale 2D films and bulk crystals with unique quantum properties."

-Joan Redwing
The IceCube Neutrino Observatory is the Largest Particle Detector on the Planet

- Detects high energy neutrinos from astrophysical sources.
- Buried deep in the Antarctic ice cap at the South Pole.
- Consists of more than 5,000 photosensors in a volume that would hold roughly 1,000 Beaver Stadiums.
- At the forefront of the new field of high-energy neutrino astrophysics.
Example: Fighting the Opioid Crisis

• Glenn Sterner, Penn State Abington, is the lead in PA for a three-state project, with Iowa and New York, funded by the National Institute of Justice.

• Developing local ability to impact community safety and address substance use issues.

• Data driven, intelligence-led investigations to disrupt opioid and other drug-related markets.

Glenn Sterner
Assistant Professor, Criminal Justice
Penn State Abington
Impact on Students and the Workforce

R3A Digital Foundry at New Kensington
Penn State Awarded the Most Undergraduate Degrees in STEM fields in the U.S.

- In 2019-20, Penn State awarded nearly 6,500 degrees, over 50% more than UC Berkeley, Texas A&M, Arizona State and Purdue.
- Penn State is one of only four universities to appear in both the STEM and business top 20s.

“It’s encouraging to see that STEM degree productivity is greatest at exactly those universities that by virtue of their faculty, facilities, and funding have well-established capacity and reputations for excellence in engineering and science.”

-Michael T. Nietzel, President Emeritus of Missouri State University

Source: Forbes
Research Prepares Undergraduate Students for Leadership and Career Success

- Over the past 5 years, undergraduate students participated in nearly 13,000 research course experiences; many more conducted research without earning credits.
- Summer Founders provided 5 teams annually with a $15,000 grant to work full-time on their startup, social good or nonprofit idea.
- Erickson Discovery Grants ($3,500 each) have supported 1,000+ undergraduate research experiences since the program’s inception.
- The Student Engagement Network has funded over 1,200 experiences with over $1.0M in grants since 2017.
- No. 5 (tied with MIT) by corporate recruiters for preparing students for success after graduation.
Research Funding Supports Students

- 73% of graduate student research stipends were funded by externally sponsored research in FY2020-21.
- External grants and contracts provided $65.9M in grad student stipend support in FY2020-21.
- Penn State currently has 10 NIH T32 Training Grants totaling $2.8M annually.
- Interdisciplinary Institutes provide ongoing support: For example, Huck annually provides up to 8 fellowships, travel awards, customized graduate student professional development, and training grants.

Source: Research Accounting the University Budget Office
Example: Partnership for Research and Education in Materials (PREM)

- The National Science Foundation has named Penn State the lead partner to Florida International University and North Carolina Central University.
- Designed to increase diversity and inclusion in materials research.
- Center for Nanoscale Science leading one of the PREM efforts.
Introducing Kriston Ramdass

• Ramdass completed his undergraduate degree at Penn State; will earn his master’s degree in aerospace engineering this fall.
• Interned at Moog Space and Defense, where he contributed to NASA’s Orion Spacecraft Crew Module.
• Also interned at Boeing Company and SpaceX.
• Selected from 533 nominations to receive Aviation Week Network’s 20 Twenties Award.
Introducing Laura Guay

- Senior majoring in Biobehavioral Health and French, with a minor in Global Health.
- Conducted research in Senegal and with the U.S. Embassy in the Democratic Republic of the Congo.
- Research focuses on how increased social connections are correlated with positive health outcomes.
- Working with UNESCO’s Social and Human Services Sector Youth Team.
$1.01 Billion Research Enterprise; awarded a record $633 million in federal funding.

Most disciplines ranked in the U.S. Top 10 for Research.

Penn State is the top public university in PA for industry-sponsored research; 100 PA companies conduct research with Penn State.

Penn State Tech Transfer indirectly supported more than 2,500 jobs and generated nearly $200 million in economic impact since 2015.
73% of graduate student research stipends were funded by externally sponsored research in FY2020-21.

External grants and contracts provided $65.9 million in graduate student stipend support in FY2020-21.

Penn State awarded the most undergraduate degrees (6,473) in STEM fields in the U.S.

95.6% of PA residents live near Commonwealth Campuses, which serve as research hubs and magnets for collaboration.