“No true teacher contents himself with merely attending his classes, and sitting down at ease after he has got them to work. He is studying constantly himself, making original investigations and publishing them to the world.”

-Evan Pugh, Penn State’s first president, setting forth the research vision in 1859
The Value of Research

• Drives progress in the Commonwealth, nation and the world.
  o Universities have become the country’s innovation centers.
• Attracts leading faculty: innovators, knowledge creators.
• Provides experiences for students that enable career success.
• Crucial for standing among AAU, Big Ten and other world-class institutions.
• Standing is a major factor in student applications and faculty recruitment and retention.
Research Operation is Organized to Provide Maximize Value

The Office of the Vice President for Research works with the University Research Council, deans and chancellors to oversee:

• University-Wide Interdisciplinary Research Institutes
• Office of Sponsored Programs
• University Affiliated Research Center (UARC)
• Center for Research Commercialization
• Office for Research Protections
Sources of Research Expenditures FY 2018

- University: $191 Million
- Federal: $562 Million
- Industry and Other: $101 Million
- Commonwealth of Pennsylvania: $73 Million

Total: $927 Million
University Impact

Brain Storms

Researchers at the Center for Neural Engineering believe their work on the physics of seizures will yield an electrifying new treatment for epilepsy. Patients like Jessica Gordon hope they’re right.
Individuals Driving Research

- **Gates Foundation** - Matt Thomas, Entomology: For new mosquito controls to help eradicate malaria. **Funding: $10.2M over 6 years**

- **Pennsylvania Department of Agriculture** – Bhushan Jayarao, Veterinary and Biomedical Sciences: Safeguarding animal and human health through the Pennsylvania Animal Diagnostic Laboratory System. **Funding: $14.3M over 5 years**

- **National Science Foundation** - Klaus Keller, Earth and Environmental Systems Institute: To develop sound, economically efficient and ethically defensible climate-risk management strategies. **Funding: $11.9M over 5 years**

- **Patient-Centered Outcomes Research Institute** - Chris Sciamanna, Medicine: To reduce bone fractures and injuries among older adults through exercise. **Funding: $13.4M over 6 years**
Faculty Who Shape our Thinking

• Nina Jablonski, Evan Pugh University Professor of Anthropology

• Breaking the illusion of skin color through teaching, research and service.

• Her TED talk has been viewed 200K times, and was described as “the best and most fascinating account of everything that you might want to know about the packaging of our anatomy.”

BTN LiveBIG 2018-19
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Interdisciplinary Research Institutes

- Cancer Institute
- Clinical and Translational Science Institute
- Huck Institutes of the Life Sciences
- Institute for CyberScience
- Institutes of Energy and the Environment
- Materials Research Institute
- Social Science Research Institute
2D Crystal Consortium

- National Science Foundation awarded $17.8 million over 5 years to fund this national user facility as a state-of-the-art resource for other academic institutions and businesses.
- Focused on the development of 2D materials for applications in next generation electronics.
- Conducted 48 projects since 2016.
- One of only 2 NSF Materials Innovation Platforms in the U.S.
Consortium to Combat Substance Abuse

• Brings together experts across Penn State to combat the opioid epidemic.
• Hiring 12 new faculty over 4 years.
• Provides seed-grant funding for new interdisciplinary teams to combat opioid and other substance abuse.
• First conference to be held April 29, 2019.
• Part of the Social Science Research Institute.
Child Maltreatment Solutions Network

• Awarded a $7.7M NIH grant over 5 years to support the goal of becoming a national resource for child maltreatment research and training.

• The network includes researchers and practitioners who:
  o produce new knowledge,
  o design and evaluate innovative approaches to the prevention, detection, and treatment of child maltreatment,
  o create interdisciplinary opportunities for students,
  o work in communities throughout PA and beyond.
**Applied Research Laboratory (ARL)**

- A DoD designated University-Affiliated Research Center (UARC).
- Approved by the Navy to execute up to $2.1 billion in research over 10 years aimed at improving U.S. national security.
- Commits 25% of fee to supporting undergraduate and graduate students: $2M in FY18.
- Has supported national security efforts for over 70 years with basic and applied research.

“The Applied Research Laboratory at Penn State is a critical component of the Naval Research Enterprise ... developing critical science and technology in support of the security of our nation.”

-U.S. Navy Rear Admiral David Goggins, Program Executive Officer, Submarines
Impact on Students
Funding Support

• External grants and contracts provided $24.7M in grad student support in FY2017-18.

• Corporate gifts support undergraduate projects, strengthen recruitment efforts, and make lasting industry connections.

• Interdisciplinary Institutes provide ongoing support: For example, Huck annually provides 7-8 fellowships, $60K in Graduate Research Innovation awards, travel awards, customized graduate student professional development, and training grants.
Training Grants

• Federal training grants provide substantial funding for grad students and postdocs. Funds are used for stipends, tuition, and training related expenses.

• Penn State currently has 10 NIH Training Grants totaling $2.8M annually.

• Examples: National Cancer Institute has provided a training grant for cancer research for 20+ years; NIH sponsors the Medical Scientist Training Program (MD/PhD); NIH supports grad students studying gene regulation.
Intersection of Teaching and Research

- Over the last 5 years, nearly 8,000 students completed an undergraduate research experience for academic credit; many more conduct research without earning credits.

- In 2015-16, 610 awards supported 974 undergraduate student research experiences.

- 156 Erickson Discovery Grants ($3,500 each) were awarded in 2017-18 to students on 11 campuses.

- Faculty incorporate research-based new knowledge into curriculum.
Research at the Commonwealth Campuses

• In 2017-18, there were 184 sections with 575 CC students participating in supervised research.

• In 2017-18, CC faculty received $16.7M in sponsored awards.

PS Berks grad Kaylee Grindrod honored for Excellence in Sociology
43% of all Penn State ranked programs were in the top 10% of their respective fields.

Top ranked programs span the university, including:

Growth in Research at Penn State

Total Research Expenditures (FY1931 to FY2018, in millions)

- **Non-Federal**
- **Federal**
Signs of Research Excellence

• 8 years of research expenditures of $800+ million.
• 15 disciplines rank in the top 10 of NSF Total Science and Engineering Research Expenditures; Penn State ranks 23rd overall.
• One of only 2 institutions in the U.S. accorded land grant, sea grant, sun grant, and space grant status.
• University Libraries rank 10th among North American research libraries.
• No. 7 among top producers of U.S. Fulbright scholars and students.
• 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.
Association of American Universities

• Member of AAU since 1958
  • AAU represents 62 leading research universities distinguished by the breadth and quality of their research and graduate education programs.
  • Membership is very selective, drawing from 2,300+ colleges and universities in the US and Canada.
  • AAU universities award nearly half of all U.S. doctoral degrees; 55% of those are in science and engineering.
AAU Public Universities - Scholarly Output and Citations 2011-2018

Scholarly Output  Citation Count

66,406 Outputs  917,962 Citations

Source: SciVal
Faculty Productivity (FY 18)

- $2.79B in research proposals submitted; $730M awarded
- 4,799 research proposals submitted
- 1,885 new awards and competitive renewals
- 1,994 unique investigators received awards
- 967 unique sponsors provided awards
Economic Development Impact
**Invent Penn State**

21 LaunchBoxes across the state; 95.6% of PA residents live within 30 miles of a LaunchBox
   6 opened in 2016; 5 in 2017; 4 in 2018; 6 in progress.

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![Map of Pennsylvania showing location of LaunchBoxes](image)

<table>
<thead>
<tr>
<th>Activity</th>
<th>FY '16-'18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurs Assisted</td>
<td>1,792</td>
</tr>
<tr>
<td>Students Engaged</td>
<td>4,529</td>
</tr>
<tr>
<td>Faculty/Staff Engaged</td>
<td>519</td>
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<tr>
<td>New Product Development Projects</td>
<td>170</td>
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<tr>
<td>New Startups Program Graduates</td>
<td>154</td>
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<tr>
<td>New Companies in PA Communities</td>
<td>45</td>
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<tr>
<td>Jobs Created</td>
<td>107.5</td>
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<tr>
<td>Internships Created</td>
<td>317</td>
</tr>
<tr>
<td>In-Kind Support Est. Value</td>
<td>$781,306</td>
</tr>
<tr>
<td>External Matched/Leverage Funds</td>
<td>$4,523,456</td>
</tr>
</tbody>
</table>
Tech Transfer

Penn State attracts research partners from the private sector with one of the nation’s friendliest IP policies for industry sponsored research.

Penn State Start-Up Companies 2000-2018 (licensing IP owned by Penn State)

- Licenses w/Start-Ups
- Options w/Start-Ups
- Other w/Start-Ups
Number of Disclosures, Patents, Licenses and Startups

- Total disclosures of inventions: 162
- LaunchBox startups: 75
- Number of patents issued: 48
- Licenses and options executed: 15
- Startup companies (Licensed PSU tech): 7

* Number of startup companies also included in licenses and options
Top Corporate Collaborators

- 340 corporate partners from 2013-18; 1,711 co-authored publications.
- On average, 500 companies sponsor projects every year with approximately 1/4 of those being PA companies.
Impact the World Campaign Imperative

This has been the best performing campaign imperative, reaching 81% of the goal at the 50% mark in the campaign with the focus on:

- Food, Water and Energy Security
- Human Health
- Economic Development and Job Creation
Summary: The Role of Research in Penn State’s Land-grant Mission

Innovative research and knowledge creation:

• Serves society
• Drives student opportunities and success
• Promotes economic development and progress
• Attracts leading faculty and outstanding students
• Enhances the University standing as a world-class institution
Discussion

1. Research clearly serves our mission. Are there additional ways we can leverage our teaching and research enterprise?

2. How do we best continue to advance the success of our unique institute model?