Penn State Research

A Discussion with
The Academic Leadership Forum

Lora G. Weiss, Ph.D.
Senior Vice President for Research

March 2, 2021
Agenda

• The Many Dimensions of Penn State Research
• Deans’ Perspectives
• SIMBA Update
• Compliance, Finance, and Cost Training
• Closing Remarks
Penn State has 16 research fields ranked in the top 10

Tied for #1 in the country

Testament to our
- Excellence
- Breadth
- Depth

#1 Materials Science
#2 Materials Engineering
#2 Mechanical Engineering
#2 Psychology
#2 Mathematics
#4 Sociology
#4 Industrial/Manufacturing Engineering
#4 Electrical Engineering
#5 Total Engineering
#6 Anthropology
#7 Computer & Information Sciences,
#7 Aeronautical & Astronautical Engineering
#8 Chemical Engineering
#8 Atmospheric/Meteorology
#9 Geological & Earth Sciences
#9 Astronomy

Source: National Science Foundation Higher Education Research and Development Survey FY2019, released Jan 2021
Dimensions of Penn State Research

Who

- Research in Colleges and Campuses
- Interdisciplinary Research Institutes
- Undergraduate Research
- Graduate Research

How

- NSF
- NIH
- USDA
- Sponsored Research & Seed Grants
- Research Support & Operations
Federal Research Funding Agencies
Foundations
Alignment with National Research Priorities

President’s Budget Request FY 2021

Federal Industries of the Future

- Artificial Intelligence
- Quantum Information Science
- Advanced Manufacturing
- Genomic Science Program
- BioTechnology
- 5G
- National Security
- Health & Wellness
- Space Exploration
Interdisciplinary Research Institutes

Materials Research Institute
Institute for Computational & Data Sciences
Huck Institutes of the Life Sciences
Penn State Cancer Institute

Clinical and Translational Science Institute
Institutes of Energy and the Environment
Social Science Research Institute
Applied Research Lab

...it’s the culture

Profoundly different approach to leveraging our expertise
Materials Research Institute

Penn State on Cover of Science

- Image from Penn State’s Materials Characterization Lab
- 3D nanostructure of membranes based on biological cellular membranes
- Used to maximize water transport during desalination
- Interdisciplinary research: biology, materials, water
- Electron microscopy image

Jan 1, 2021
Materials Research Institute – cont’d

A Strategy for Unrivaled Success

• 1992: Materials Research Institute created
  − Initial strategic investment of ~$500,000
• 2020: More that $150M in materials-related research awards
• Ranked #1 in materials science and #2 in materials engineering
  − When combined, no other university comes close
• Unrivaled core facilities
• Critical and strategic partner for Industry
  − Morgan, Corning, PPG, Lockheed Martin, Volvo, Dow, Murata
  − 12 Centers of Innovation for Industry interactions
• Interdisciplinary: 330 faculty from 5 colleges, 17 departments
  − Educating undergraduates, graduate students, postdocs, and industry
Research Support & Operations

Office of Sponsored Programs

Office of Industrial Partnerships
Commercialization, Intellectual Property, Technology Transfer

# Awards in FY20
- Federal 1628
- State 244
- Industry 797
- Foundations 213
- Other 817
TOTAL # AWARDS 3699

Office for Research Protections

Building a top research enterprise: Rising to the challenge

Research Operations
Streamlining Complexity for Efficient Operations: Labs, Lab Safety, Facilities, Equipment, Budgets, Analytics, IT, HR, Communications, ...
Federal Compliance – Recent Examples

National Defense Authorization Act, Section 889
- Prohibits use of any telecommunications equipment, system, or services from specific international providers

Cybersecurity Maturity Model Certification
- Must meet additional requirements to safeguard critical information and data, including financial, legal, infrastructure, and export control

Disclosure of Current, Pending, and Other Support
- Developed in response to undue foreign influence activities
- Includes: laboratory personnel, equipment, supplies, lab space, non-monetary commitments
Insights from Deans
Interdisciplinary Research Institutes

Materials Research Institute
Institute for Computational & Data Sciences
Huck Institutes of the Life Sciences
Penn State Cancer Institute
Clinical and Translational Science Institute
Institutes of Energy and the Environment
Social Science Research Institute
Applied Research Lab

...it’s the culture

Profoundly different approach to leveraging our expertise
Social Science Research Institute

Four Key Research Areas

- Smart and Connected Health
- The Human System
- Social Disparities
- Transitioning Data to Knowledge and Impact

Impact of online-technology: Is it displacing important activities such as parent-child interactions, physical activity, and regular sleep?

COVID-19 Impact

Child Maltreatment Solutions Network:
Impact of social distancing on family wellbeing and child safety
Institute for Computational & Data Sciences

• Navigating the complex world of massive analytics
  – Fundamental algorithms to medical applications and meteorological discoveries
  – Applying big data and big simulation methods across the research landscape
• Facilities offer
  – 36,500 computing cores
  – 25 PetaBytes of storage
  – A dynamic software stack of broadly used research applications
  – 890 gigaflops of total peak theoretical performance

Using data from the Human Connectome Project to better understand the correlations among brain features
Applied Research Lab

A Department of Defense University Affiliated Research Center (UARC)

- Developing innovative solutions to address challenging national security problems in sea, land, air, space, and cyber
- Maintaining essential core capabilities
  - Communications and Information
  - Materials & Manufacturing
  - Navigation
  - Undersea Systems
  - Fluid Dynamics
  - Acoustics
- Transitioning advanced technology to operational programs in support of national security priorities
- Contributing to Penn State’s education, research, and service mission
  - Employing more than 200 students annually
Impact of Research on Students

• Impact on Job Opportunities

  - Internships, senior projects, summer hires in critical areas of our economy
  - 2014-2019: nearly 8,000 students completed an undergraduate research experience
  - 12 active NIH Training Grants totaling $3.4M annually
  - Graduate School piloting Accelerate to Industry, a program providing career readiness opportunities for students
Impact of Research on Students – cont’d

- Impact on Ability to Recruit
  - Corporate gifts support undergraduate projects, strengthen recruitment efforts, and make lasting industry connections
  - Merck, Lockheed Martin, PPG, Volvo, CSL Behring, and Wabtec all engage undergraduates in the research they sponsor
  - Companies locate at Innovation Park to have proximity to students for recruiting

Office of Undergraduate Research and Fellowships
https://urfm.psu.edu/
Impact of Research on Students – cont’d

• Impact on Knowledge
  – Faculty incorporate research-based knowledge into curriculum

Spring 2019: Ceramics students processed red clay from Centre County to send to artist Andy Goldsworthy to dye flags for an installation at Rockefeller Center in New York City
Impact of Research on Students – cont’d

• Impact on Knowledge
  – Consortium for Social Movements & Education Research and Practice

• Broad University involvement: 31 faculty from
  – College of Liberal Arts
  – College of Education
  – Penn State Outreach
  – Brandywine Campus

• 4 student organizations
  – Black Caucus
  – Social Movement Group
  – Black Graduate Student Association
  – Adult Education Student Association

Example Projects
• The Reproduction of Social Inequality through Routine Voter Maintenance
• Education in and for the Movement for Black Lives
• Reflections on Community-engaged Learning with Migrant Farmworkers
Research at the Behrend College

Lake Plastic Recovery, Recycling, and Polymer Research

- From 2015-2020: $3.7 million in sponsored awards
  - NSF, ARPA-E, Industry
  - 9 active faculty researchers
  - 2 postdocs
  - 40+ undergraduate students

- In 2020, launched new major
  - Polymer Engineering and Science
Penn State entomologists and Penn State Ag Extension helped find solution to mushroom phorid fly infestation

- Pennsylvania leads the nation in mushroom production
  - 67 mushroom farms produced more than 500 million pounds of mushrooms last year

- Chemical products would be effective in killing larvae, but adding them to compost could affect the mushrooms

- Applied EcoVia to window screens to target adult flies
  - Keeps product away from compost and crops

- By November 2020, we were seeing nearly complete elimination in phorid flies on our test farms
“For CSL Behring, this represents an opportunity for us to support our talent pipeline that will bring some of Penn State’s brightest minds to our efforts in developing life-saving medicines.”
- Paul Perreault, CEO CSL Behring

Watch the video
https://www.youtube.com/watch?v=aaNhyhiZWTA
Thank You