HEPAP
December 3, 2020

Sean L. Jones, PhD
Assistant Director, MPS
National Science Foundation

Welcome The New NSF Director

Dr. Sethuraman Panchanathan,
15th Director of the National Science Foundation

STRENGTHEN at SPEED and SCALE

Thank you, Anne Kinney

Dr. Anne L. Kinney
Deputy Center Director, NASA Goddard
Thank you for your service!

Staff changes in MPS

Assistant Director
Sean L. Jones

Deputy AD
(Acting)
Tie Luo

Senior Facilities Advisor
Chris Smith

Office of Multidisciplinary Activities (OMA)
Clark Cooper

Staff Associate
Kathleen McCloud

Astronomical Sciences Division Director
Ralph Gaume

Chemistry Division Director
David Berkowitz

Materials Research Division Director
Linda Sapochak

Mathematical Sciences Division Director
Juan Meza

Physics Division Director
Denise Caldwell

Deputy DD
James Neff

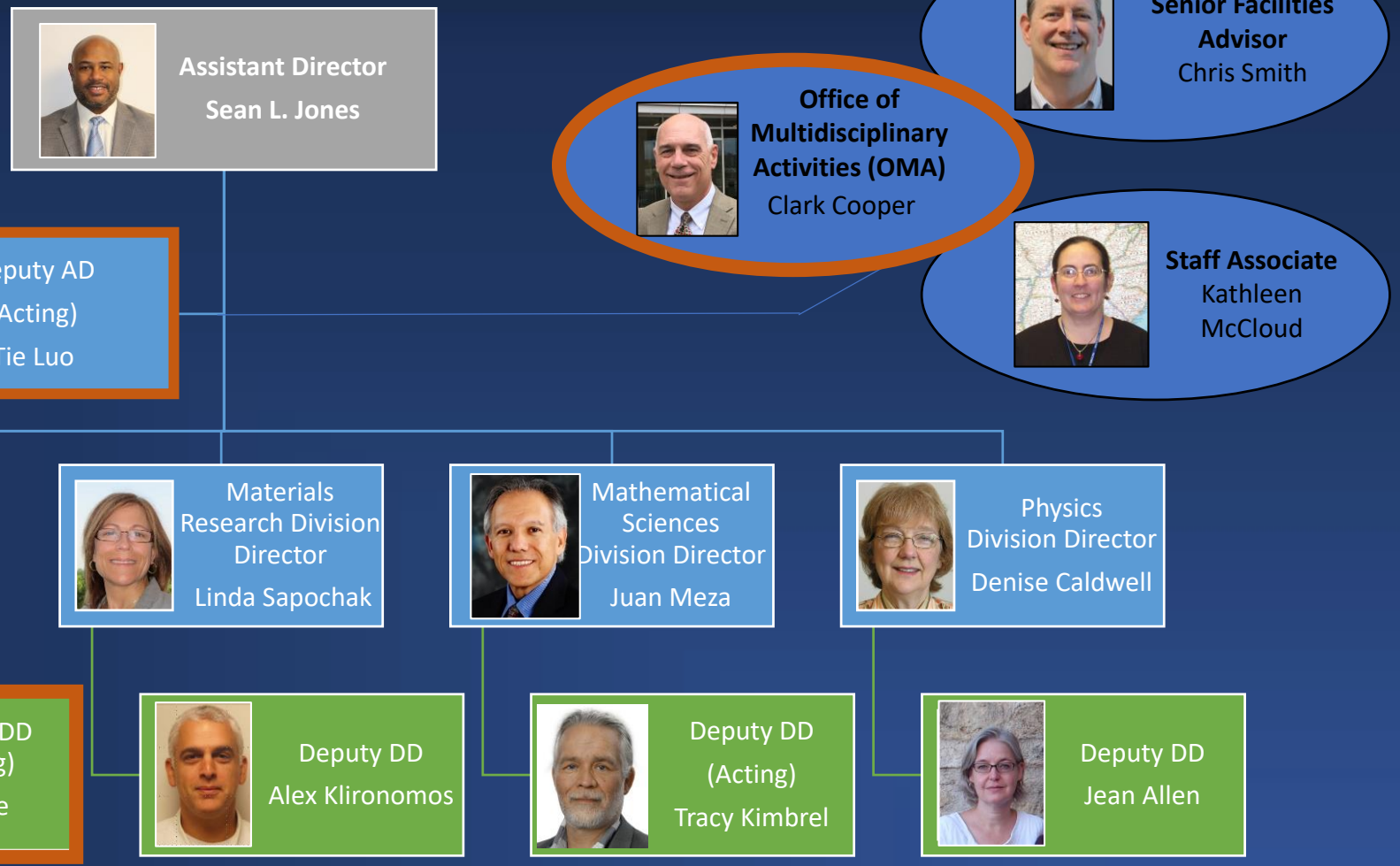
Deputy DD
(Acting)
Lin He

Deputy DD
Alex Klironomos

Deputy DD
(Acting)
Tracy Kimbrel

Deputy DD
Jean Allen

Staff changes in MPS



Also searching for:

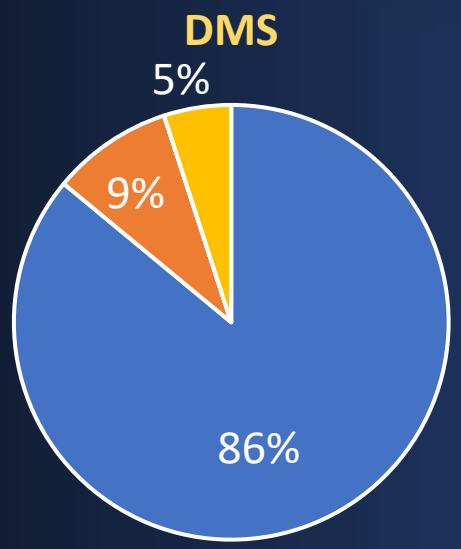
- Chief Officer of Research Facilities (CORF), Office of the Director
- Assistant Director for the Engineering Directorate

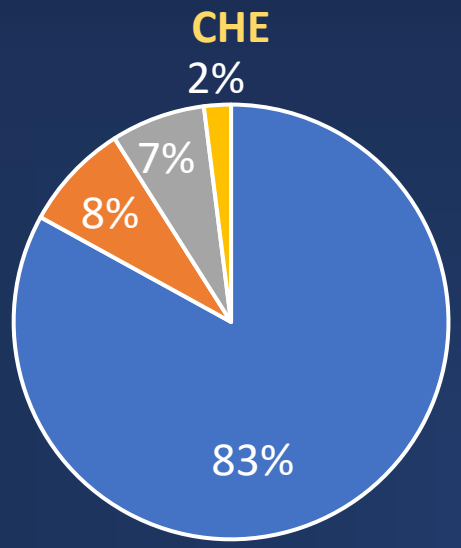
FY 2021 Budget

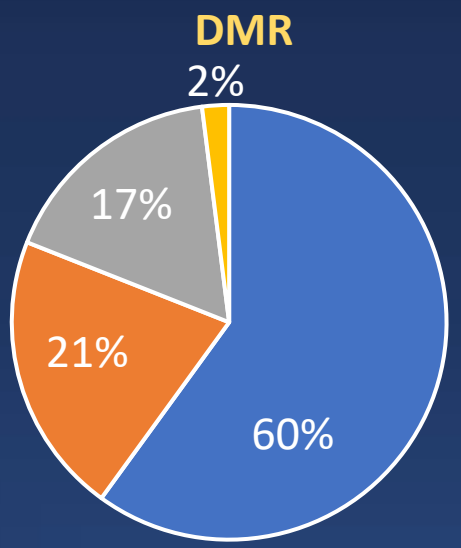
- Continuing Resolution until 12/11/2020

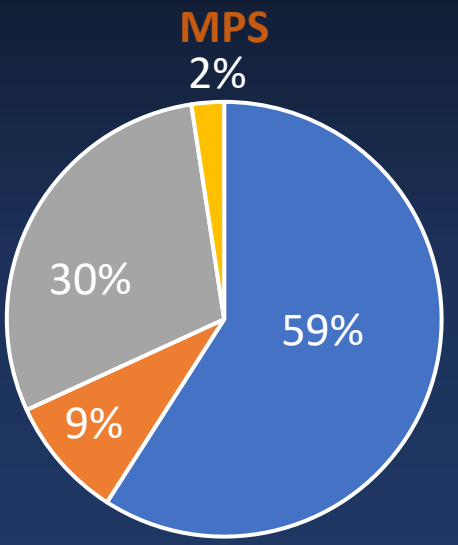
- NSF budget request = $7.741 billion
  - House: $8.548 billion
  - Senate: $8.478 billion

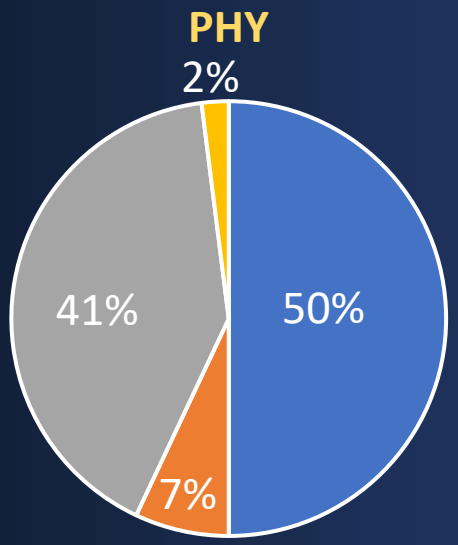
MPS Budget FY2019 Actuals

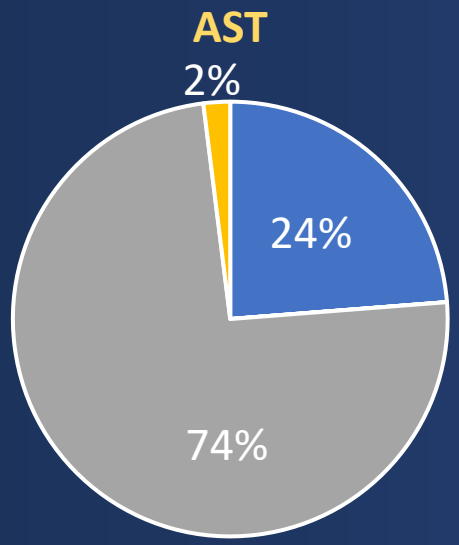












- Individual Investigators & Small Teams
- Centers and Institutes
- Research Infrastructure
- REU and PostDocs

Nobel Laureates 2020

This year's Nobel Prize in Physics was awarded to Andrea Ghez, Roger Penrose, and Reinhard Genzel for work on black holes.

NSF's 10 Big Ideas

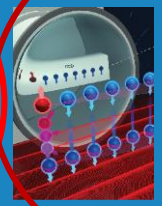
RESEARCH IDEAS

Harnessing Data for 21st Century Science and Engineering

Work at the Human-Technology Frontier: Shaping the Future

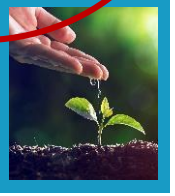
Navigating the New Arctic

Windows on the Universe: The Era of Multi-messenger Astrophysics



The Quantum Leap: Leading the Next Quantum Revolution

Understanding the Rules of Life: Predicting Phenotype



PROCESS IDEAS

Mid-scale Research Infrastructure

NSF 2026

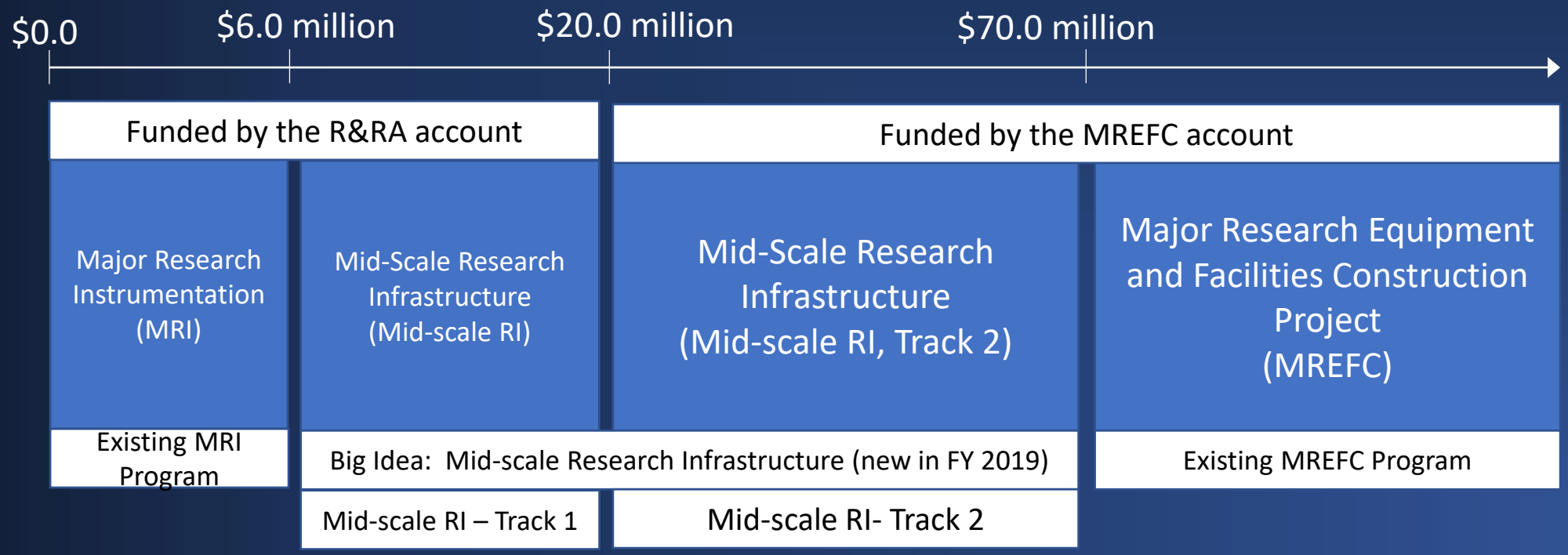
Growing Convergence Research at NSF

NSF INCLUDES: Enhancing STEM through Diversity and Inclusion

MPS Awards: Big Ideas

Mid-Scale Research Infrastructure 2 Award

NSF Portfolio of Central Instrumentation and Infrastructure Implementation Programs

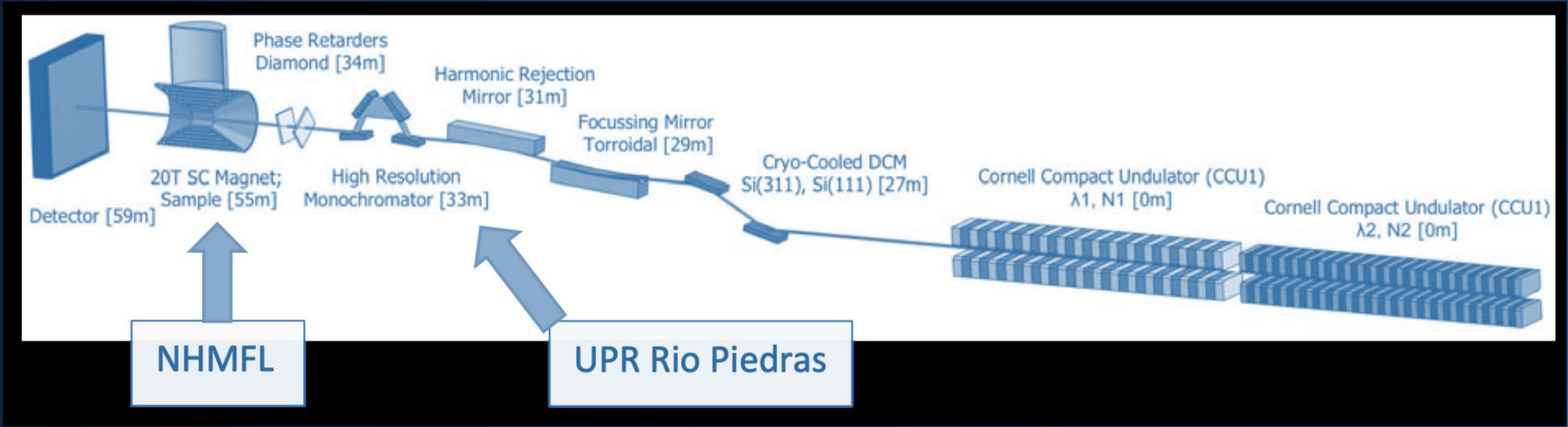


MPS Awards: Big Ideas

Mid-Scale Research Infrastructure –Track 2 Award

High Magnetic Field Frontier Beamline (HMF):

CHESS will partner with NSF-funded National High Magnetic Field Laboratory and the University of Puerto Rico at Río Piedras to design and implement technology and train early career researchers from groups underrepresented in STEM



- Magnetic structures in high fields
- Tuning parameter for structural biology
- Electronic quantum matter
- Controlling processes in engineering and chemistry

PD 18-5115

Program Description: Windows on the Universe (WoU): The Era of Multi-Messenger Astrophysics

- Proposals submitted to participating programs in MPS/AST, MPS/PHY and GEO/OPP.
- Proposals funded through “Big Idea” allocation as well as existing programs.
- Criteria: <u>any area of research supported through the participating divisions that address at least one of the following:</u>
  - *Coordination:* Hardware, software, or other infrastructure to coordinate observations involving more than one messenger.
  - *Observations:* Observations of astrophysical objects or phenomena that are potentially sources of more than one messenger, including the use of existing observatories, experiments, and data archives, as well as the development and construction of new capabilities for advancing multi-messenger astrophysics.
  - *Interpretation:* Theory, simulations and other activities to understand or interpret observations of astrophysical objects that are sources of more than one messenger.

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505593

Industries of the Future

"These industries promise to fuel American prosperity, improve quality of life and national security, and create high-paying jobs for American workers."

Quantum Information Science

Agency Steward for QIS

- National Quantum Initiative (NQI) aligned investments
- Quantum sensors and simulators, Quantum interconnects, Quantum computing
- Diverse quantum-literate workforce
- NSF 19-55

Artificial Intelligence

AI Institutes

Focus areas: Machine Learning, Deep Learning, Molecular Synthesis and Manufacturing

- 3 AI Institute (CHE and PHY, 1 co-fund with DMS-CISE)
- NSF-Simons collaboration
- NSF 20-604

Advanced Wireless/5G

Steward for Spectrum Innovation Initiative

- National Radio Dynamic Zones
- Collaborative Institutes
- Workforce Development
- NSF 20-557
  - 17 Planning Grants awarded
  - 1 National Center to be funded in FY21

Biotechnology

Contributions to URoL programs in synthetic biology, epigenetics, and microbiome research

- 4 MPS programs that are bio-focused (CHE, DMR, DMS and PHY)

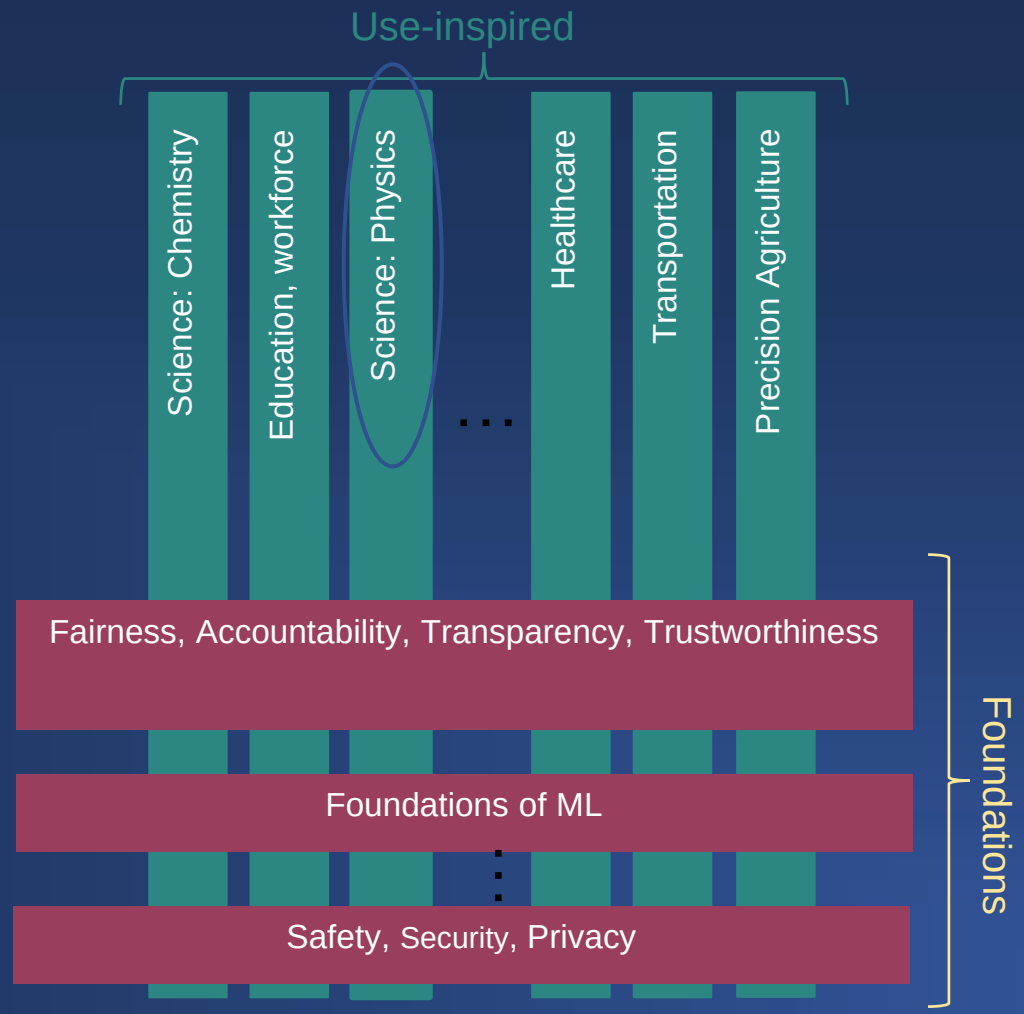
Advanced Manufacturing

New methods, processes, analyses, tools and equipment for manufacturing products, supply chain components and materials

- DMREF (Materials Genome Initiative)

National AI Research Institutes

- **National nexus points** for universities, federal agencies, industry and nonprofits **to advance AI research and education**
- In FY 2020:
  - *Planning grants* for future Institutes
  - Launching up to six multidisciplinary, multi-institutional research *Institutes*
- Investment: ~$200M over six years, beginning in FY 2020



The NSF AI Institute for Artificial Intelligence and Fundamental Interactions (IAIFI)

"eye-phi"

Advance physics knowledge — from the smallest building blocks of nature to the largest structures in the universe — and galvanize AI research innovation

Physics Theory

Physics Experiment

AI Foundations

Build strong multidisciplinary collaborations
Advocacy for shared solutions across subfields
Training, education & outreach at Physics/AI intersection
Cultivate early-career talent (e.g. IAIFI Fellows)
Foster connections to physics facilities and industry

The New York Times

By Dennis Overbye Nov. 23, 2020

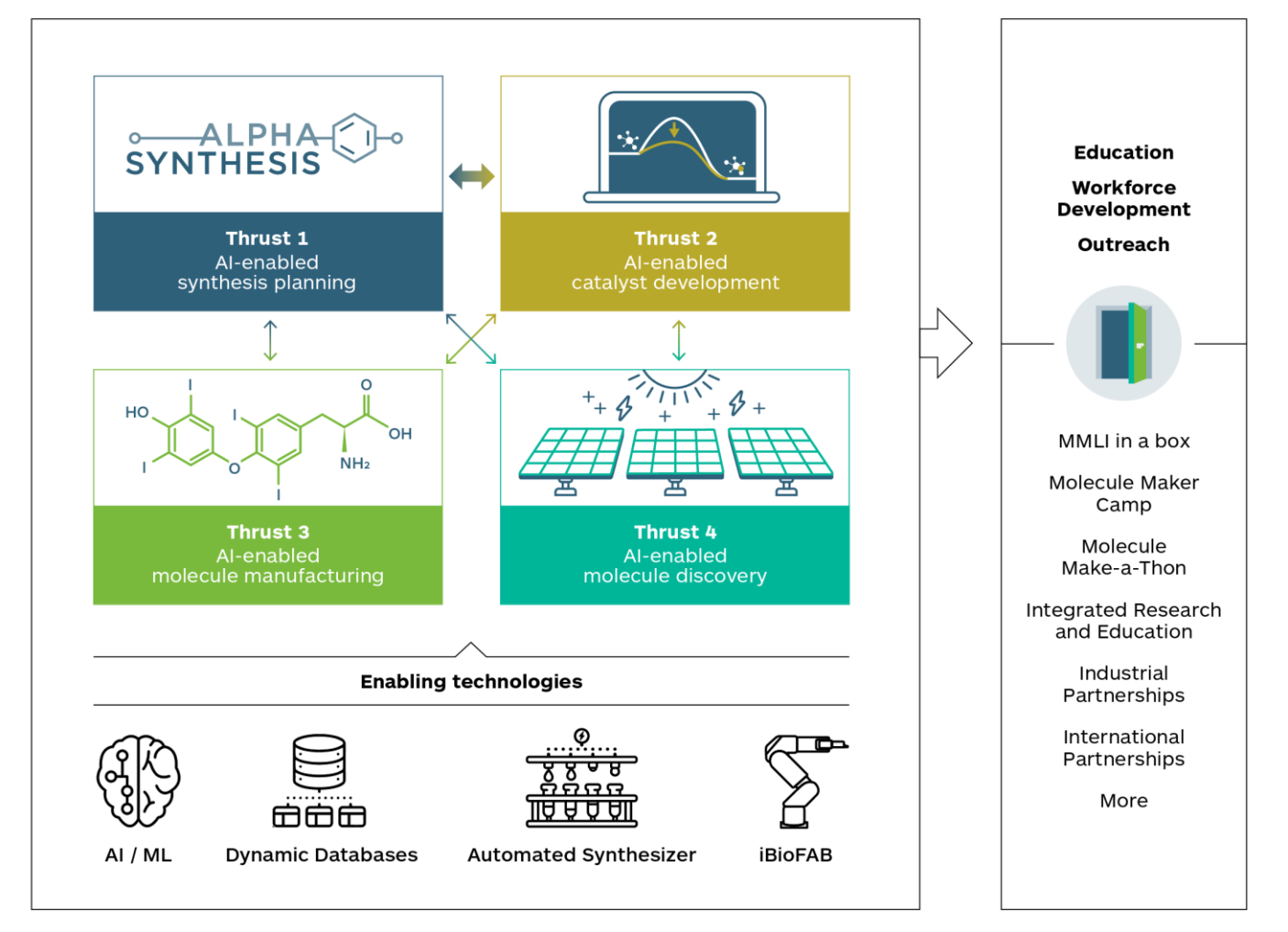
Can a Computer Devise a Theory of Everything?

See Jesse Thaler's IAIFI talk tomorrow

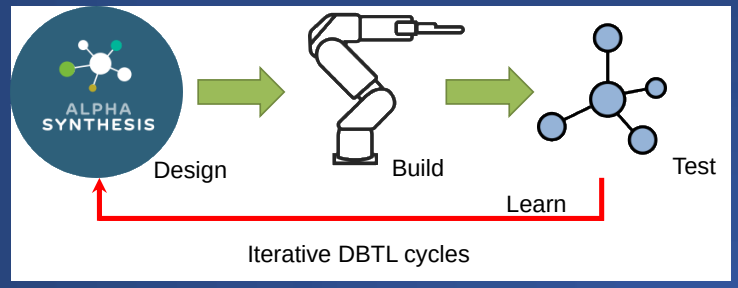
NSF AI Institute for Molecular Discovery, Synthetic Strategy and Manufacturing (NSF Molecule Maker Lab Institute, MMLI)

PI: Huimin Zhao, Award No.: 2019897

MOLECULE MAKER LAB INSTITUTE



- Discover a wide range of molecular functions
- Harness the power of data to advance the science of molecular synthesis
- Inspire future workforce to participate in the process of molecular innovation
- It is jointly supported by Division of Chemistry, Directorate of Computer and information Science and Engineering, and Directorate of Engineering.



https://news.psu.edu/story/630459/2020/09/01/research/engineering-lab-part-new-ai-based-molecular-maker-lab-institute

NSF

Thank you!