

# I want to address two questions:

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- What does it mean to be a **leading and societally-relevant** university in an increasingly globalized world?
- What does it mean to be a broadly educated person in the 21<sup>st</sup> century?

# Two Major Themes

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- The unique role of engineering as a linking discipline
  - ▣ to the world of science
  - ▣ to the world of technology and society &
  - ▣ as a source of innovation/economy
- Engineering education as a “Liberal Art”



# AMERICAN ACADEMY OF ARTS & SCIENCES

# ARISE 2

Unleashing  
America's  
Research &  
Innovation  
Enterprise



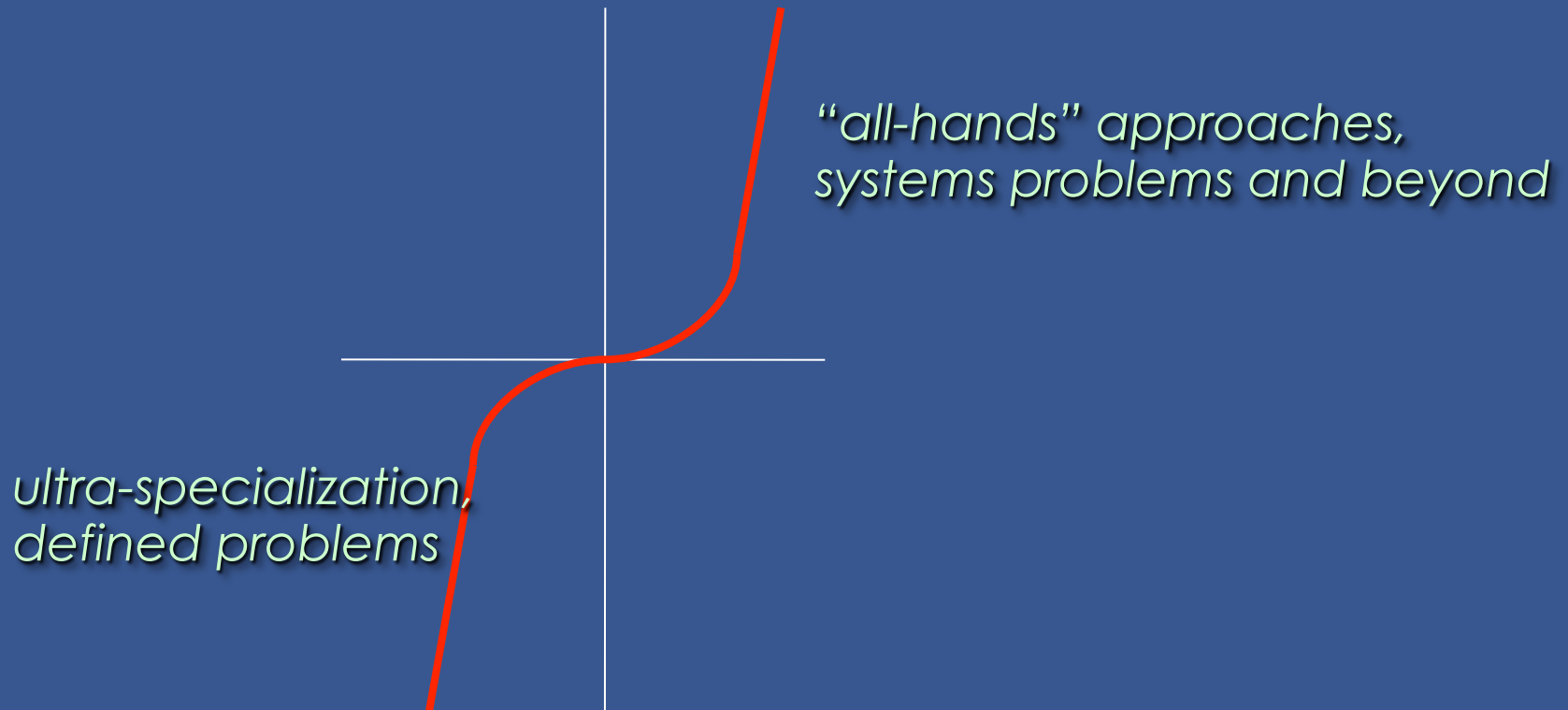
**Venkatesh Narayanamurti**, Harvard University, Co-chair  
**Keith R. Yamamoto**, University of California, San Francisco, Co-chair  
**Nancy C. Andrews**, Duke University School of Medicine  
**Dennis Ausiello**, Harvard Medical School  
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**David Botstein**, Princeton University  
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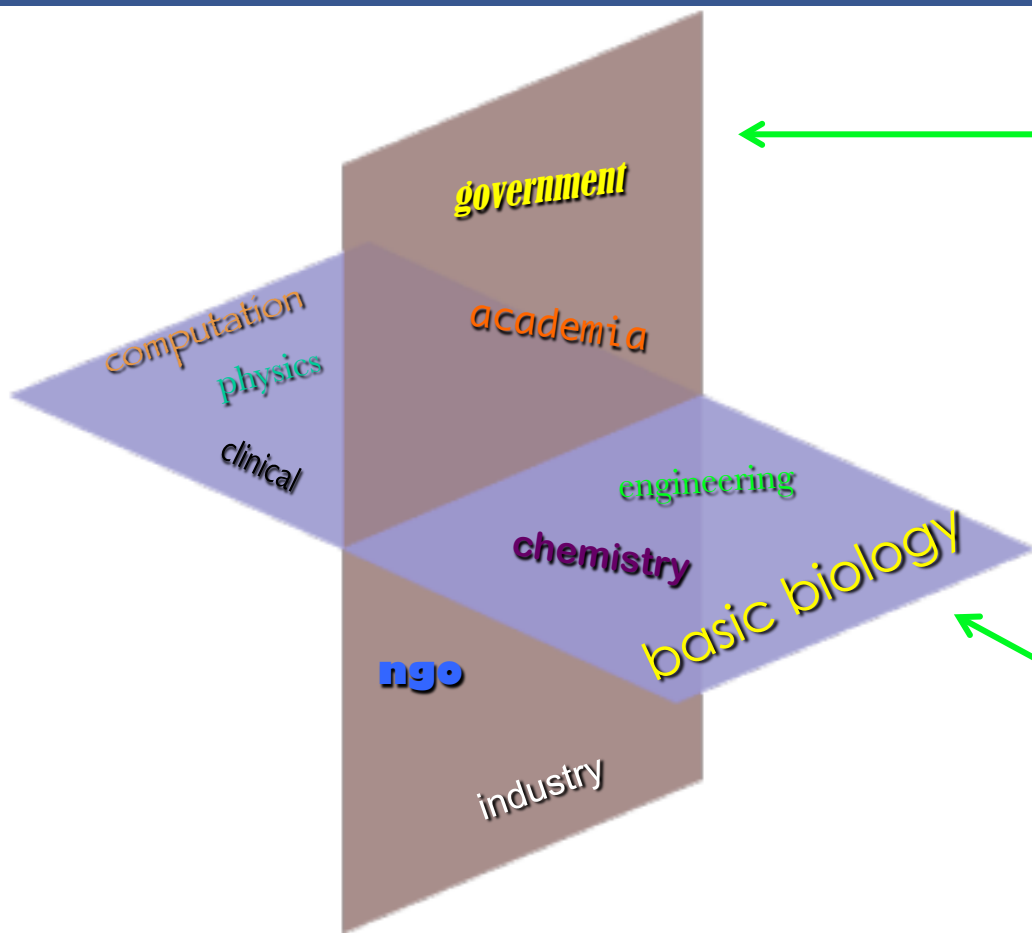
## Research at an inflection point?



Reassess and revise practices and policies



# Overarching objective: Integrate practices and policies across two planes



Stakeholder synergy:  
Cooperate across  
academia, industry,  
government sectors

Trans-disciplinary science:  
Merge physical and life science  
theory, concepts, applications

# Some Characteristics of Grand Challenges

- Compelling
- Large
- Relevant
- Feasible
- Timely
- Transdisciplinary

ARISE II: Advancing Research in Science and Engineering,  
American Academy of Arts and Sciences

<https://www.amacad.org/multimedia/pdfs/publications/researchpapersmonographs/arise2.pdf>



# CYCLES OF INVENTION AND DISCOVERY

Rethinking the Endless Frontier

VENKATESH NARAYANAMURTI AND TOLUWALOGO ODUMOSU

Cycles of invention and discovery offers an in-depth look at the real-world practice of science and engineering. It shows how the standard categories of “basic” and “applied” have become a hindrance to the organization of the U.S. science and technology enterprise. Tracing the history of these problematic categories, Venkatesh Narayanamurti and Toluwalogo Odumosu document how historical views of policy makers and scientists have led to the construction of science as a pure ideal on the one hand and of engineering as a practical (and inherently less prestigious) activity on the other. Even today, this erroneous but still widespread distinction forces these two endeavors into separate silos, misdirects billions of dollars, and thwarts progress in science and engineering research.

The authors contrast this outmoded perspective with the lived experiences of researchers at major research laboratories. Using such Nobel Prize-winning examples as magnetic resonance imaging, the transistor, and the laser, they explore the daily micro-practices of research, showing how distinctions between the search for knowledge and creative problem-solving break down when one pays attention to the ways in which path-breaking research actually happens. By studying key contemporary research institutions, the authors highlight the importance of integrated research practices, contrasting these with models of research in the classic but still-influential report *Science the Endless Frontier*. Narayanamurti and Odumosu’s new model of the research ecosystem shows that discovery and invention are often two sides of the same coin that propels innovation forward.