

# The United States National Bioeconomy Blueprint

Presented at the 2017 Bio Future Forum  
Seoul, Korea

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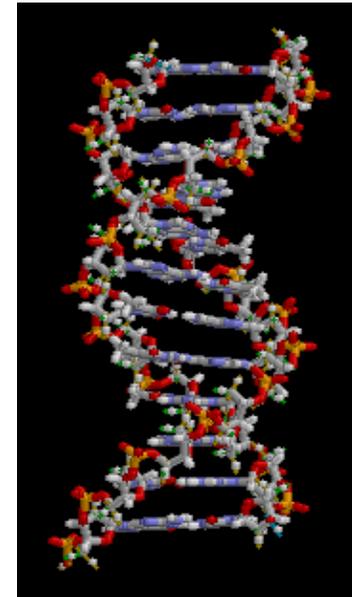
*Chief Business Officer, Ceres Nanosciences*  
*Former Assistant Director, White House Office of*  
*Science and Technology Policy*

# The U.S. bioeconomy rests on two pillars

BIOMASS

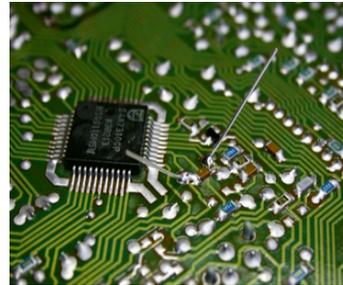


BIOSCIENCES



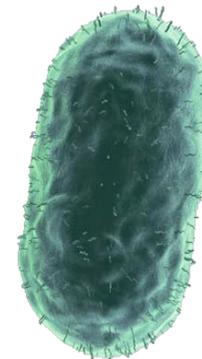
# We are now in an era where biology is technology...

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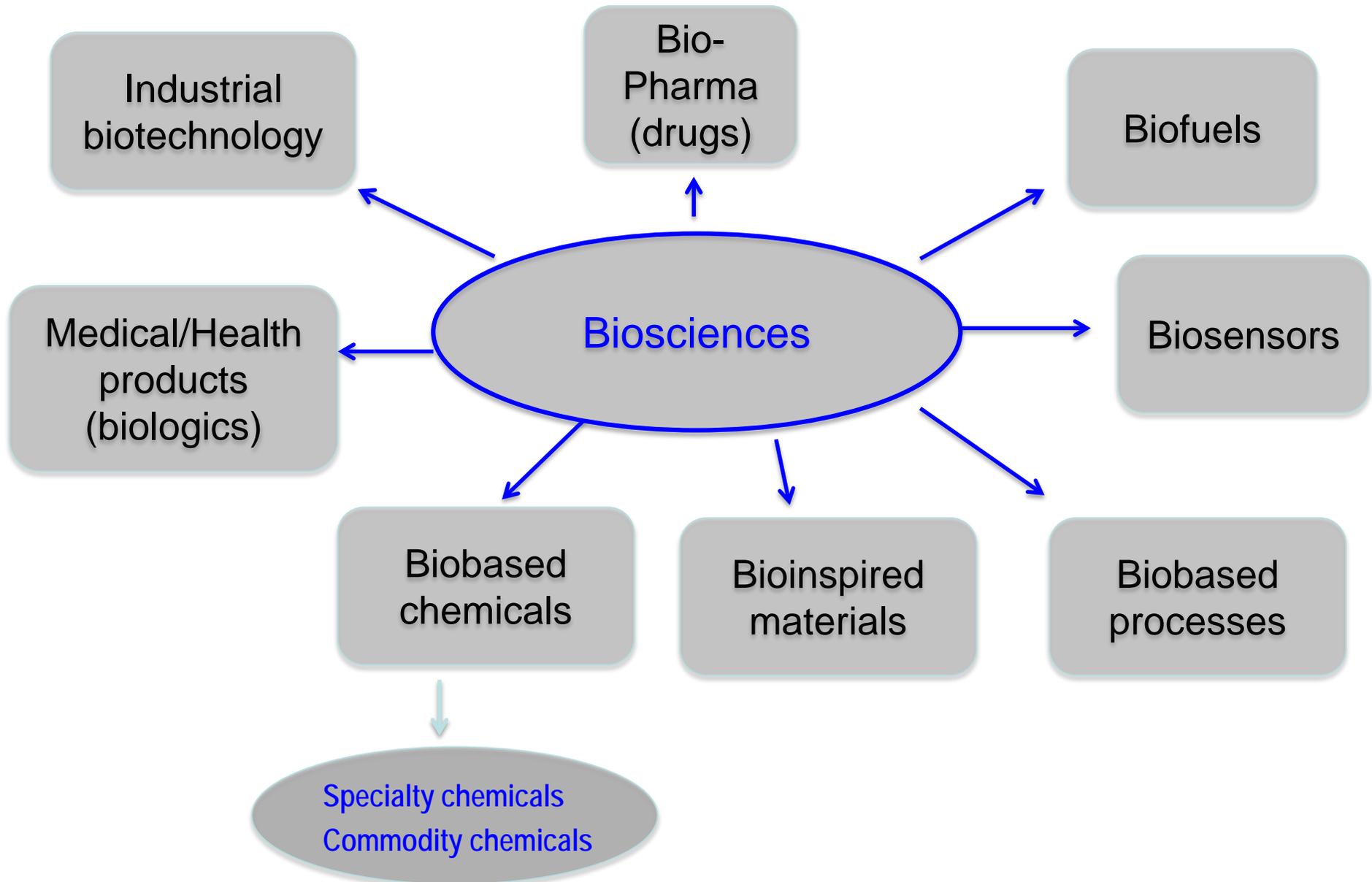


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# ...with multiple applications

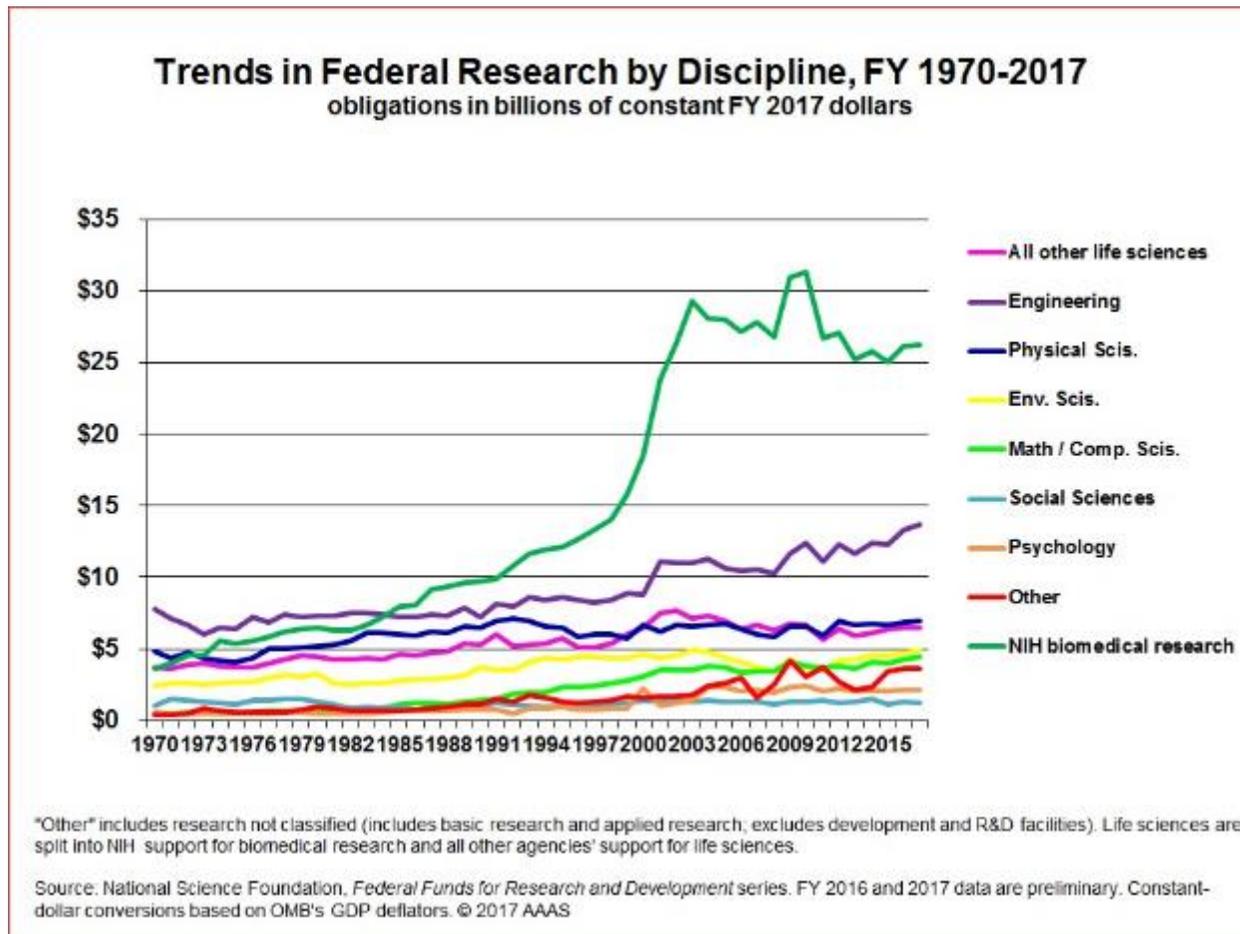


# United States Government biosciences effort is large and diverse

## More than 20 R&D agencies across 8 Cabinet-level departments and 4 independent agencies

- **Department of Agriculture (USDA)**
  - Agricultural Research Service (ARS)
  - National Institute of Food and Agriculture (NIFA)
  - Forest Service (FS)
  - Animal and Plant Health Inspection Service (APHIS)
- **Department of Commerce (DOC)**
  - National Oceanic and Atmospheric Administration (NOAA)
  - National Marine Fisheries Service (NMFS)
  - National Institute of Standards and Technology (NIST)
- **Department of Defense (DOD)**
  - Air Force Office of Science Research (AFOSR)
  - Defense Advanced Research Projects Agency (DARPA)
  - Defense Threat Reduction Agency (DTRA)
  - Office of Naval Research (ONR)
  - U.S. Army Medical Research and Materiel Command (USAMRMC)
- **Department of Energy (DOE)**
  - Office of Science
  - National Laboratories
  - Office of Energy Efficiency and Renewable Energy (EERE)
  - Advanced Research Projects Agency-Energy (ARPA-E)
- **Department of Homeland Security (DHS)**
- **Department of the Interior (DOI)**
  - Fish and Wildlife Service (FWS)
  - Geological Survey (USGS)
- **Health and Human Services Department (HHS)**
  - Centers for Disease Control and Prevention (CDC)
  - Food and Drug Administration (FDA)
  - National Institutes of Health (NIH)
  - Food and Drug Administration (FDA)
- **Veterans Affairs Department (VA)**
- **Independent Agencies**
  - National Aeronautics and Space Administration (NASA)
  - National Science Foundation (NSF)
  - Environmental Protection Agency (EPA)
  - Director of National Intelligence (DNI)
    - Intelligence Advance Research Projects (IARPA)

# U.S. Gov't spends >\$30 billion on biosciences R&D

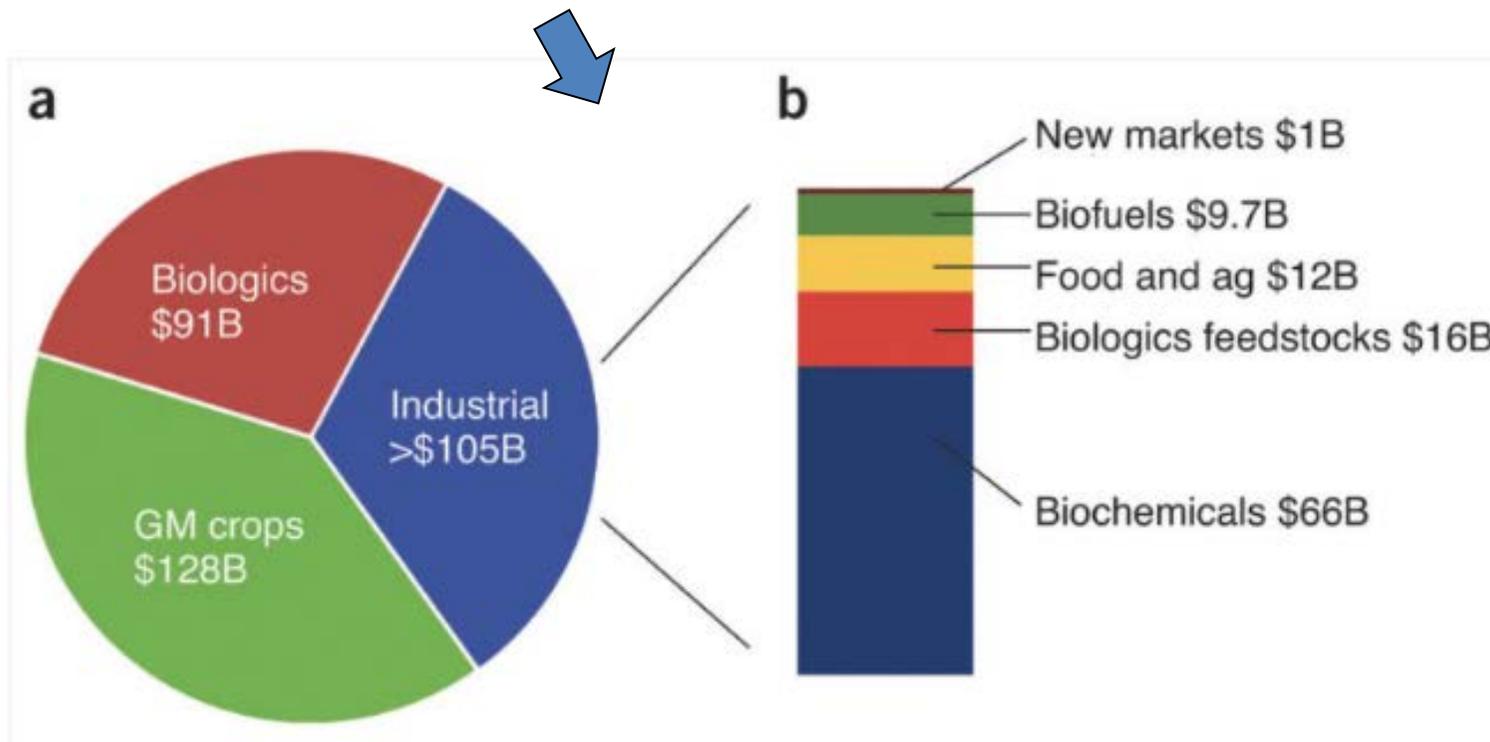
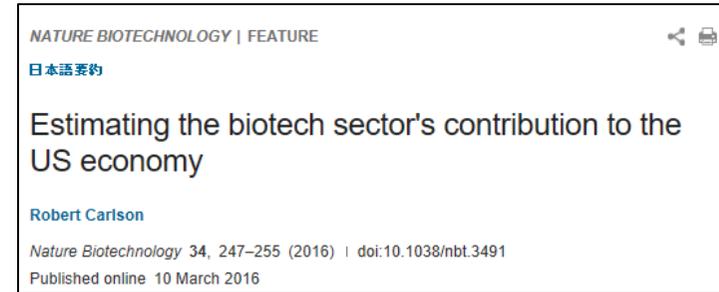


- And, when you include funding from foundations, philanthropists, state governments, private research institutes, and industry that number is much larger.

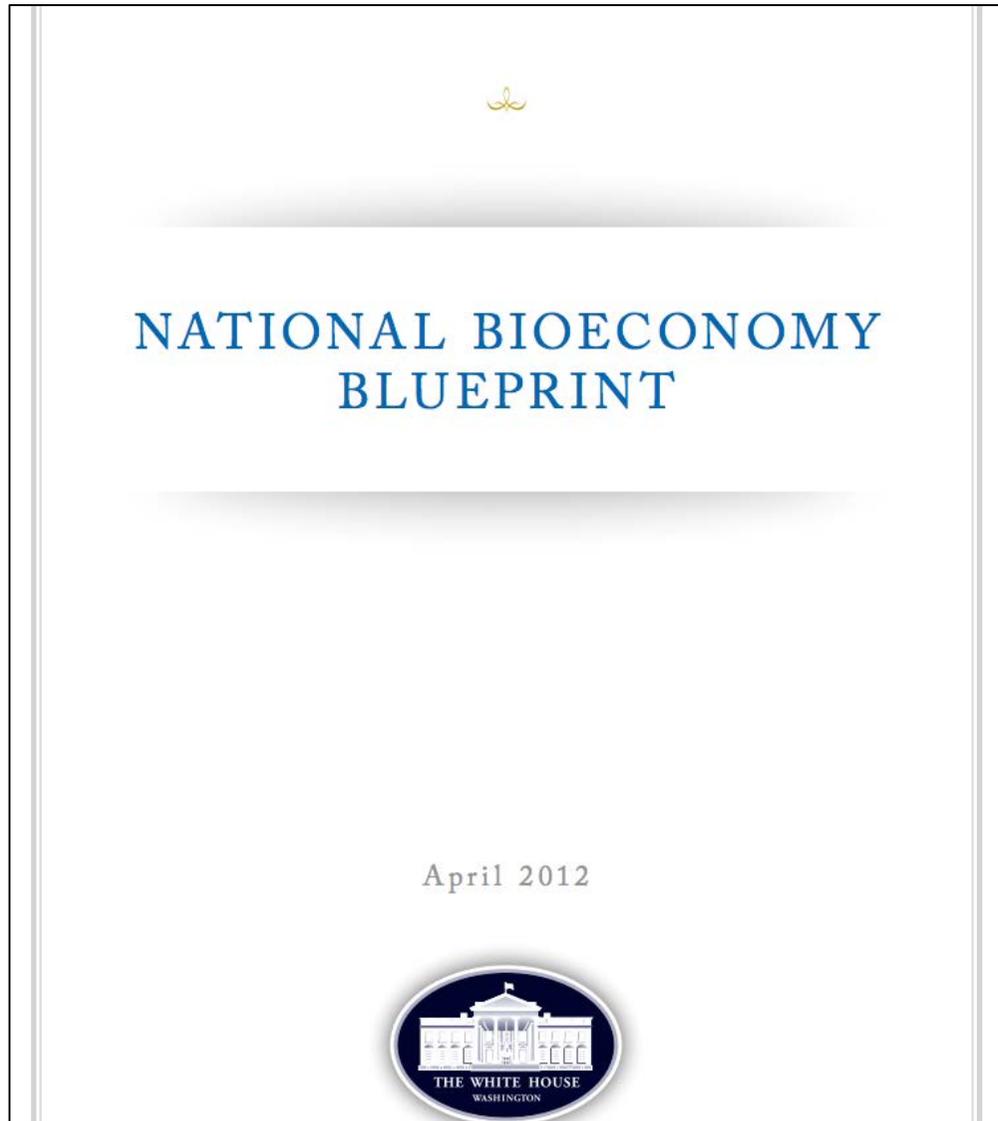
# The U.S. bioeconomy is large and diverse

In 2012

- >\$324 Billion in revenues
- = 2% of overall U.S. GDP
- Contributed to more than 5% of U.S. economy's overall growth



# Ok, fine, but why develop a national bioeconomy strategy?



- Lay out strategic objectives that will help realize the full potential of the U.S. bioeconomy
- Signal to industry, investors, and researchers a commitment to biological research as a driver of the future bioeconomy
- Underscore the potential of biological research to address national challenges in health, energy, environment, food
- Provide guidance to S&T agencies about where to focus efforts



# NATIONAL BIOECONOMY BLUEPRINT

April 2012



# Objective 1

Support R&D investments that will provide the foundation for the future U.S. bioeconomy

- Expand and develop essential bioeconomy technologies
- Integrate approaches across disciplines
- Implement improved funding mechanisms

## Objective 2

Facilitate the transition of bioinventions from lab to market, focusing on translational and regulatory sciences

- Update SBIR programs
- Accelerate transfer of government-owned inventions\*
- Enhance entrepreneurship at universities
- Utilize federal procurement authority to create and grow new bio-markets

# Objective 3

- Develop and reform regulations to reduce barriers, increase speed and predictability of regulatory processes, and reduce costs while protecting human and environmental health
- improve regulatory processes and regulations
  - collaborate with stakeholders

# Objective 4

Update training programs and align academic institution initiatives with student training for national workforce needs

- Enable employer-educator partnerships
- Re-engineer graduate education programs

# Objective 5

Identify and support opportunities for development of public-private partnerships and precompetitive collaborations – where competitors pool resources, knowledge, and expertise to learn from successes and failures

# What came AFTER the National Bioeconomy Blueprint?



More than \$6.5 billion in new R&D funding (public and private) for bioeconomy-related activities, including:

- 2013 - BRAIN Initiative (**neurotechnologies**) - \$1.5B public-private funding from 2014-2016 AND \$1.5B over 2017-2026 (21<sup>st</sup> Century Cures Act)
- 2015 - **Precision Medicine** Initiative – \$1.4B over 2017-2026 (21<sup>st</sup> Century Cures Act)
- 2016 - **Cancer Moonshot** - \$1.8B over 2017-2026 (21<sup>st</sup> Century Cures Act)



# What came AFTER the National Bioeconomy Blueprint? (continued)



More than \$6.5 billion in R&D funding (public and private) for bioeconomy-related activities, including:

- 2015-2017 – **Modernized the U.S. Biotechnology Regulatory System**
- 2016 - Advanced Regenerative Manufacturing Institute (**multicellular tissues and workforce development**) - \$290M public-private funding
- 2016 - National Institute for Innovation in Manufacturing Biopharmaceuticals (**cell-based therapeutics and workforce development**) - \$90M
- 2017 - DOE Agile Biofoundry (**synthetic biology**) - \$40M to achieve a 50% reduction in time-to-scale up for chemical biomanufacturing

## National Strategy for Modernizing the Regulatory System for Biotechnology Products

Product of the Emerging Technologies Interagency Policy Coordination Committee's Biotechnology Working Group



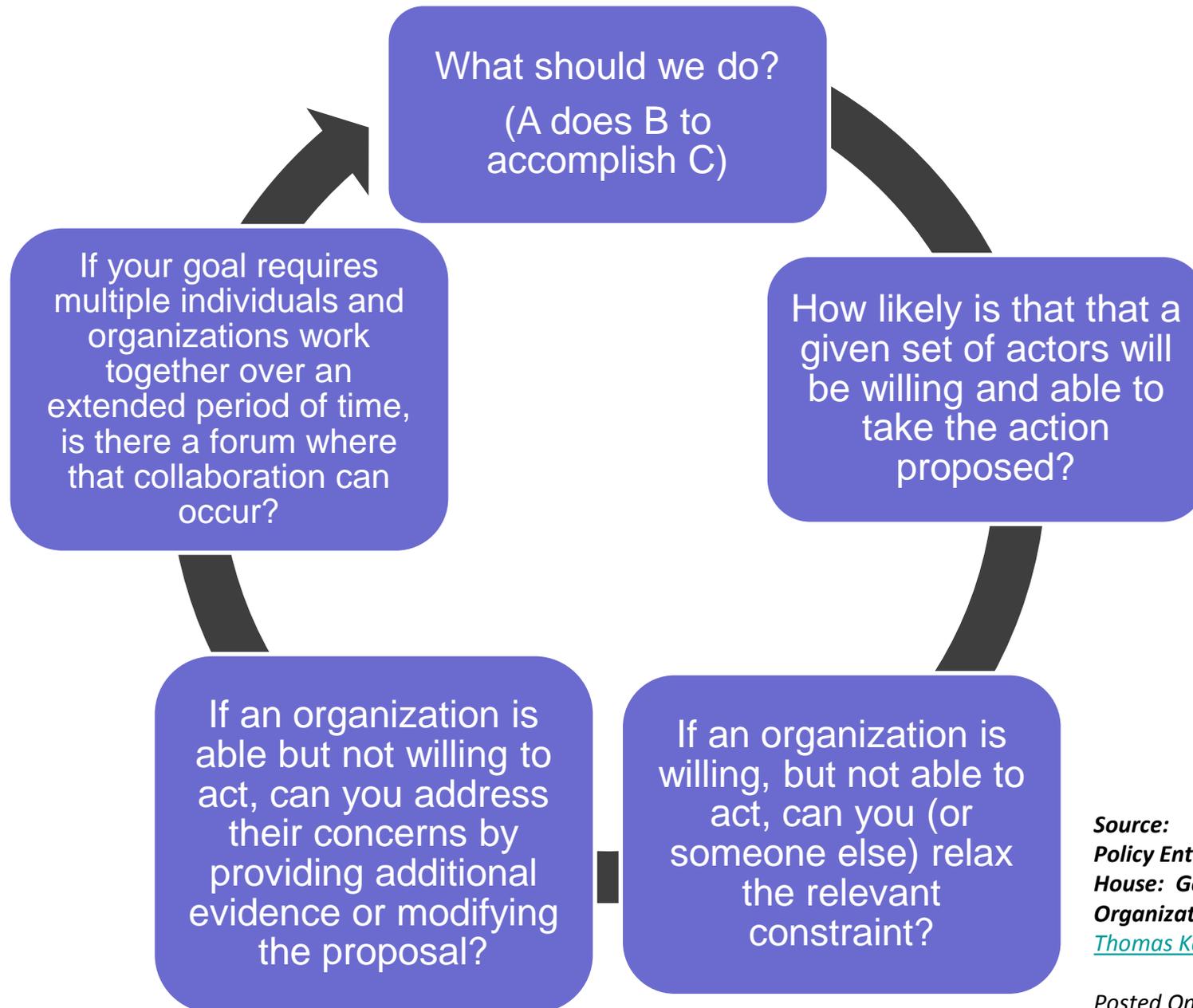
September 2016



# So HOW did the United States develop a national bioeconomy strategy?

- Objectives developed and refined
  - National needs/societal challenges (e.g., National Academy of Sciences reports)
  - Administration priorities
  - Agency input
  - Public input
- Research – trends, economics, etc.
- Foundational technologies selected
  - Potential to significantly and broadly change biology and the economy
- Early achievements solicited from agencies
- Clearance through official USG process
- Release the document
- And, continue to work on the priorities!

# One useful framework for filling in the details



**Source:**  
*Policy Entrepreneurship at the White House: Getting Things Done in Large Organizations*  
[Thomas Kalil](#)

Posted Online July 11, 2017  
doi: [10.1162/innov\\_a\\_00253](https://doi.org/10.1162/innov_a_00253)

# And, some things that might be possible if we make the right investments

- Advances in biomedical sciences & “big data” & artificial intelligence will drastically improve healthcare
  - But, will be critical to protect privacy and security
- Ensuring sufficient safe, secure, sustainable, affordable food, water, and energy for all, while reducing GHGs
- Fashioning materials from abundant elements to substitute for current uses of scarce ones
- Understanding the brain and curing its ailments
- Controlling infectious and vector-borne diseases
- Defeating cancer
- Facilitating graceful aging
- Cellular therapeutics
  - Beyond small molecules and biologics
- Personalized organs and tissues on demand

*Credit to Dr. John Holdren, Former Director of White House OSTP, for assembling most of this list*

# Thank you!

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