

The NIH **BRAIN** Initiative

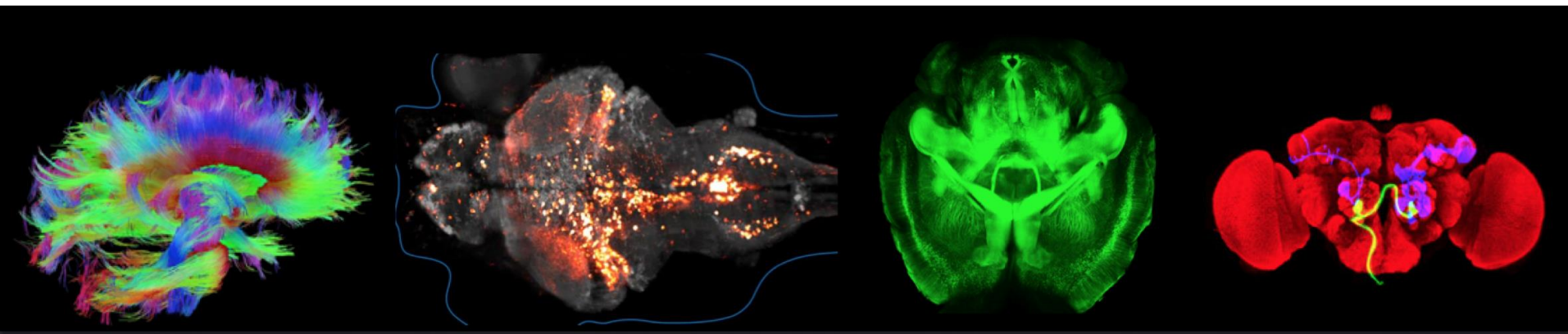
*Brain Research through Advancing Innovative
Neurotechnologies*

CRCNS PI Meeting

Sept. 2016

BRAIN 2025: A SCIENTIFIC VISION

- A Focus on Circuits and Networks
- First years emphasize technology development and validation, with a growing emphasis on problem-driven Neuroscience
- Map the cells and the circuits of the brain
- Measure the fluctuating electrical and chemical patterns within circuits
- Understand how this generates our thoughts and actions – **How the brain thinks!**



Seven High Priority Research Areas

Brain
Cell
Types

1. **Discovering diversity:** Identify and provide experimental access to the different brain cell types to determine their roles in health and disease.

Tools for
Circuit
Diagrams

2. **Maps at multiple scales:** Generate circuit diagrams that vary in resolution from synapses to the whole brain.

Tech. to
Monitor
Neural
Activity

3. **The brain in action:** Produce a dynamic picture of the functioning brain by developing and applying improved methods for large-scale monitoring of neural activity.

Precise
Inter-
ventional
Tools

4. **Demonstrating causality:** Link brain activity to behavior with precise interventional tools that change neural circuit dynamics.

Seven High Priority Research Areas

Theory
and Data
Analysis
Tools

5. **Identifying fundamental principles:** Produce conceptual foundations for understanding the biological basis of mental processes through development of new theoretical and data analysis tools.

Advance
Human
Neuro-
science

6. **Advancing human neuroscience:** Develop innovative technologies to understand the human brain and treat its disorders; create and support integrated human brain research networks.

Integrate
Approaches

7. **From BRAIN Initiative to the brain:** Integrate new technological and conceptual approaches produced in goals #1-6 to discover how dynamic patterns of neural activity are transformed into cognition, emotion, perception, and action in health and disease.

Integrative and Quantitative Approaches to Understanding Circuits

BRAIN 2025: “The Application of Integrated Technologies to Study Fundamental Questions in Neuroscience -- Numerous long-standing problems in brain science will benefit dramatically from the integrated experimental approach made possible by the BRAIN Initiative.”

Integrative Approaches – family of mechanisms GOALS and SCOPE OF WORK

	Integrative Approaches – family of mechanisms GOALS and SCOPE OF WORK	
FY17 FOAs	Exploratory Projects to establish feasibility/validity	Research Projects toward extensive, elaborated goals
Individual Lab or Small Multi-PI team	Exploratory Targeted BRAIN Circuits Projects – eTargeted BCP (R21, NEW) 2 year scope of work	Targeted BRAIN Circuits Projects – TargetedBCP (R01, NEW) 4-5 year scope of work
Multi-Component, Team-Approach Science	Exploratory Team-Research BRAIN Circuit Programs - eTeamBCP (U01, Reissue) 3 year scope of work	Team-Research BRAIN Circuit Programs - TeamBCP (U19, NEW) 5-10 year scope of work

Integrative and Quantitative Approaches to Understanding Circuits

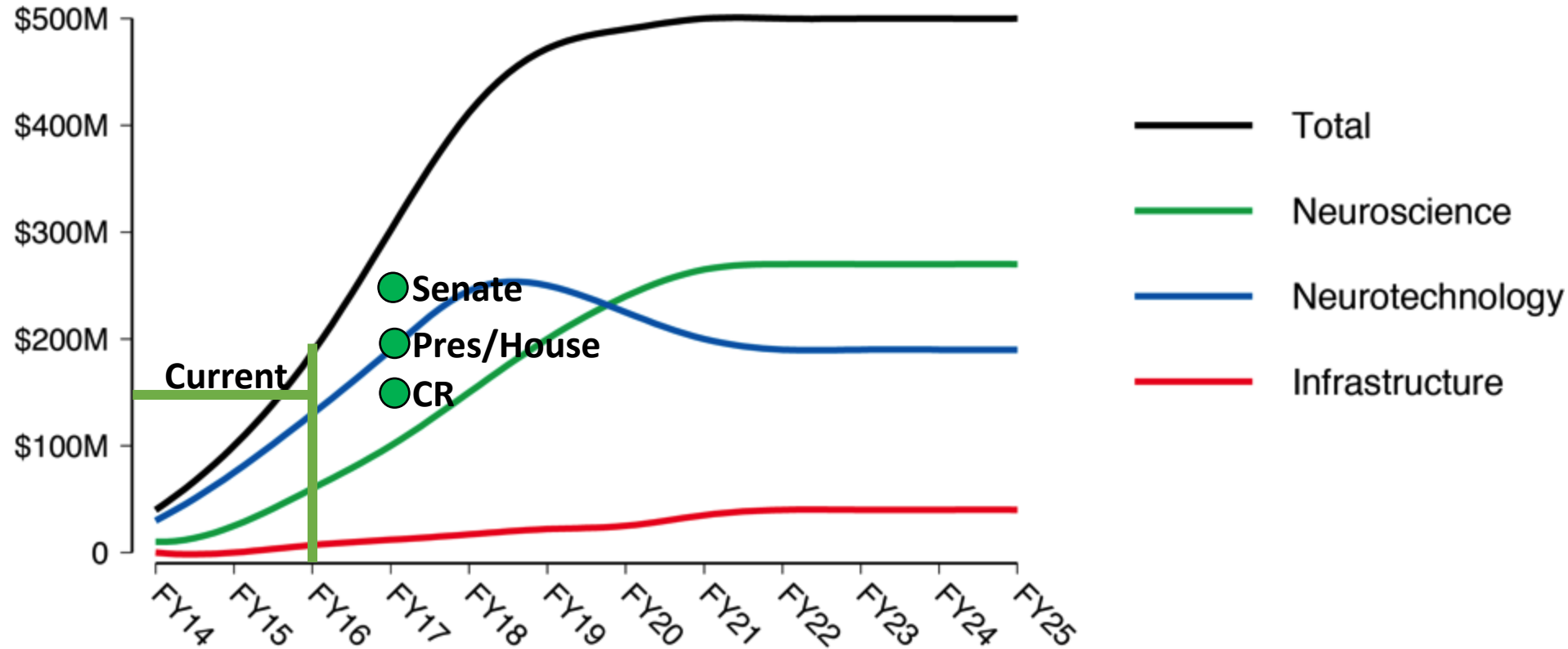
BRAIN 2025: “Rigorous theory, modeling, and statistics are advancing our understanding of complex, nonlinear brain functions where human intuition fails. New kinds of data are accruing at increasing rates, mandating new methods of data analysis and interpretation.”

Theories, Models and Methods for Analysis of Complex Data from the Brain R01; FY2016, FY2017 Reissue?

BRAIN 2025: “Consenting humans who are undergoing diagnostic brain monitoring, or receiving neurotechnology for clinical applications, provide an extraordinary opportunity for scientific research. New mechanisms are needed to maximize the collection of this priceless information and ensure that it benefits people with brain disorders.”

Research Opportunities Using Invasive Neural Recording and Stimulating Technologies in the Human Brain U01; FY2016, FY2017 Reissue

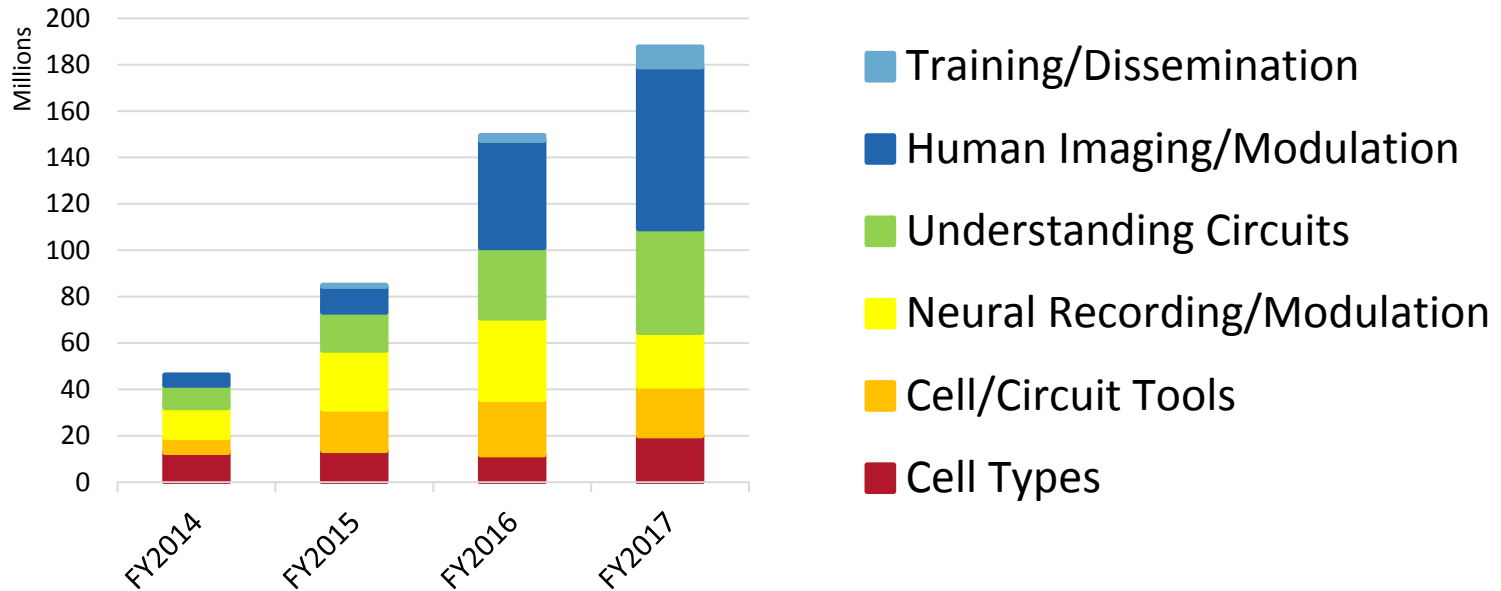
Recommended Budget



Ramp up to \$400M/yr by FY 2018 \implies Plateau at \$500M/yr by FY2021

Total investment of \$4.5B by FY 2025

FY17 Planned FOAs by Categories



- 1. Census of Brain Cell Types (~4 FOAs)
- 2. Tools for Cells and Circuits (1 FOA – active now)
- 3. Technologies for Neural Recording and Modulation (~3 FOA)
- 4. Understanding Neural Circuits (~6 FOA)
- 5. Human Imaging and Neuromodulation (~7 FOA)
- 6. Technology Dissemination and Training (~3 FOA)
- 7. Data Coordination (~3 FOA)
- 8. Ethics (1 FOA)