

## **UNDERSTANDING THE BRAIN (UTB)**

**\$129,200,000**  
**-\$30,660,000 / -19.2%**

### **Overview**

Understanding the Brain (UtB) is one of the grand scientific challenges at the intersection of the physical, life, behavioral, computing, and engineering sciences. In FY 2013, the multi-agency Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative was announced, with NSF as one of the lead participating agencies, and Congress reaffirmed its support for NSF's continued investments in the BRAIN Initiative as part of the 2017 American Innovation and Competitiveness Act (P.L. 114-329).<sup>1</sup> Through several new, cross-cutting programs and numerous existing core programs across the directorates, NSF will continue to support catalytic innovation in neuroscience as well as large-scale dissemination efforts to establish a national research infrastructure that will accelerate our understanding of brain function.

There remains much to discover to attain a comprehensive understanding of the general principles underlying how cognition and behavior relate to the brain's structural organization and dynamic activities; how brain, behavior, and environment interact; and how the brain can recover from lost functionality. The critical challenge to this comprehensive understanding is to integrate research and innovation across multiple scales of space and time, from biophysical, molecular, physiological, and genetic to cognitive and behavioral, with the ultimate goals of establishing integrative, quantitative, computational, and predictive theories of brain structure, activity, and function.

NSF is uniquely positioned to address this challenge and continue advancing research on understanding the brain by bringing together a wide range of scientific and engineering disciplines to reveal the fundamental principles underlying brain structure and function. Since FY 2014, the UtB activity has consolidated NSF's ongoing activities in cognitive science, neuroscience and the BRAIN Initiative. The UtB activity began in FY 2016 and will continue until FY 2020. NSF has been instrumental in supporting transformative breakthroughs in brain research and related technologies, such as optogenetics, the CLARITY brain preservation technique, and the first Food and Drug Administration (FDA) approved artificial retina, which all began with NSF support. The co-mingling of NSF's disciplinary and interdisciplinary fields is expected to foster new trans-disciplinary and convergent approaches to transform understanding of brain, cognition, behavior, and education, through the development of new technologies, theories, and fundamental research.

### **Goals**

The overall goal of UtB is to enable scientific understanding of the full complexity and function of the brain in action and in context. This multi-year goal is being pursued across four ongoing priority areas:

1. Develop innovative neurotechnologies, new physical and conceptual tools, experimental approaches, theories, and models to monitor and analyze brain activity and integrate neuroscience information across scales and scientific disciplines;
2. Identify the fundamental relationships among neural architecture, activity, cognition, and behavior;
3. Transform our understanding of how the brain responds and adapts to changing environments; and
4. Train a new generation of scientists, engineers, and educators for a transdisciplinary, globally competitive workforce in neuroscience and neuroengineering.

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<sup>1</sup>[www.congress.gov/bill/114th-congress/senate-bill/3084/text](http://www.congress.gov/bill/114th-congress/senate-bill/3084/text)

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**Funding Levels**

(Dollars in Millions)

<b>Dir/Office</b>	<b>FY 2017 Actual</b>	<b>FY 2018 (TBD)</b>	<b>FY 2019 Request</b>
BIO	\$46.39	-	\$46.00
CISE	25.84	-	22.15
EHR	11.00	-	7.00
ENG	23.40	-	16.75
MPS	25.46	-	13.30
SBE	27.78	-	24.00
<b>Total, UtB</b>	<b>\$159.86</b>	<b>-</b>	<b>\$129.20</b>
<i>BRAIN Initiative</i>	<i>\$89.73</i>	<i>-</i>	<i>\$67.26</i>