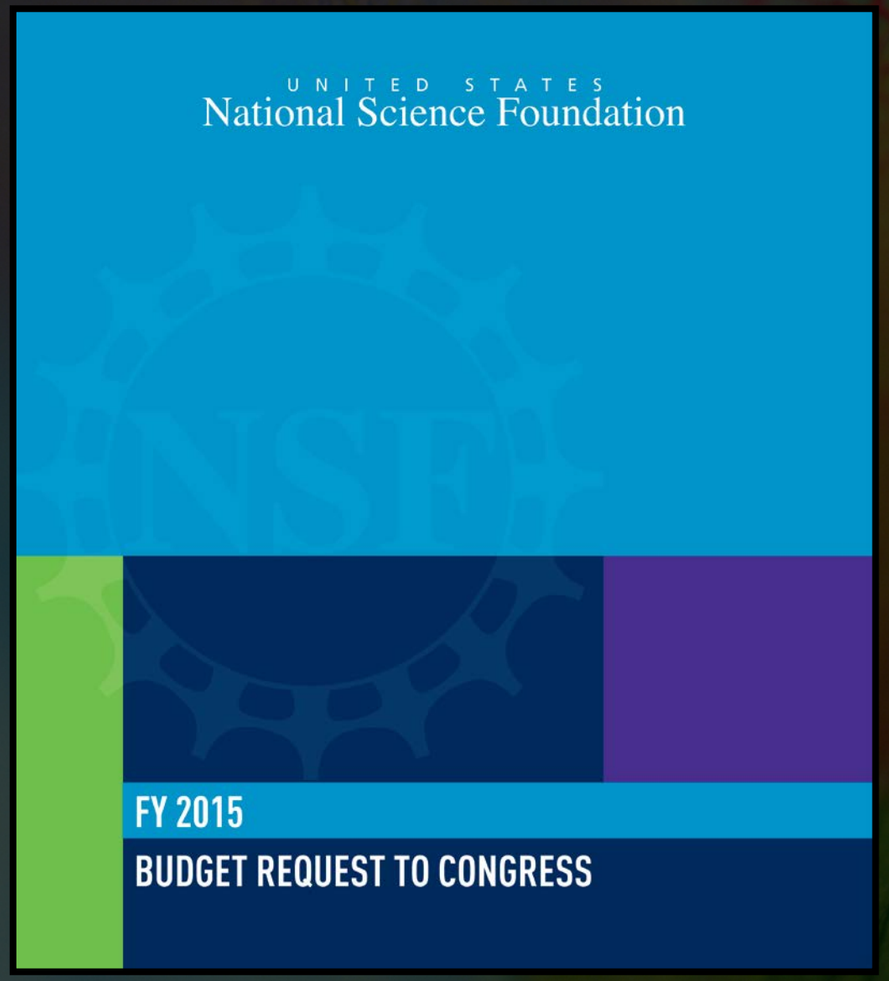
NATIONAL SCIENCE FOUNDATION

FISCAL YEAR 2015 BUDGET REQUEST

John Wingfield
Directorate for Biological Sciences
March 10, 2014

NSF FY 2015 Budget Request



NSF FY 2015 Budget

Total: $7.255 billion

Increase: $83 million

1.2% over FY 2014 Estimate

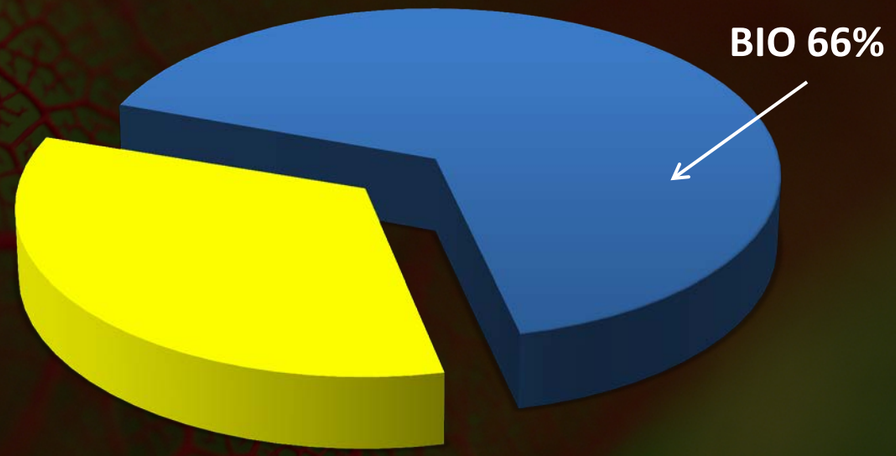
BIO FY 2015 Budget Request

TOTAL, BIO R&RA: $708.52 million,

-1.8%

- **Research: $531 million**
- **Learning: $32 million**
- **Infrastructure: $133 million**
- **Administration: $13 million**

NEON Construction: $98.2 Million



Other federal spending 34%

Federal Support for Basic Research in Non-Medical Biological Sciences at Academic Institutions

National Science Foundation
FY 2015 Budget Request to Congress
(Dollars in Millions)

	FY 2013 Actual	FY 2014 Estimate	FY 2015 Request	FY 2015 Request Change over FY 2014 Estimate
Biological Sciences	$679.21	$721.27	$708.52	-$12.75
Computer & Information Science & Engineering	858.13	894.00	893.35	-0.65
Engineering	820.18	851.07	858.17	7.10
Engineering Programs	*658.84*	*691.68*	*693.18*	*1.50*
SBIR/STTR	*161.34*	*159.39*	*164.99*	*5.60*
Geosciences	1273.77	1303.03	1304.39	1.36
Mathematical & Physical Sciences	1249.34	1299.80	1295.56	-4.24
Social, Behavioral & Economic Sciences	242.62	256.85	272.20	15.35
Office of International and Integrative Activities	434.28	481.59	473.86	-7.73
U.S. Arctic Research Commission	1.39	1.30	1.41	0.11
Total, Research and Related Activities	5,558.88	5,808.92	5,807.46	-1.46

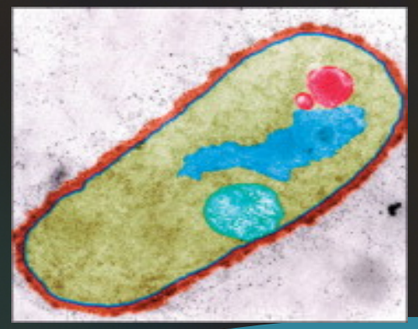
BIO FY 2015 Budget Request

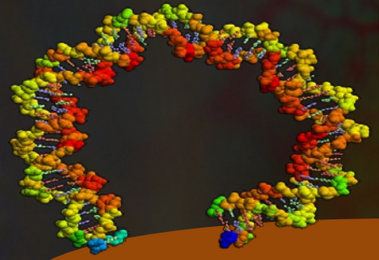
Biological Sciences Funding (Dollars in Millions)					
	FY 2013 Actual	FY 2014 Estimate	FY 2015 Request	Change over FY 2014 Estimate	
				Amount	Percent
Molecular and Cellular Biosciences (MCB)	$123.40	$129.68	$128.58	-$1.10	-0.9%
Integrative Organismal Systems (IOS)	204.50	215.74	218.19	2.45	1.1%
Environmental Biology (DEB)	133.26	138.87	137.52	-1.35	-1.0%
Biological Infrastructure (DBI)	121.16	132.33	136.67	4.34	3.3%
Emerging Frontiers (EF)	96.90	104.65	87.56	-17.09	-16.3%
Total, BIO	**$679.21**	**$721.27**	**$708.52**	**-$12.75**	**-1.8%**
Totals may not add due to rounding.					

BIO Major Investments

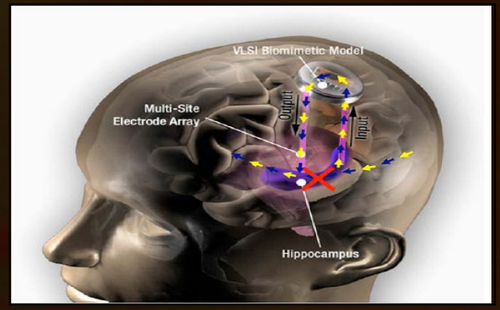
- **Five Grand Challenges (2010 National Research Council Report)**
- **Neuroscience – Understanding the Brain**
- **BioMaPS: Research at the Interface of Biological, Mathematical and Physical Sciences, and Engineering**
- **National Ecological Observatory Network (NEON)**
- **SEES: Science, Engineering and Education for Sustainability**
- **Cyberinfrastructure**

Five Grand Challenges for 21st Century Biology





Genomes to Phenomes

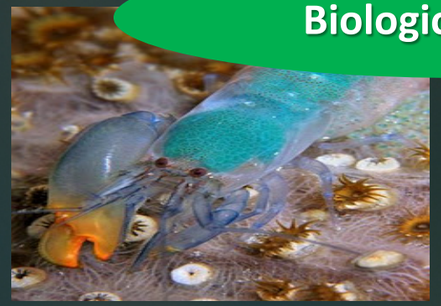


Synthesizing Life

The Brain

Research at the Intersection of the Physical and Life Sciences (2010 NRC Report)

Biological Diversity



Earth, Climate, & Biosphere

Cognitive Science & Neuroscience

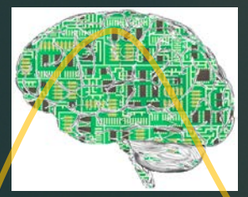
$29 M

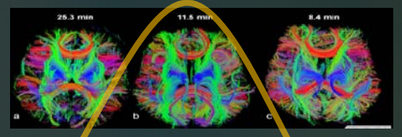
Overarching Goals:

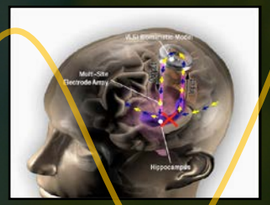
- Develop innovative neurotechnologies and new tools to study neural systems across scales and disciplines
- Identify the fundamental relationships among cognition and behavior
- Understand how the brain responds and adapts to changing environments
- Train a new generation of neuroscientists and neuroengineers

FY 2015 NSF-wide Emphases:

- Integrative and transdisciplinary team-based brain research
- Data science, infrastructure and tool development for understanding the brain
- Training and professional development in multi-disciplinary research, data management and analysis





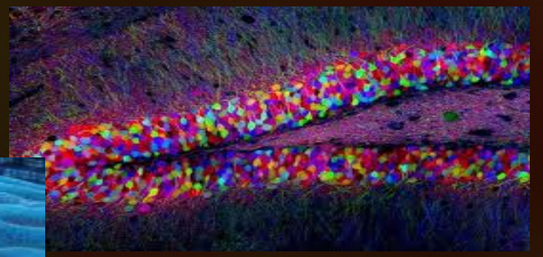


Neuroscience: Understanding the Brain

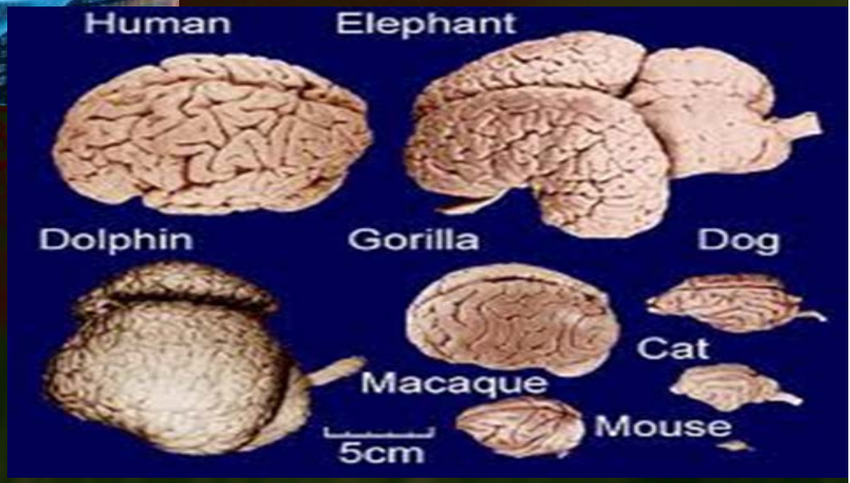
$9.5M

Optogenetics

Computational Neuroscience



High Resolution Imaging



Species Comparisons

Fundamental research to understand neural circuitry and neural activity that underlies cognition, behavior and thought.

BIO focus on genetics, molecular and cellular mechanisms responsible for brain evolution, development, and function.

Going for the Multiplier Effect - BRAIN EAGER

Foster innovative approaches aimed at

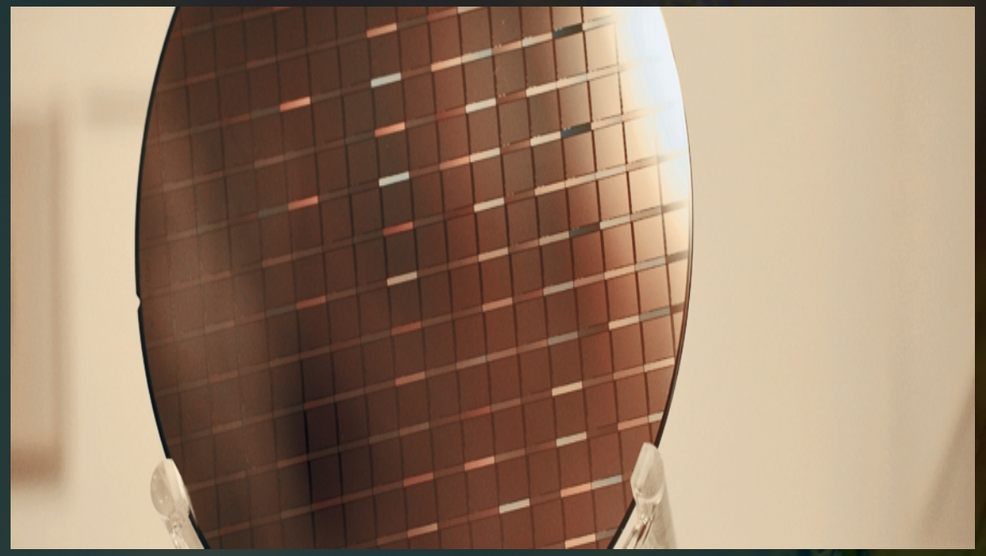
"Catching circuits in action – from neurons to behavior"

- Develop tools to identify neural circuits active during behavior
- Develop methods to map connectivity in identified circuits
- Manipulate identified circuits to relate behavior and neural activity
- Data analysis and modeling tools for fundamental insights
- Establish general principles of emergent behavior from neural activity

Involves neurobiologists, theorists, mathematicians, computer scientists & engineers

Research at the Interface of Biological, Mathematical and Physical Sciences and Engineering (BioMaPS)

$14.31M

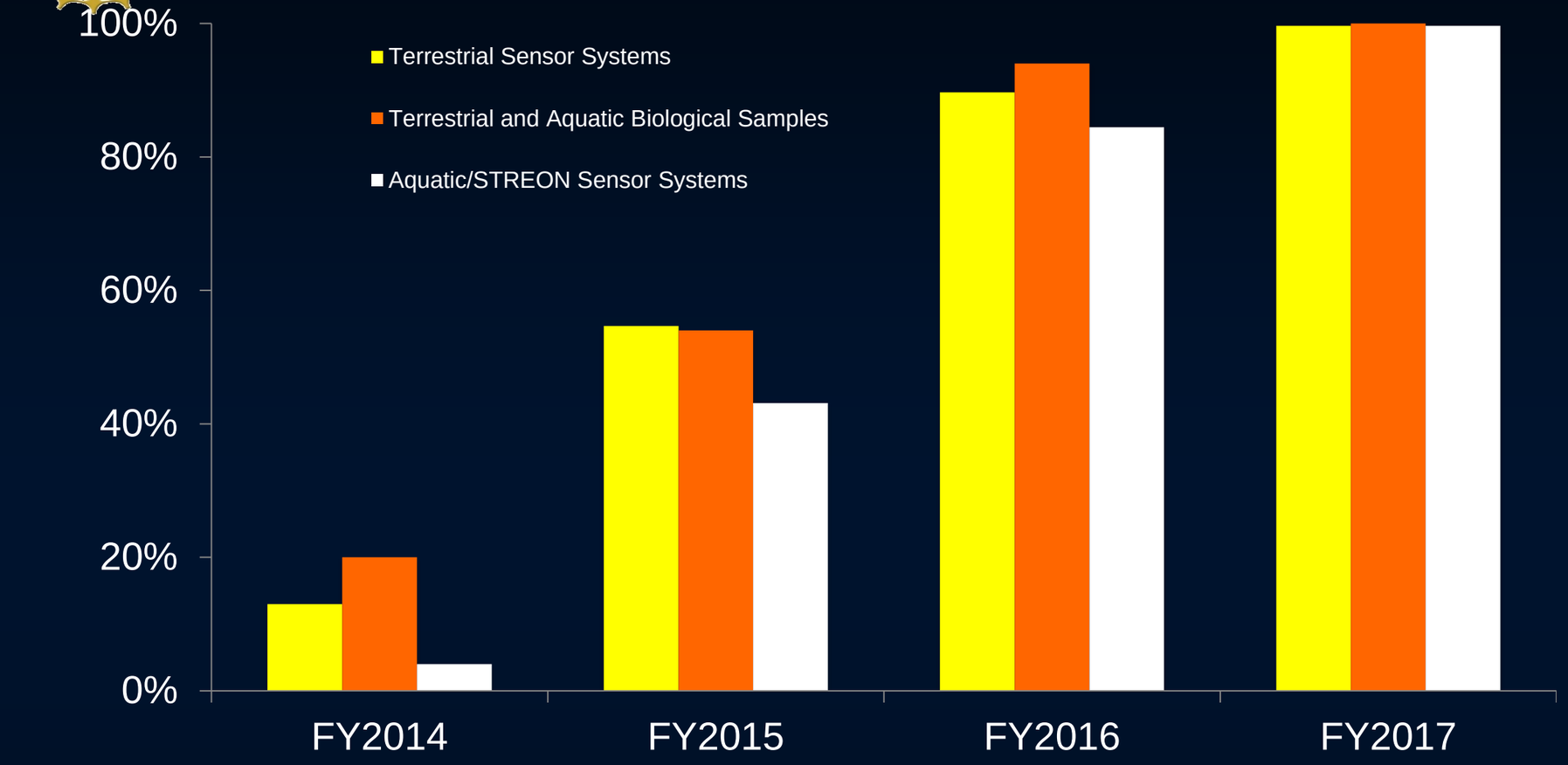


New topics for FY 2015 :

- understanding the environmental impacts of synthetic organisms
- integration of evolutionary thinking into design-build-test cycles used in synthetic biology
- application of synthetic biology tools and approaches in environmental research

From bioscience to bioeconomy: A wafer for chemical space investigations inspires molecular nanodevices and diagnostic applications (Award # - 1330914)

Observatory Construction



Sensor Systems

Biological Sampling

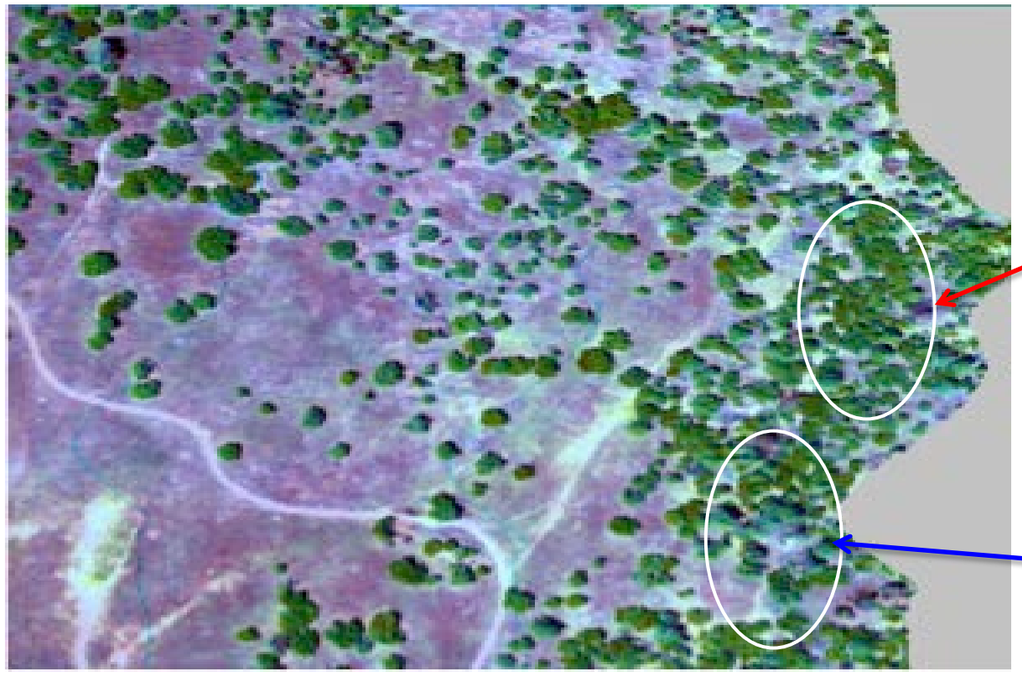
In 2014:

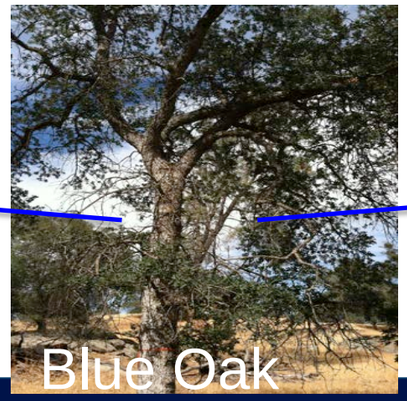
- Initial operations begin
- Data portal goes live with provisional data
- Community workshops to engage researchers in using provisional data for scientific and educational projects.

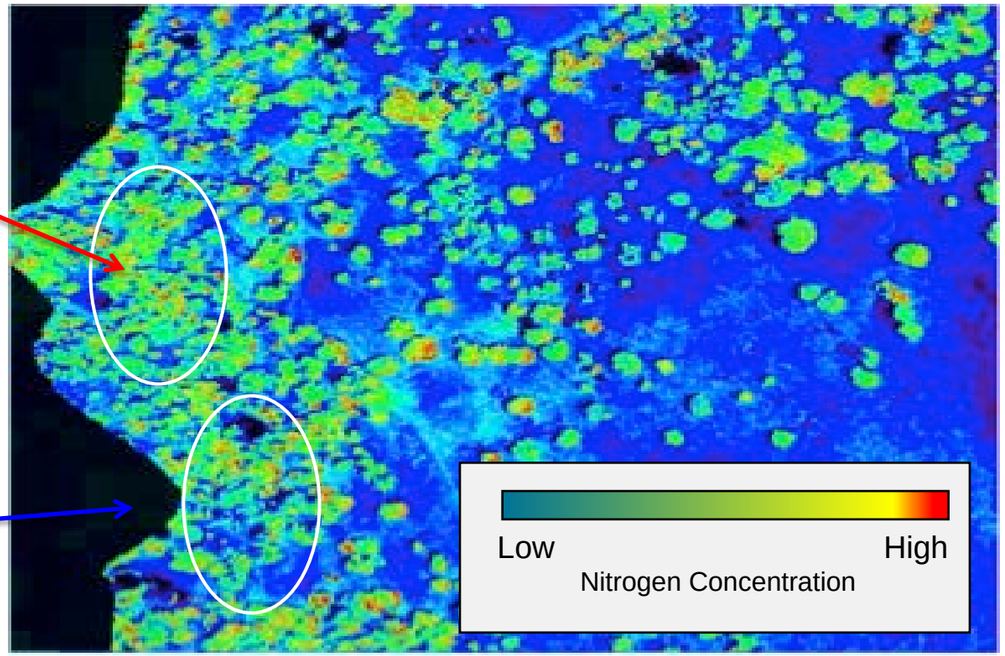
Using NEON Airborne Data to Map Diversity and Assess Nitrogen Concentrations from Individual trees to Entire Regions

Blue and Live Oaks have different canopy structures and can be visibly identified using LIDAR and NEON's high resolution camera

High resolution spectrometer data are overlain with an index of nitrogen concentration to develop correlations between visible imagery and biogeochemistry







SEES: Science, Engineering and Education for Sustainability

$21 M

- NSF-wide investment
- BIO FY 2015 Focus
  - Focus on Dimensions of Biodiversity and Dynamics of Coupled and Natural Human Systems
- Evaluating impact on sustainability research, collaboration across disciplines and workforce development

Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21)

Accelerating the progress of scientific discovery and innovation

$124.75M

- **BigData** – Developing core scientific and technological means of managing, analyzing, visualizing, and extracting useful information from large, diverse, distributed and heterogeneous data sets;
- **DIBBS** - Creating data infrastructure building blocks through pilots and early implementations of robust and shared data-centric cyberinfrastructure for scientific communities;
- **CDS&E** - Building and developing new computational and data-enabled science and engineering research communities;
- **SI²** - Advancing new computational infrastructure, and catalyzing new paradigms and practices in the development and use of software that is robust, reliable, usable, and sustainable; and
- **Community Building Partnerships** - EarthCube, Building Community and Capacity (BCC), and DataWay.

CISE, BIO, EHR, ENG, GEO, MPS, and SBE

BIO CYBERINFRASTRUCTURE

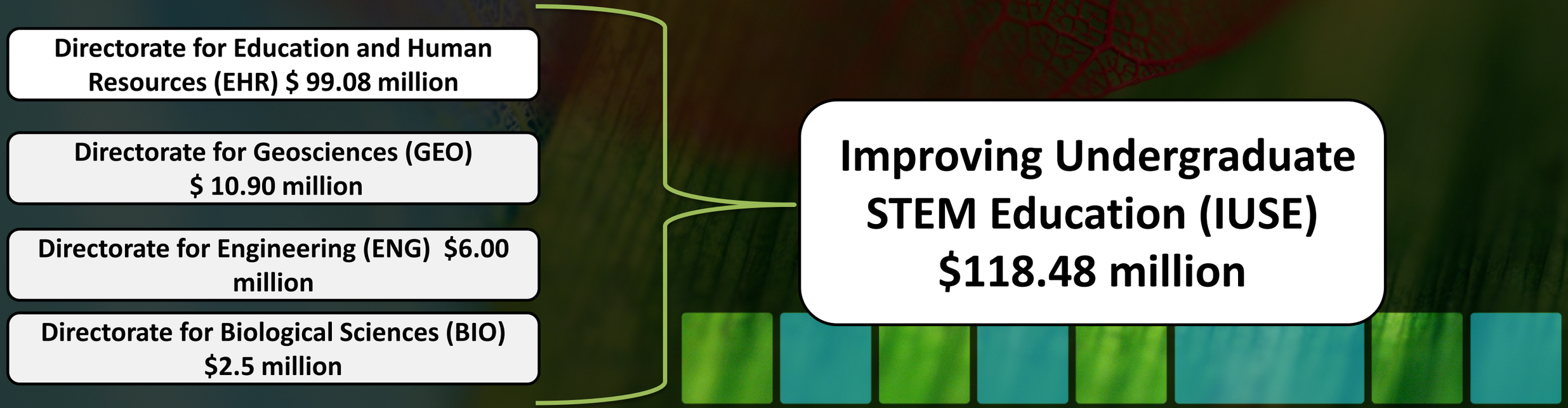
FY 2015 Activities:

$3.75 M

- Software Infrastructure for Sustained Innovation
- Data-enabled Science
- Cyberinfrastructure in the Life Sciences
- Strategic Integration for the Biological Sciences (SIBs)
- BIO cyber facilities; *e.g.*, iPlant , iDigBio

Improving Undergraduate STEM Education (IUSE)

- Rapidly and dramatically improve U.S. undergraduate STEM education through coherent, agency-wide investment to:
  - increase numbers
  - broaden diversity
  - Improve preparation of STEM professionals
- Common system of assessing the impact of the collective investment



Investments in STEM Graduate Education

NSF invests in STEM graduate education through fellowship and traineeship mechanisms to:

- invest in foundational, emerging, and interdisciplinary areas of science, engineering, and education
- build the U.S. STEM human capital to advance S&E and innovation for the Nation
- encourage innovation and design of graduate program models

Graduate Research Fellowship (GRF) $333.44 million

NSF Research Traineeship (NRT) $37.84 million, including $7.0 for new track, *Innovation in Graduate Education (IGE)*

FY 2015 Investments in STEM Graduate Education $371.28 million

The Directorate for Biological Sciences

Enabling Discoveries