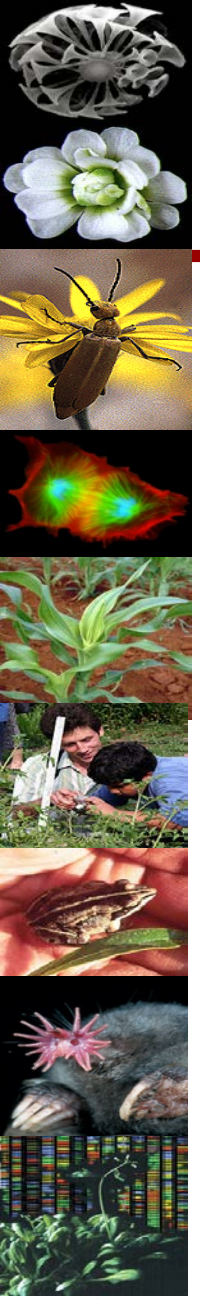


Biological Sciences Directorate
Division of Biological Infrastructure

Muriel Poston, Division Director
Division of Biological Infrastructure
Biological Sciences Directorate

National Science Foundation
WHERE DISCOVERIES BEGIN

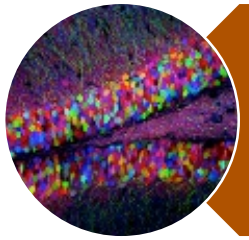
Directorate for Biological Sciences (BIO)

"To enable discoveries for understanding life, advance the frontiers of biological knowledge, increase our understanding of complex systems, and provide a theoretical basis for original research in many other scientific disciplines."

BIO Priorities

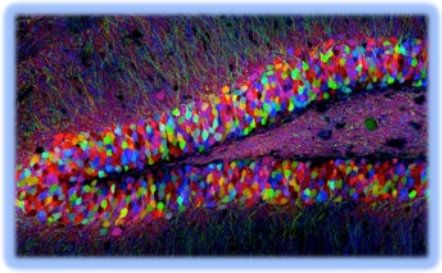
Understanding the Rules of Life

NEON / NEON Science



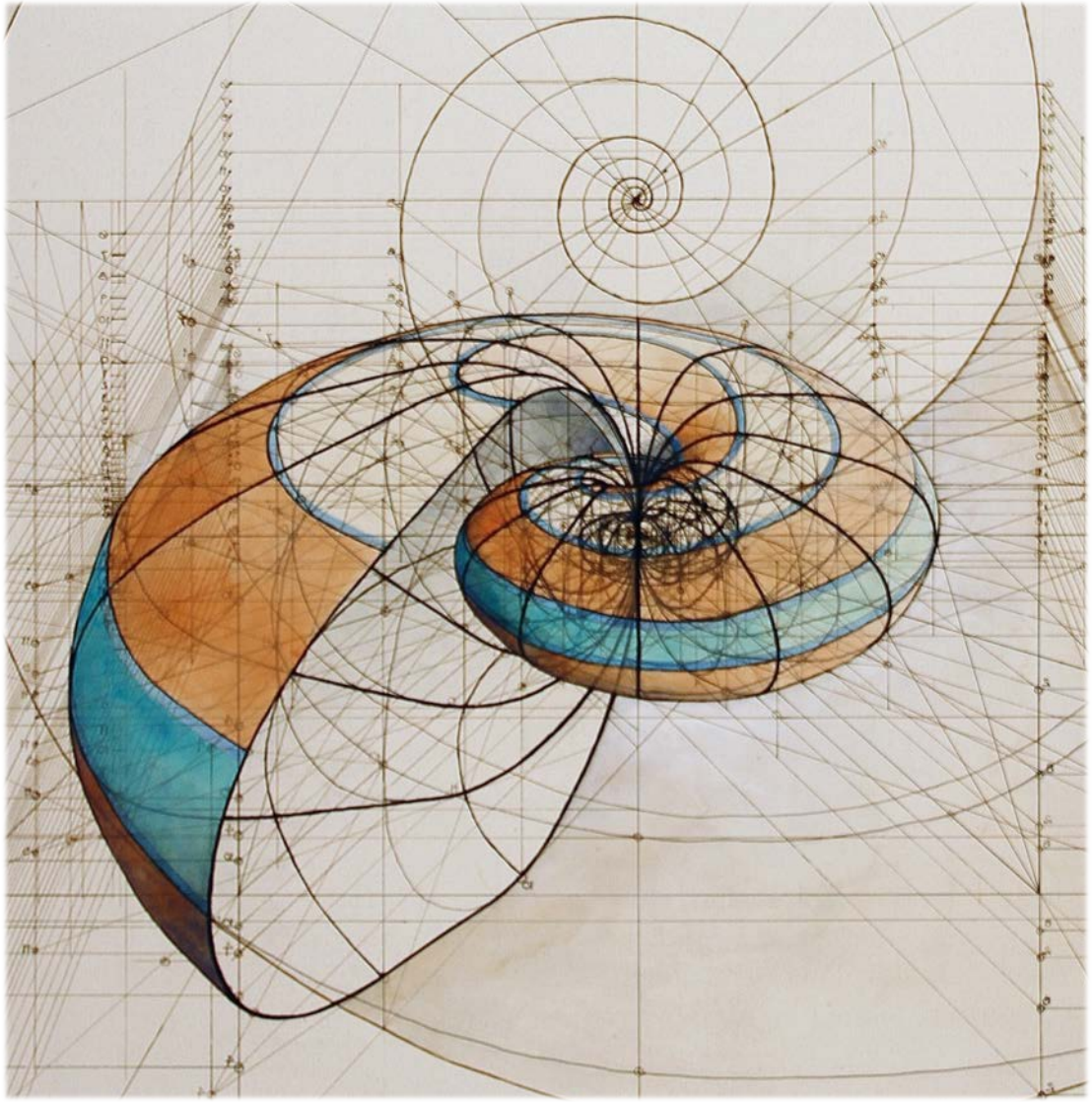
Understanding the Brain

Fundamental Research and Workforce Development

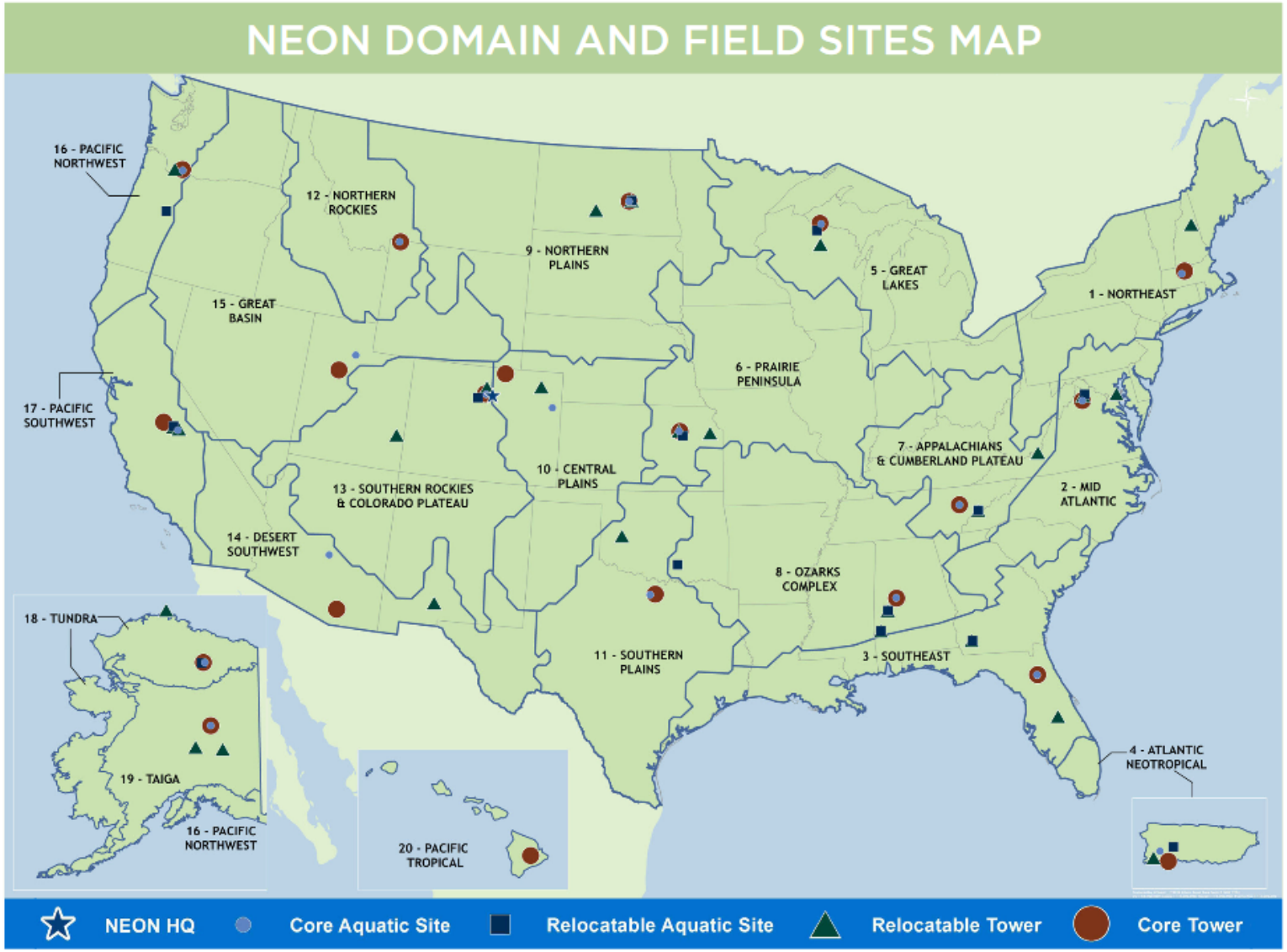


Shift to “no-deadlines”:

- Foster collaborative, convergent research
- Reduce number of proposals
- Increase overall quality of proposals
- Positive community feedback



Map of NEON Domains and Sites



The NEON program has established “core” aquatic and terrestrial sites at locations selected to characterize wildland environments over the 30-year lifetime of the

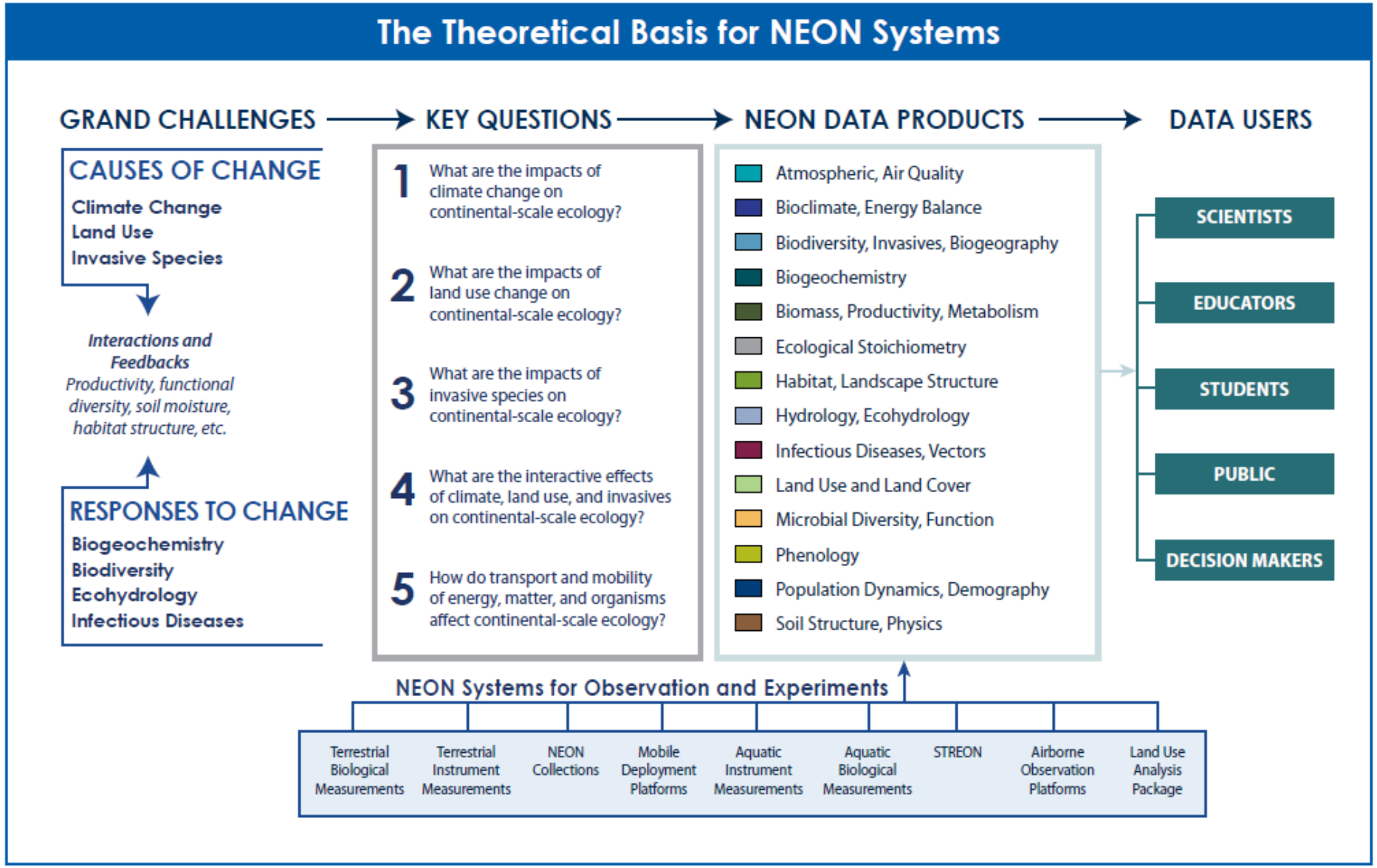


Figure 3: How the Grand Challenges translate into the five key questions and then into the data products and the required NEON systems for observation.

Data Themes

ATMOSPHERE
Characterize atmospheric processes and change over time, including changes in physical climate and net ecosystem exchange

BIOGEOCHEMISTRY
Measure key nutrients (carbon, nitrogen and phosphorus) and track through atmosphere, water bodies, soil, microbes, plants and animals

ECOHYDROLOGY
Measure precipitation patterns, soil/groundwater dynamics, interactions with vegetation, processes such as nutrient cycling in aquatic ecosystems

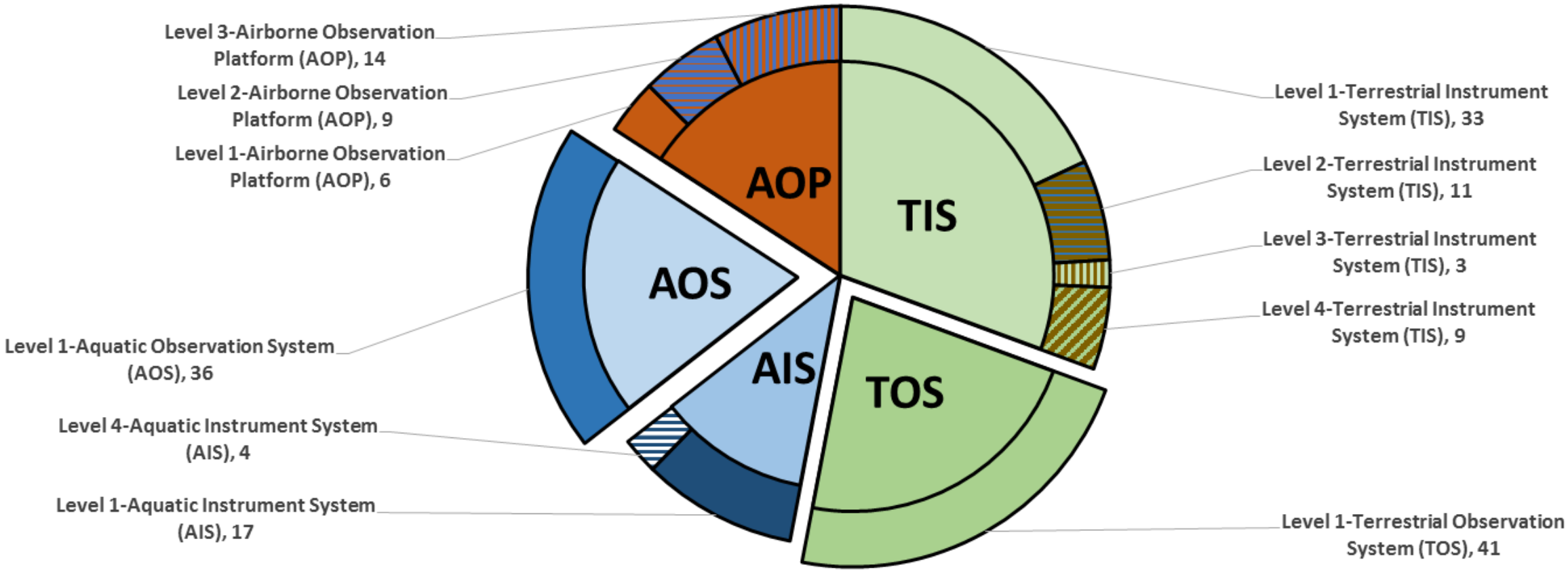
LAND COVER, and PROCESSES
In situ measurements and airborne remote sensing observations that are combined and integrated with other data to produce a suite of land data products

ORGANISMS, POPULATIONS, and COMMUNITIES
Measurements of individual organism traits, population dynamics and the composition of communities; includes most of sample archive

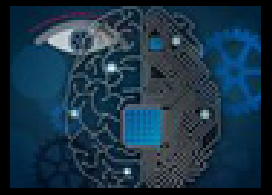
NEON's 180 Data Products Overlap Multiple Themes

Atmospheric 58	Organismal 51	Ecohydrology 47	Biogeochemistry 85	Land Related 47
				
+11 from AmeriFlux	+1 from PhenoCam +3 from MG-RAST	+2 from AeroNet		
H_2O, CO_2 Heat Isotopes Turbulence Storage Fluxes	Abundance Composition Pathogens Phenology DNA Barcodes Marker Genes Metagenomics	Water quality Precipitation Levels Discharge Radiation Geomorphology	Soil conditions Chemistry Particulates Foliar characteristics	Spectrometry Hi-Ras imagery LIDAR

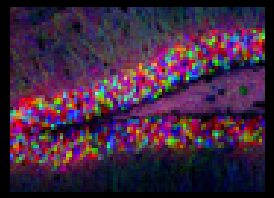
NEON Data Product Catalog



NSF BRAIN Initiative Themes

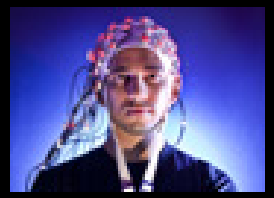


Multi-scale Integration of Brain Dynamic Activity and Structure



Neurotechnology and Research Infrastructure

Quantitative Theory and Modeling of Brain Function



Brain-Inspired Concepts and Designs

BRAIN Workforce Development

NSF BRAIN Initiative – a timeline

April 2013

NSF awards $10.8 million in early concept grants for brain research

BRAIN EAGERs
September 2014

Bold new brain research in neuroengineering, brain-inspired design, and individuality

NCS awards
August 2015

Olfactory Ideas Lab
September 2015

NSF funds new integrative approaches to study the brain

NCS awards
August 2016

Cyber EAGERs
September 2016

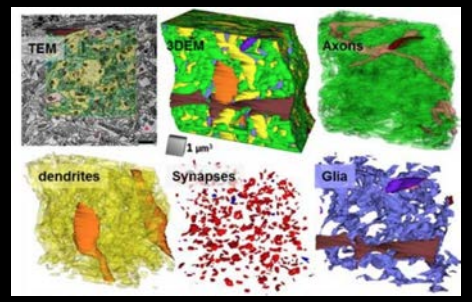
NSF funds new multidisciplinary approaches to study the brain

NCS awards
August 2017

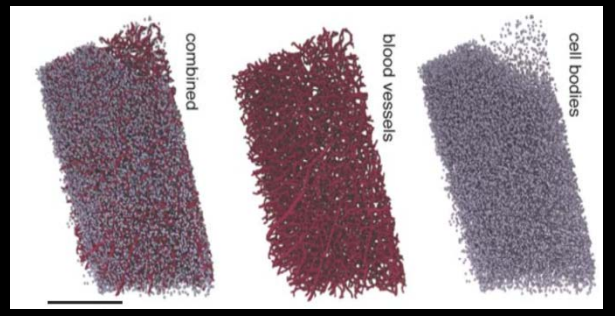
NeuroNex awards
August 2017

NeuroNex Technology Awards

Data and cyberinfrastructure intensive projects

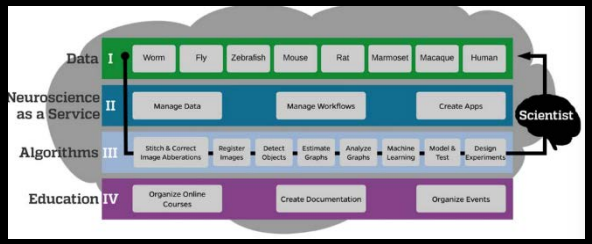


Harris/Carson/Sejnowski
UT Austin, Salk Institute, TACC
“Enhanced resolution for 3DEM analysis of synapses across brain regions and taxa”



Kasthuri/Littlewood (U. Chicago and Argonne Natl. Lab

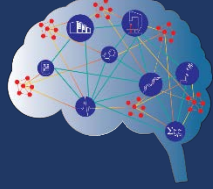
“A National Resource for Mesoscale and Connectomic Brain Mapping in Diverse Species”



Vogelstein/Burns/**Priebe** (JHU)

“Towards Automated Analysis of Multi-Terabyte Cleared Brains”

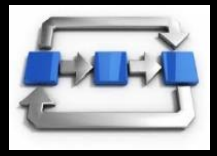
Cyberinfrastructure for Neuroscience



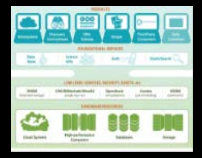
Research cyberinfrastructure at the institutional, regional, and national levels…

Computing Resources

Data Infrastructure



Software and Workflow Systems



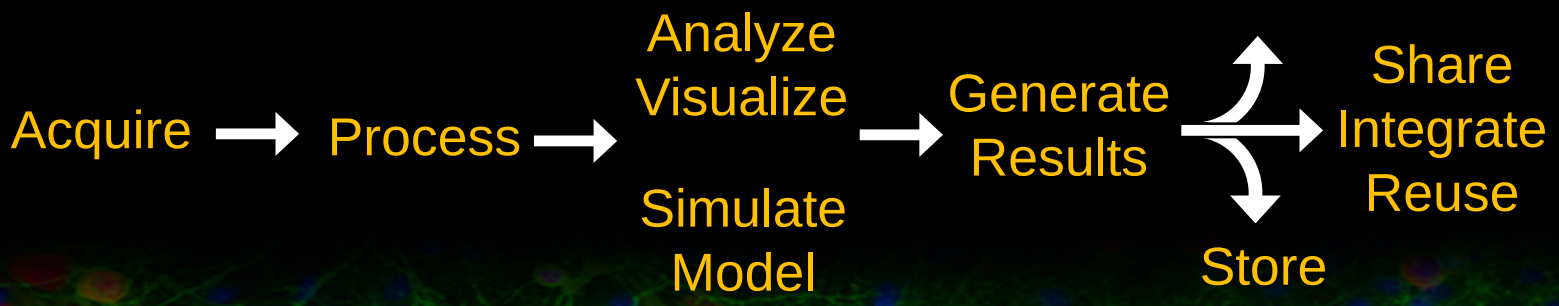
Gateways, Services

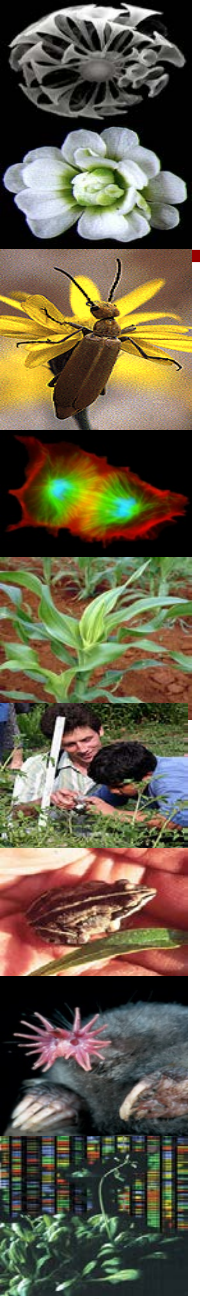
Coordination, User support

Networking, Security

People, Communities

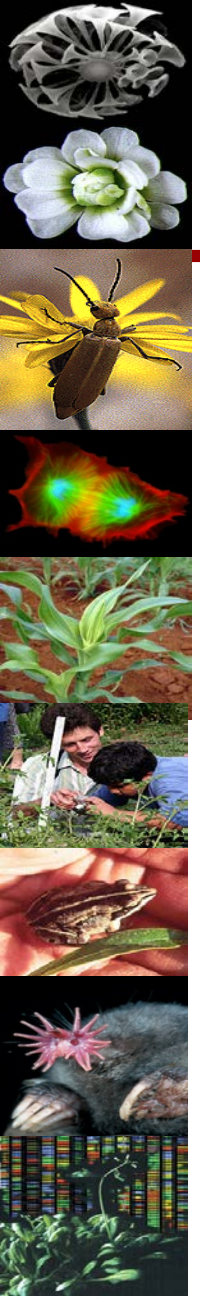
… enables, accelerates and scales-up discovery and collaboration pathways





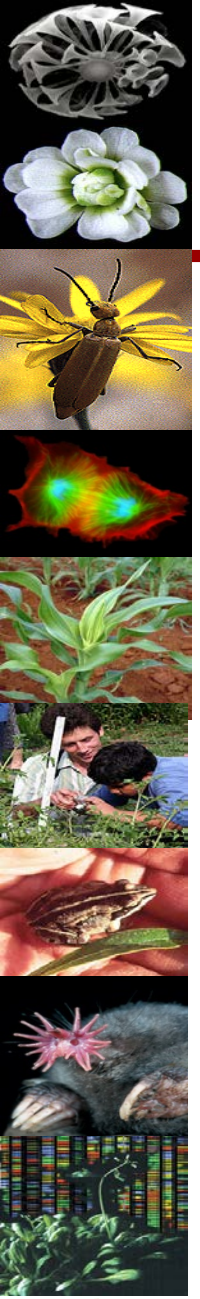
Cyberinfrastructure in Biological Infrastructure

- DBI envisions cyberinfrastructure support in a life cycle context:
  - Innovation: development of new tools and software platforms (proof of concept) that will be transformative to research areas supported by the Biological Sciences Directorate
  - Capacity building: involves scaling beyond the initial innovation to ensure utilization of the cyberinfrastructure to a broad constituency beyond the initial developers
  - Sustainability: core infrastructure operation beyond that will sustain the cyberinfrastructure as it seeks to develop a sustainable model



Principles of Collaboration with other NSF Research Directorates (CISE, MPS, ENG)

- Issues of Scale:
  - Emphasis on force multiplers from smaller scale investments, e.g. Galaxy or CyVerse or iDigBio provide dissemination and integration platforms for tools and activities funded in BIO with smaller awards
- Interoperability:
  - Cyberinfrastructure supported in BIO sits at the transition between the fundamental technologies supported in CISE, MPS (MA), ENG and BIO's core researchers who represent the users of the tools supported by BIO's cyberinfrastructure.



Questions?

mposton@nsf.gov