

ACD **BRAIN** WORKING GROUP

ACD UPDATE – DECEMBER 5, 2013

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Investigator, HHMI

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Co-Chair, ACD BRAIN Working Group

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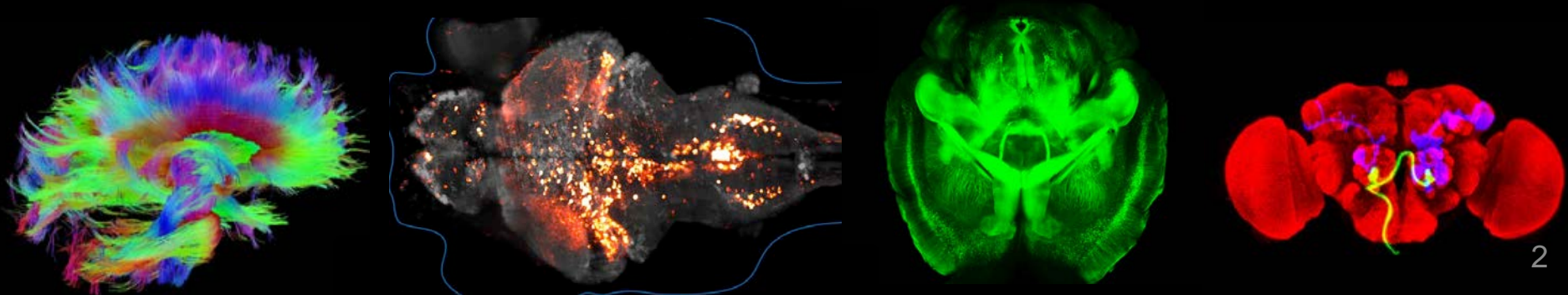
Co-Chair, ACD BRAIN Working Group



OUR CHARGE

Accelerate the development and application of **innovative technologies** to construct a **dynamic picture** of brain function that **integrates neuronal and circuit activity over time and space.**

Build on neuroscience, genetics, physics, engineering, informatics, nanoscience, chemistry, mathematics, to catalyze an interdisciplinary effort of unprecedented scope.



BRAIN INITIATIVE WORKING GROUP

Cornelia Bargmann and Bill Newsome (*co-chairs*)

David Anderson, Caltech

Emery Brown, MIT

Karl Deisseroth, Stanford

John Donoghue, Brown

Peter MacLeish, Morehouse

Eve Marder, Brandeis

Richard Normann, Utah

Joshua Sanes, Harvard

Mark Schnitzer, Stanford

Terry Sejnowski, Salk

David Tank, Princeton

Roger Tsien, UCSD

Kamil Ugurbil, Minnesota

Ex Officio Members

Kathy Hudson, NIH

Geoffrey Ling, DARPA

John Wingfield, NSF

Executive Secretary

Lyric Jorgenson, NIH

OUR PLAN

Review
neuroscience landscape

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Articulate short-, mid- and
long-range scientific goals

Develop rigorous scientific plan, including

- High-priority research areas
- Principles and appropriate structures
- *Collaboration opportunities*
- *Timelines, milestones and cost estimates (Next)*

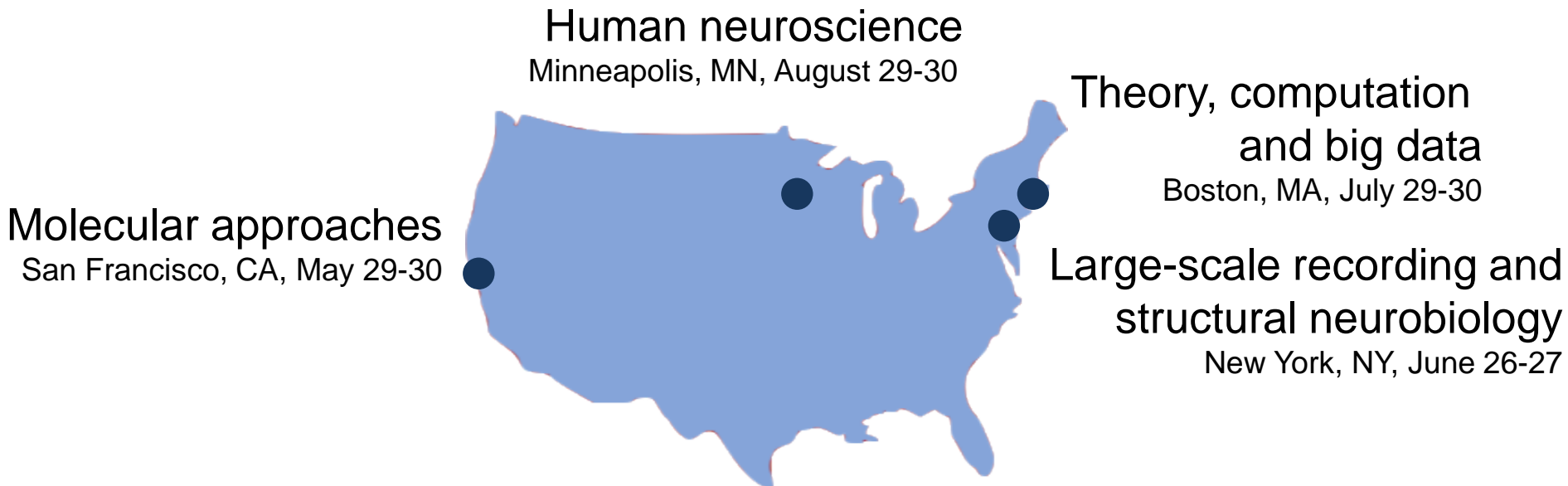
Delivered interim report on high-priority areas
for NIH FY14 funding in September 2013,
Deliver final report in June 2014

OUR PROCESS

FOUR WORKSHOPS (SPRING/SUMMER 2013)

48 outside experts

Opportunities for public commentary

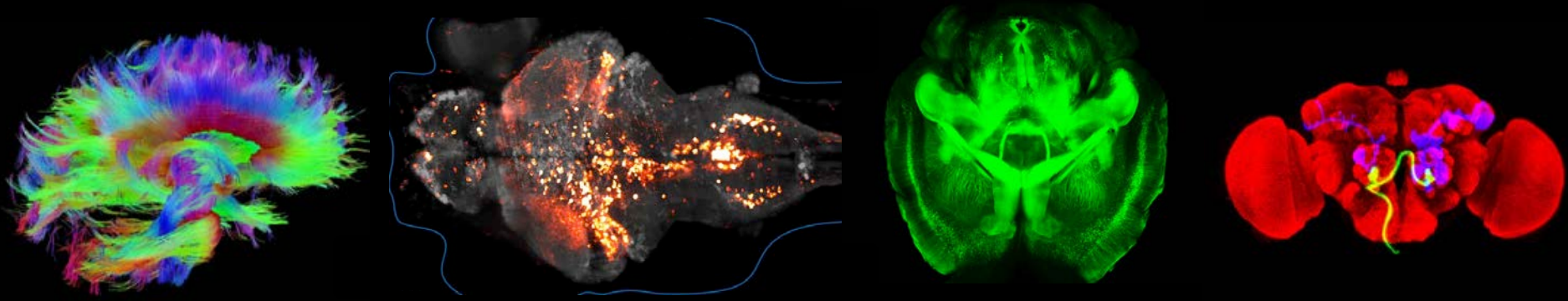


THREE ADDITIONAL MEETINGS April 16, May 5, September 8

INTERIM REPORT TO THE ACD September 16

A FOCUS ON CIRCUITS AND NETWORKS

To map the circuits of the brain, measure the fluctuating patterns of electrical and chemical activity flowing within those circuits, and understand how their interplay creates our unique cognitive and behavioral capabilities.



HIGH IMPACT AND HIGH-QUALITY SCIENCE

The BRAIN Initiative must accelerate other areas of neuroscience research

- In 2014 NIH will spend \$5.5B on neuroscience research, and BRAIN will be \$40M (<1%). It must focus, yet have broad impact.

Technology is not an end in itself

- Focus is on **acquiring fundamental insight** about nervous system function in health and disease. What tools and infrastructure are needed?

Pose the problems, don't dictate the solutions

- Allow the most compelling ideas to flourish – it is early and new approaches are still emerging. Encourage collaboration.

A FOCUS ON CIRCUITS AND NETWORKS

Maps of the Brain:

Cellular maps – with molecular components

Activity maps – electrical and chemical

Connectivity maps – local and long-range

Functional maps – perturbations and behavior

Conceptual maps – theory and understanding

An Interdisciplinary Effort for:

Discovery of fundamental circuit properties and principles

Insight into circuits relevant to human brain function & disease

Acceleration of basic science, medicine, and technology

INTERIM REPORT -- PRINCIPLES

- 1 Use appropriate experimental systems and models
- 2 Cross boundaries in interdisciplinary collaborations
- 3 Integrate spatial and temporal scales
- 4 Establish platforms for sharing data
- 5 Validate and disseminate technology
- 6 Consider ethical implications of neuroscience research

INTERIM REPORT -- HIGH PRIORITY RESEARCH AREAS

- 1) Generate a census of cell types
- 2) Create structural maps of the brain
- 3) Develop new large-scale network recording capabilities
- 4) Develop a suite of tools for circuit manipulation
- 5) Link neuronal activity to behavior
- 6) Integrate theory, modeling, statistics, and computation with experimentation
- 7) Delineate mechanisms underlying human imaging technologies
- 8) Create mechanisms to enable collection of human data
- 9) Disseminate knowledge and training

INTERIM REPORT: FEEDBACK

Feedback was solicited at events associated with
the **Society for Neuroscience** meeting

November, 2013, San Diego

- 1) Open SFN panel discussion with US agencies (NIH, NSF and DARPA) and European Commission (Human Brain Project)
- 2) Town hall with scientific community (Newsome & Bargmann)
- 3) National Academy of Sciences, neuroscience members
- 4) ACD Working group meeting (November 13):

Discussion with outgoing President Swanson, President Mason,
and President-elect Hyman of the Society for Neuroscience

Presentations by and discussion with NSF, DARPA, HHMI, Allen
Brain Institute, Kavli representatives

INTERIM REPORT: FEEDBACK

- Response to scientific program has been very positive.
- Actions needed in response to feedback:
 - State explicitly how the **BRAIN Initiative will positively impact multiple areas of neuroscience**: cellular and molecular, genetics, developmental and stem cells, cognitive, disease-focused.
 - Address concerns about the **NIH funding climate**: will BRAIN generate new resources?
 - Clarify how NIH and other **BRAIN partners** will cooperate with each other, with international efforts, and with private sector groups.

NEXT STEPS

- Interim report articulated a scientific and technological agenda for understanding neuronal circuits and how they mediate cognition and behavior.
- Next meeting, January 16-17, 2014, Washington DC
 - Discussion with NIH Big Data to Knowledge representative
 - Identify core goals for a 10-year national BRAIN Initiative.
 - Identify essential technologies for achieving these goals.
 - Recommend appropriate structures for achieving the goals: Small scale collaborations? Larger group efforts? Dedicated centers?
 - Develop time-lines and specific milestones toward achieving the goals.

NEXT STEPS

- Stakeholder meeting to refine recommendations.
 - March 5-6, 2014, Washington DC
 - Brain Initiative partners, public and private
 - NIH Neuroscience leadership
 - Representatives of The Society for Neuroscience
 - Representatives of clinical societies (Neurology, Psychiatry, Anaesthesiology, Neurosurgery)
 - Patient advocacy organizations
 - Additional suggestions
 - Deliver final report to ACD, June 5, 2014
- Goals, critical technologies, mechanisms, time-lines and milestones.