

Institute of Medicine Neuroscience Training Workshop

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How can the Allen Institute Help to Prepare the Next Generation?

Allen Institute for Brain Science

Our Mission: Past - and Present

The mission of the Allen Institute for Brain Science is to **accelerate** the **understanding of how the human brain works** in health and disease. Using a **team science approach**, we generate useful public resources, drive technological and analytical advances, and discover fundamental brain properties through **integration of experiments, modeling, and theory.**



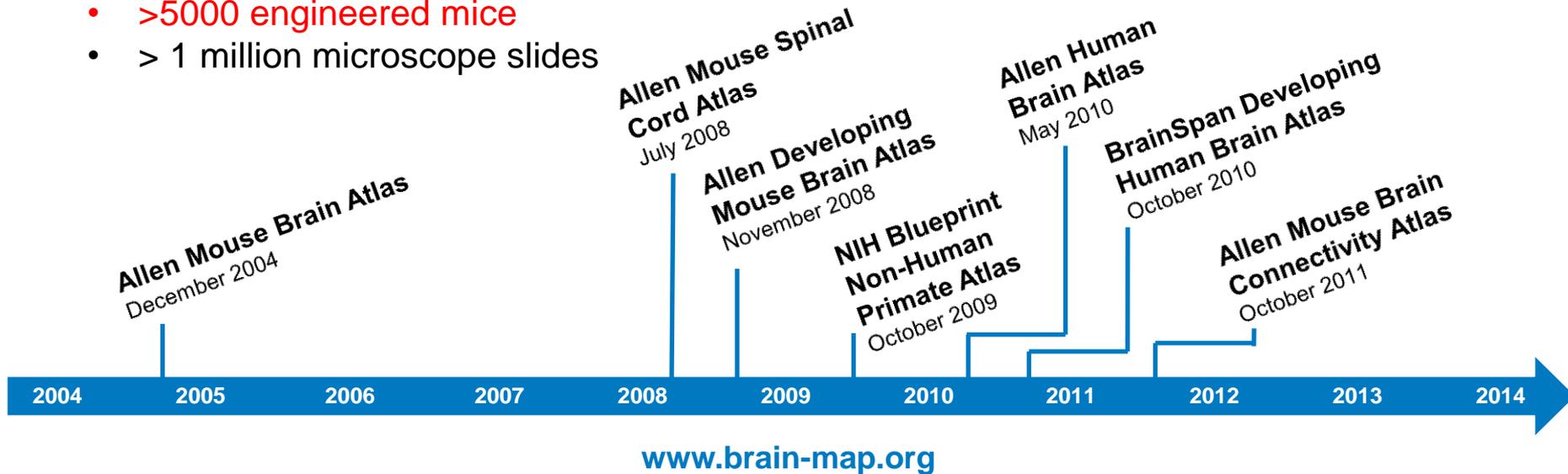
Big Science - Open Data for the Biggest Impact

- Founded by **Paul G. Allen** in 2003
- Independent, **non-profit** research organization working to support **basic research** in the brain sciences
- Dedicated to making **tools and data and knowledge** readily and freely available to the scientific community
- Project-focused, industrial scale, **milestone driven**
- **Multi-disciplinary teams** working towards a common goal
- **Launched 10-year Plan in 2012**



First 10 Years & 30 on-time public data releases: **ALLEN BRAIN ATLAS Online Public Resources**

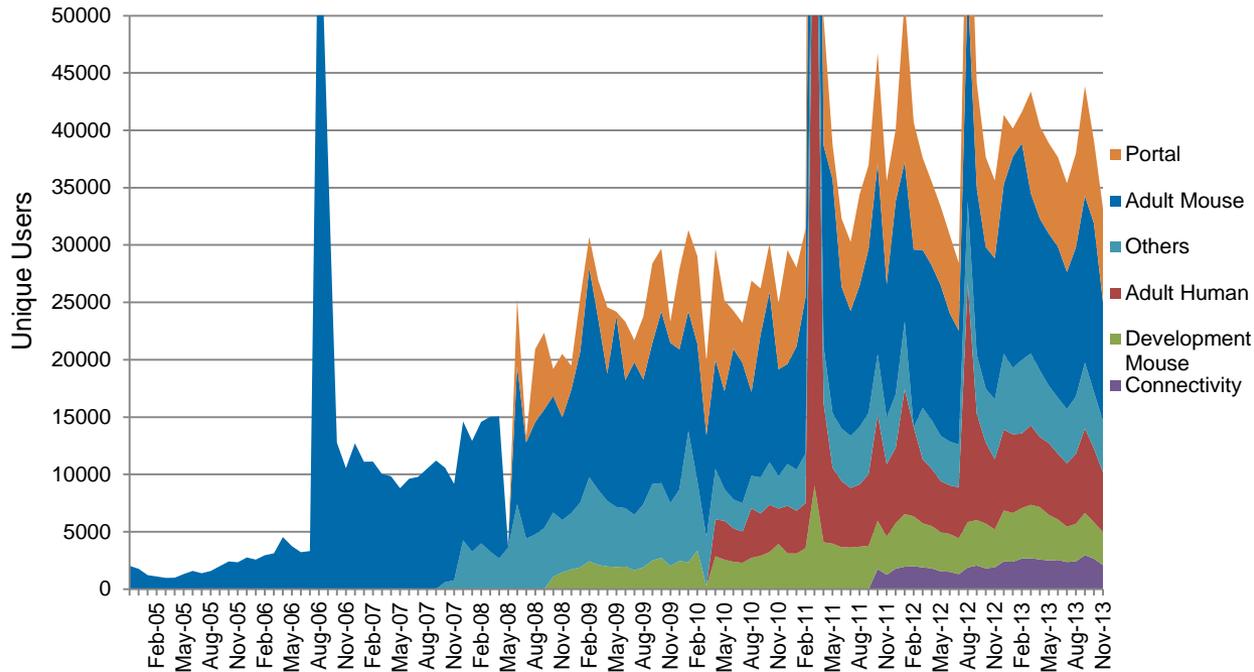
- 50,000 visitors/month
- Users from around the globe
- **>3 Petabytes data** generated
- **>5000 engineered mice**
- > 1 million microscope slides



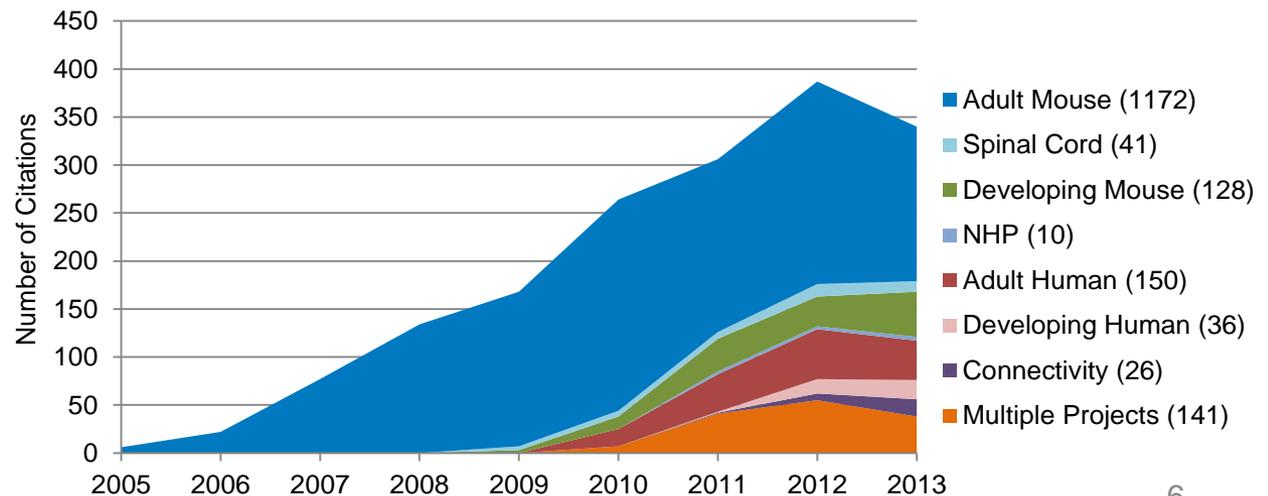
All data are:

- publicly accessible as soon as they pass QC
- freely available
- accessible 1-2 years prior to any publications

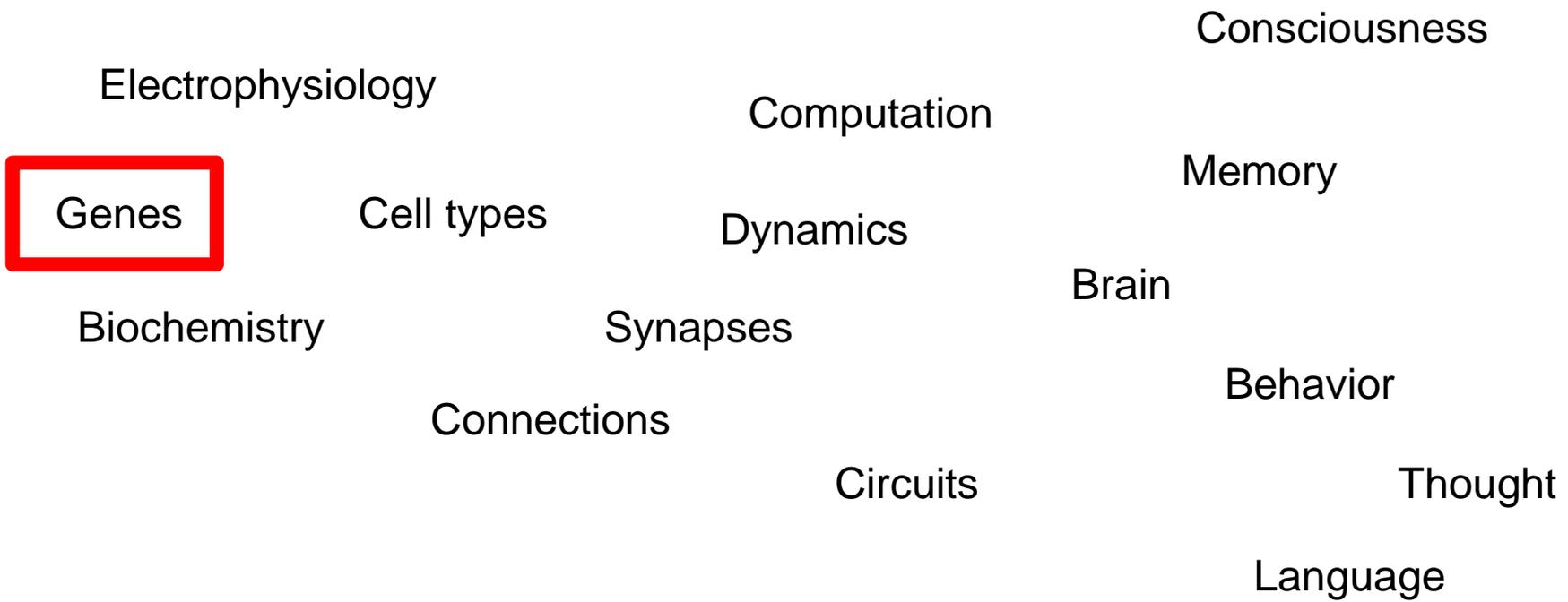
Atlas Impact: Web Statistics and Publications



- Identify gene marker(s) associated with diseases, pathways,
- Refine neuroanatomy
- Identify cell type markers
- Compare similarities/differences between **human & mouse**



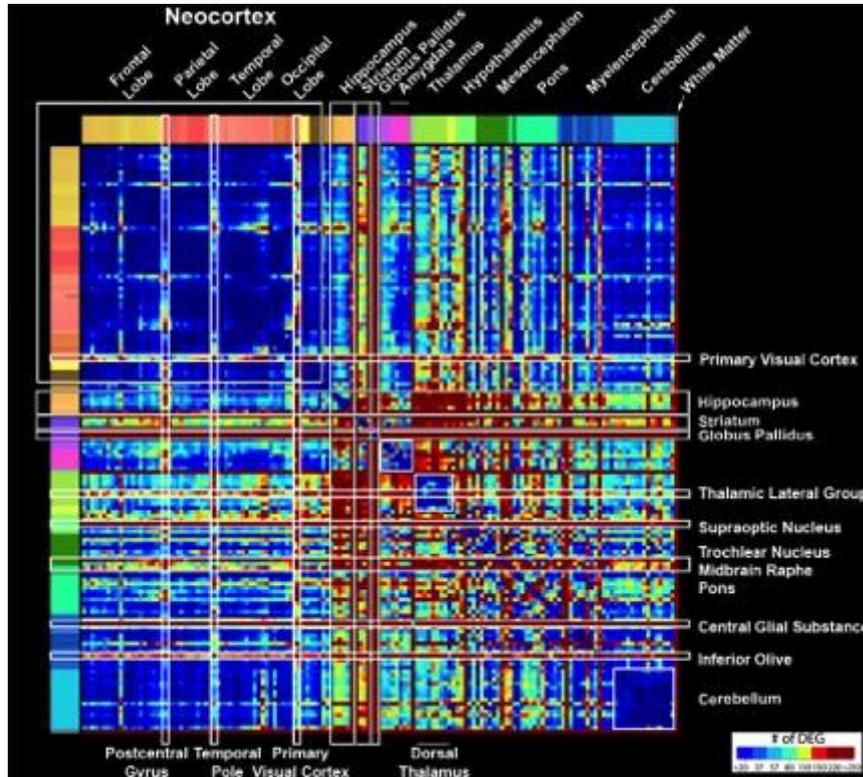
2012-2022: Long-range path to understanding the brain



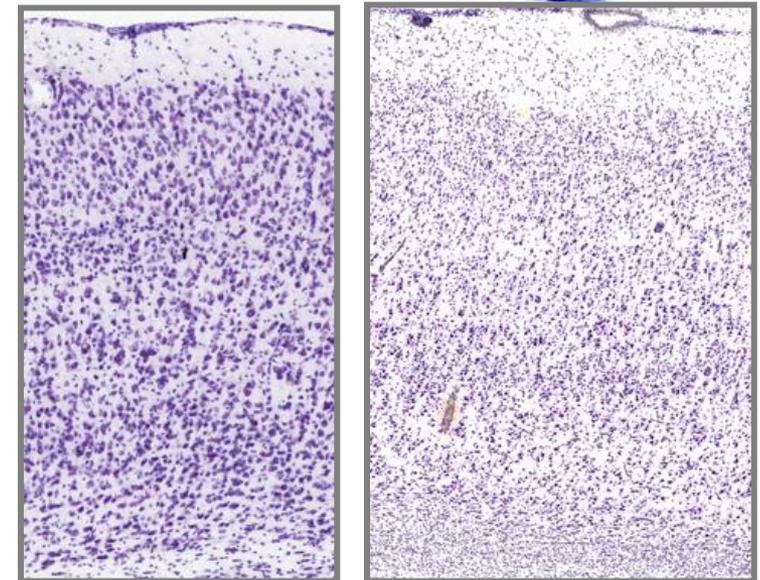
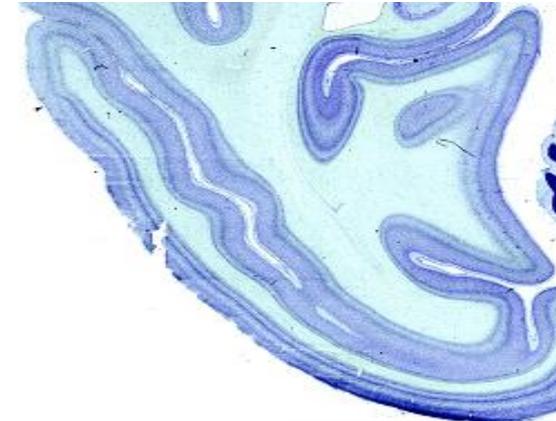
Our Plan: Understanding *Vision in Human and*

The Big Challenge: Where we are going...

- Cortex is a planar 2+e-D computational tissue
- Varies 10^5 in areas across mammals
- Relatively uniform across area



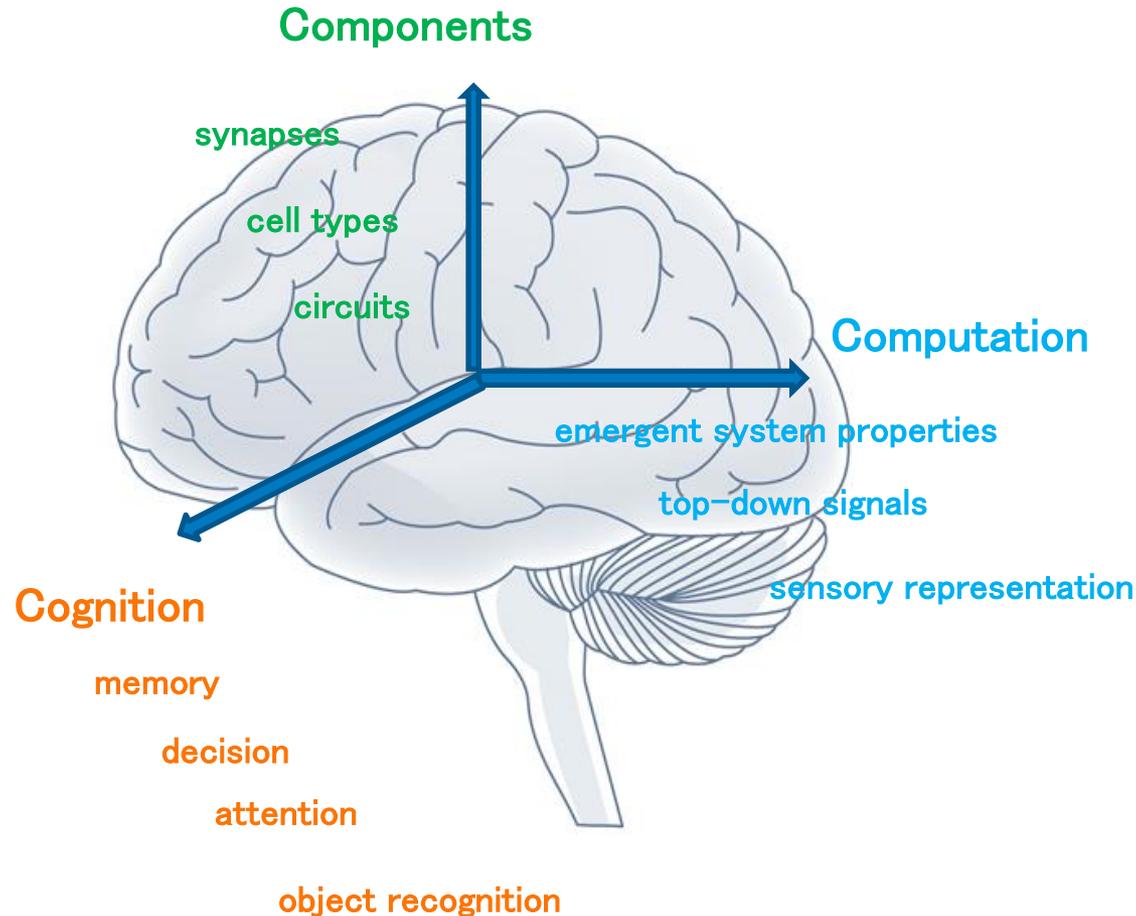
Hawrylycz, et al. Nature 2012



Temporal Neocortex

- What is the canonical, columnar operation performed by cortex that makes natural intelligence so robust and flexible?

Beyond Vision: Collaborating to drive questions elsewhere

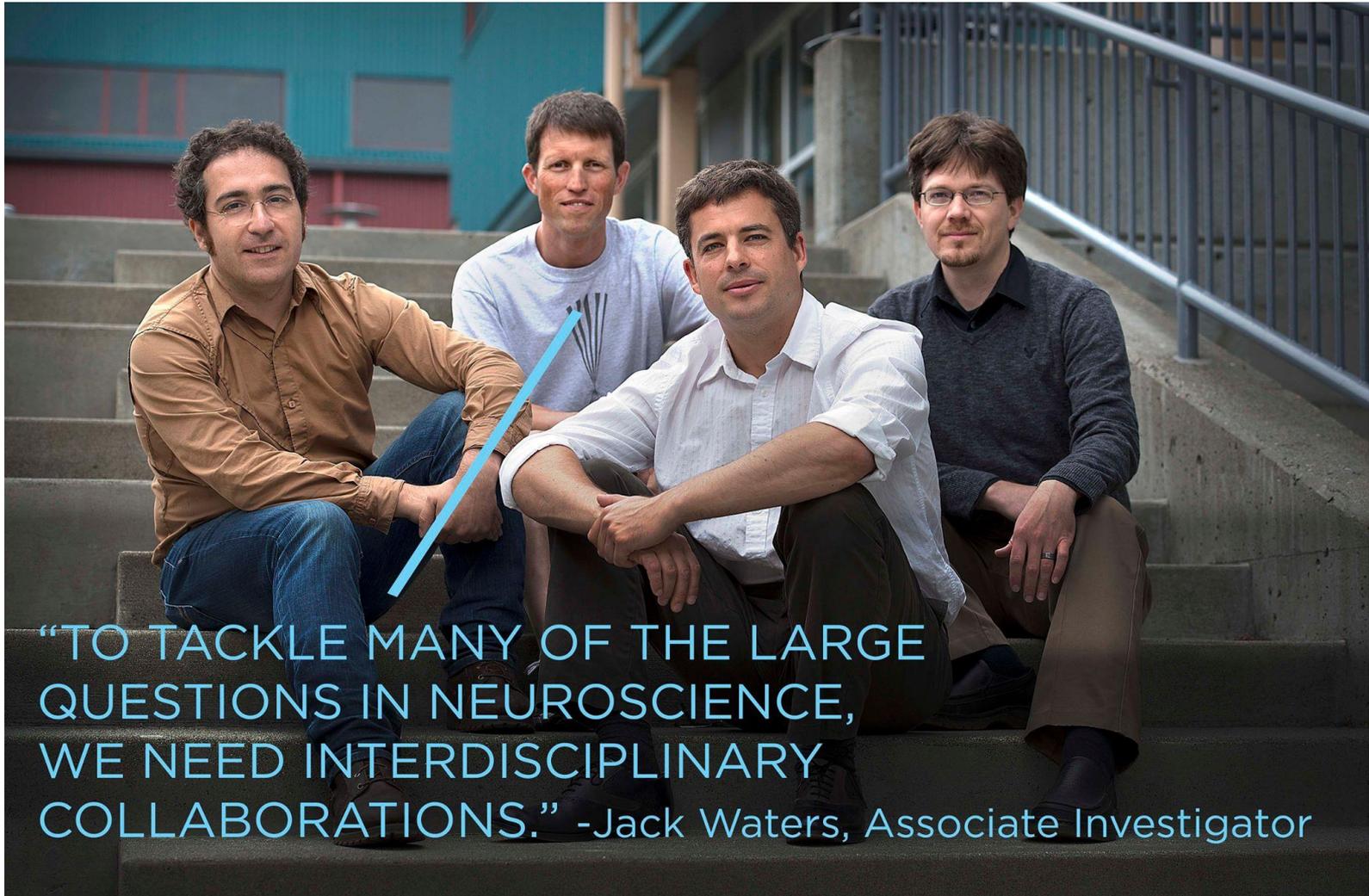


Models and Approaches: Mouse Cortex, Human Cortex, single Cell type-functional, morphological and gene expression analysis, human array tomography and functional analysis, iPS-derived cells, computational modeling, expression-anatomical-functional correlates, engineer/program new high-throughput tools to analyze form and function, etc

**Where is the workforce to tackle
this?**

It takes a Village: Team Science
*Multi-disciplinary Collaborative
Research In Action*

Phase II: Fostering Collaborative Culture Change



“TO TACKLE MANY OF THE LARGE QUESTIONS IN NEUROSCIENCE, WE NEED INTERDISCIPLINARY COLLABORATIONS.” -Jack Waters, Associate Investigator

Team Science: Multi-disciplinary teams working towards a common goal, flexible career development

ENGINEERING

**MODELING, ANALYSIS
& THEORY**

**NEURAL
CODING**

**NEURO
CELL
BIOLOGY**



**Mouse
TRANSGENESIS**

“STRUCTURED SCIENCE”

Team Science: Multi-disciplinary teams working towards a common goal

HUMAN BRAIN RESEARCH

STRUCTURED SCIENCE

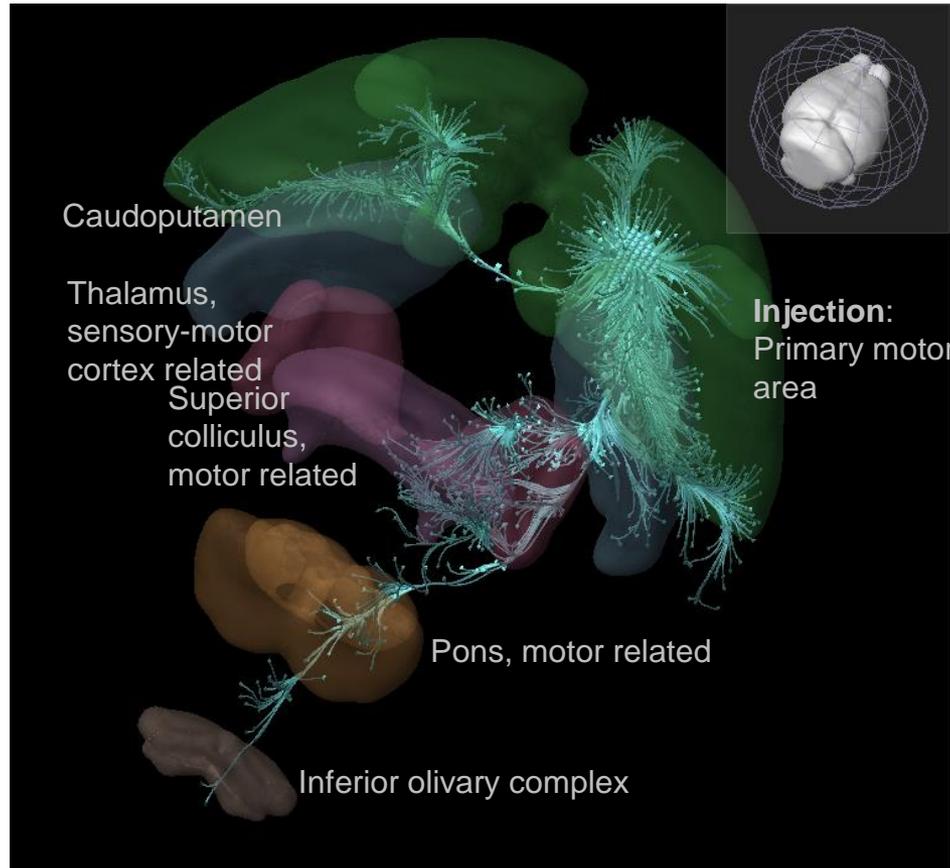


INFORMATION TECHNOLOGY

RESEARCH & DEVELOPMENT

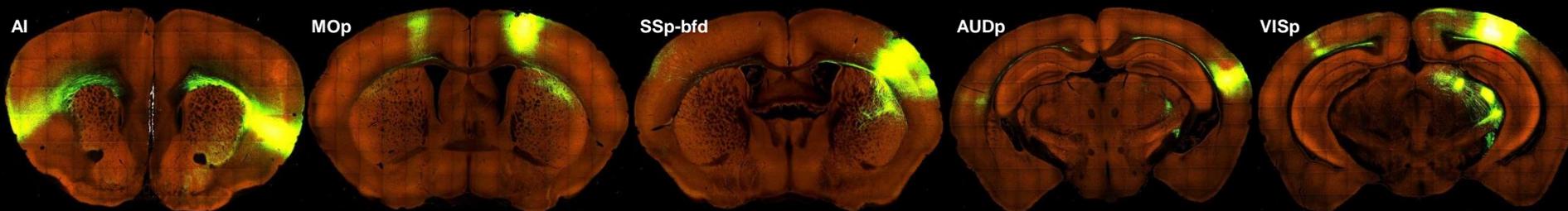
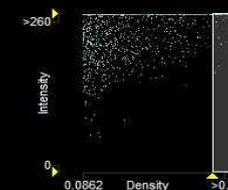
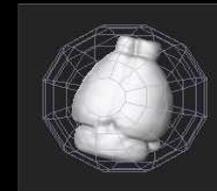
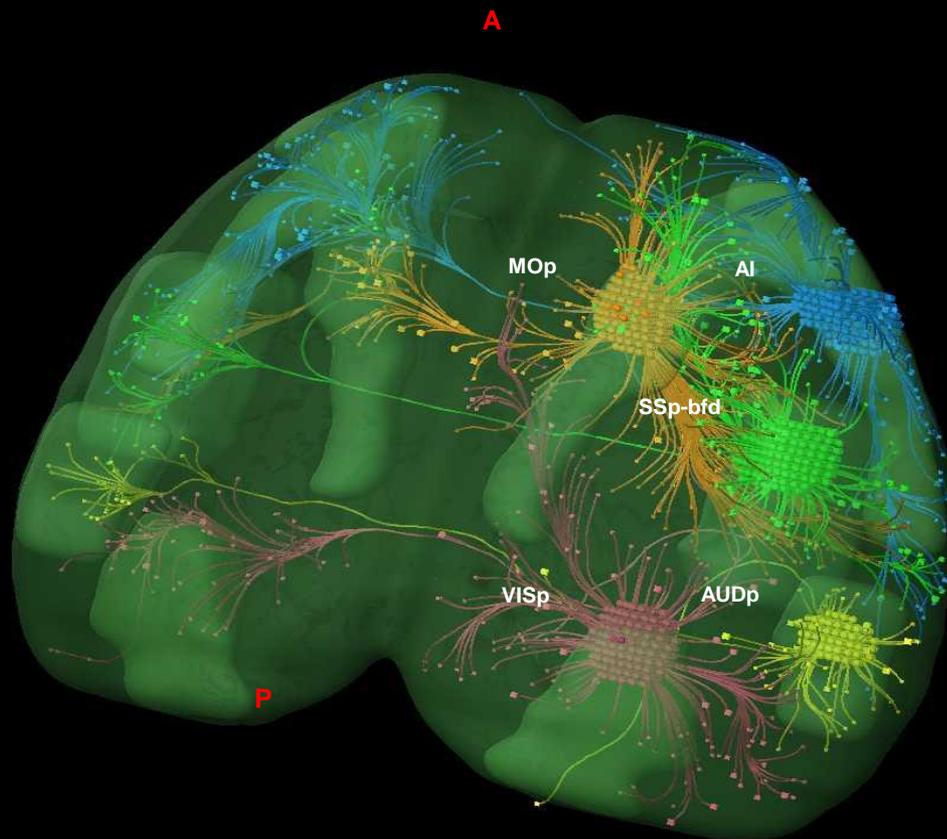
EXPANDING THE TEAM : Internships, **Visiting Scientist Program**, Academic Partnerships for graduate training

Allen Institute: Developing the Data and Tools, - and Teaching How to Use them

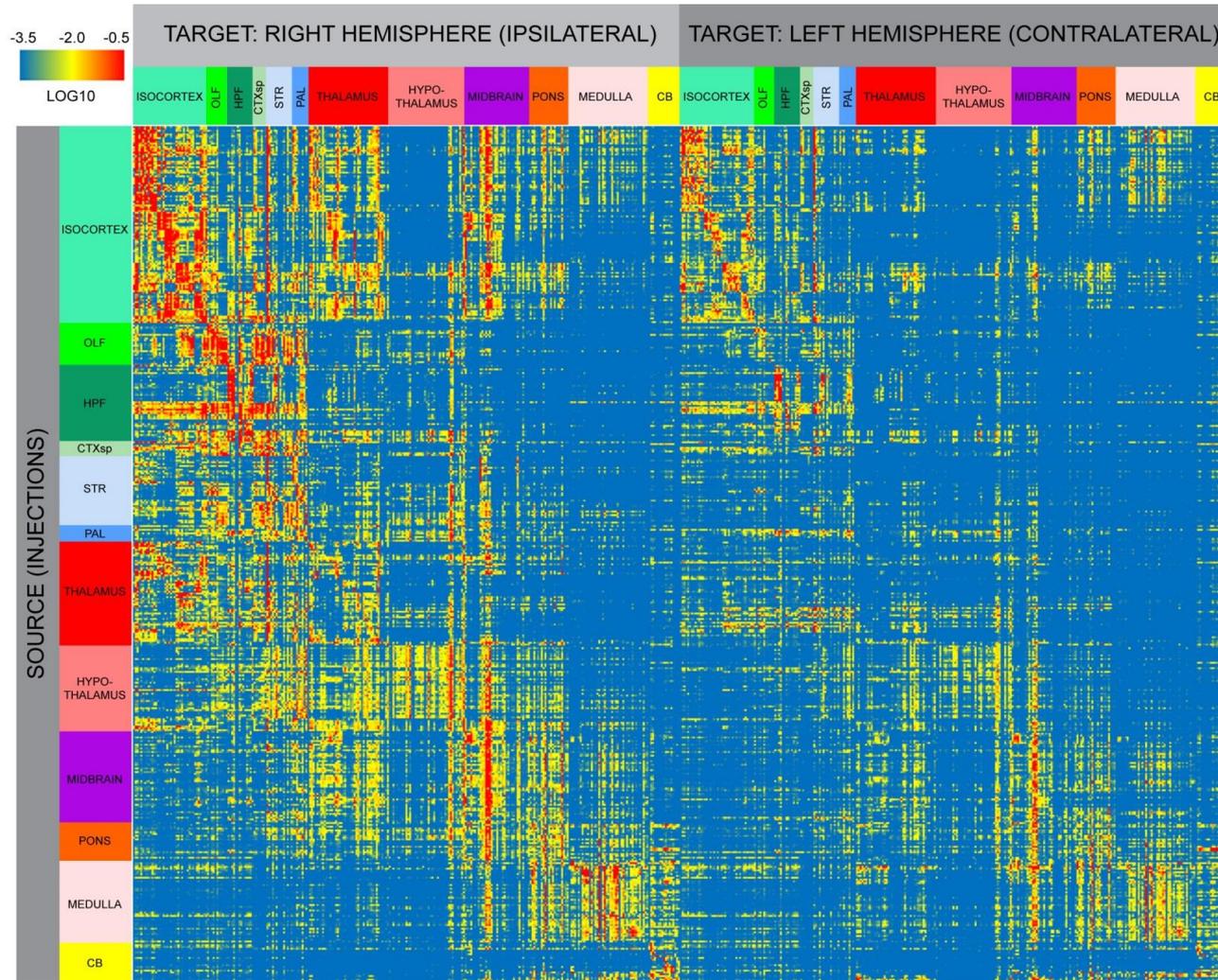


Brain Explorer, AGEA, Molecular Neuroanatomical Maps

Neuroanatomy Illuminated - Cortical Projection Map



Looking Slightly Differently: Connectivity Matrix for the Entire Mouse Brain



Julie Harris, Lydia Ng

“ Think of what you could do if you could really mine all that data ”
Brian Litt, IOM workshop, 2014

Interrogating Big Data: Helping to Train the Next Generation

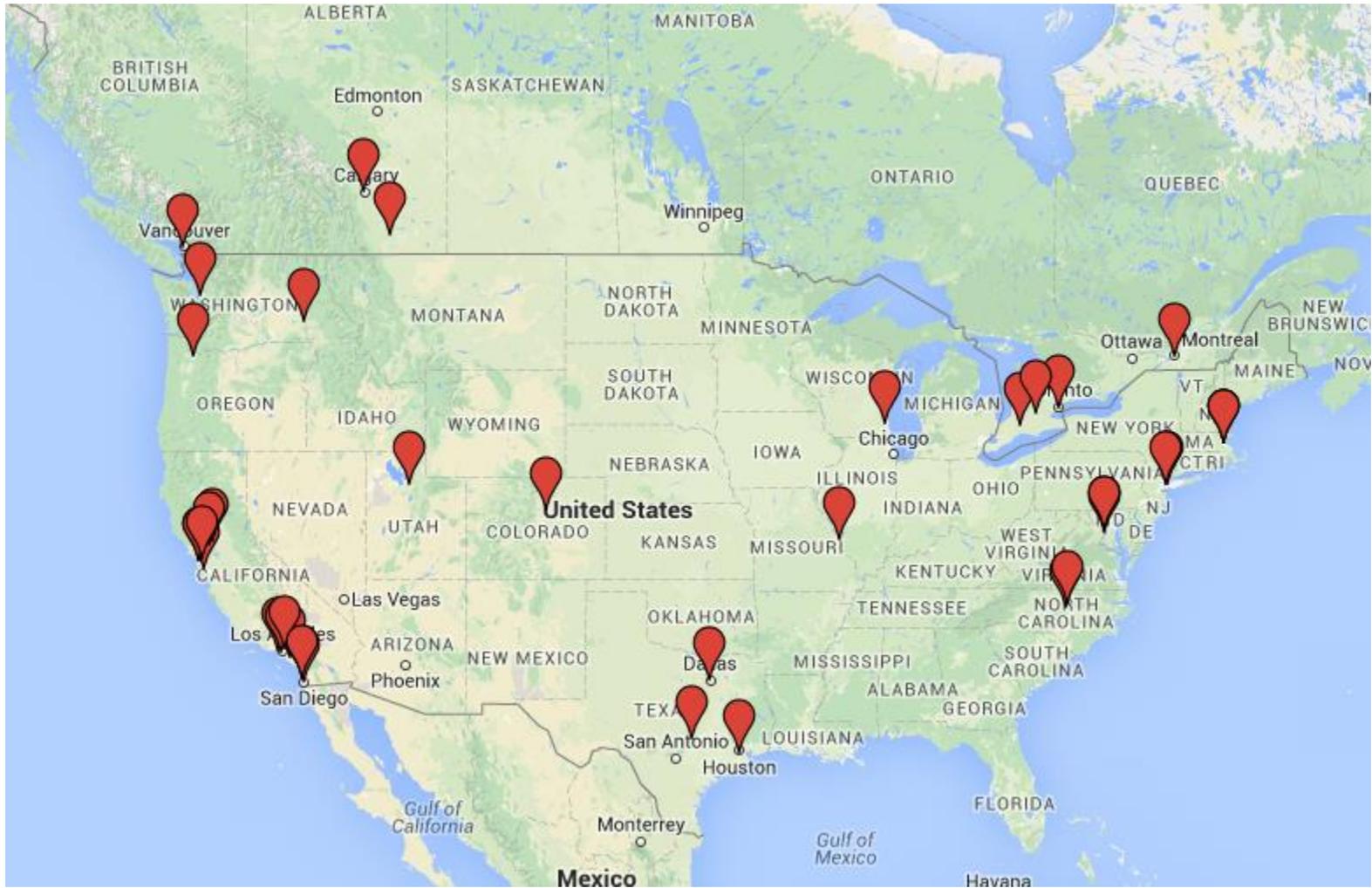
- **Online Webinars**
 - ~60 attendees each session
- **On-site training**
 - ~800 attendees at 31 institutions in 2013
 - >600 attendees at 19 institutions in 2014 (to Sept)



- **Courses and Hackathons**
 - Molecular Neuroanatomy at OIST
 - Allen Brain Atlas API Hackathon
 - Allen Human Brain Atlas **Hackathon**
 - Summer Workshop on the Dynamic Brain
 - Neuro-ethics, Scientific Ethics
 - Showcase



Allen Brain Training Sessions, US/Canada 2013-14



Terri Gilbert on Tour

Allen Brain Atlas Training Sessions in Europe



- now collaborating with IBRO and HBP on informatics workshop development

Workshops and Symposia

Course in Molecular Neuroanatomy at Okinawa (OIST)



- Two-week course in Japan
- 2011- 2013

Allen Brain Institute “Hackathon”

- Held at the Allen Institute: 2012 Hackathon



- Bring in the Programmers: Give them a different kind of challenge

Summer Workshop on the Dynamic Brain, 2014

- Partnership with Allen Institute and University of Washington
- Two-week intensive course at Friday Harbor, Washington



In 2015: Workshop Development with IBRO, HBP

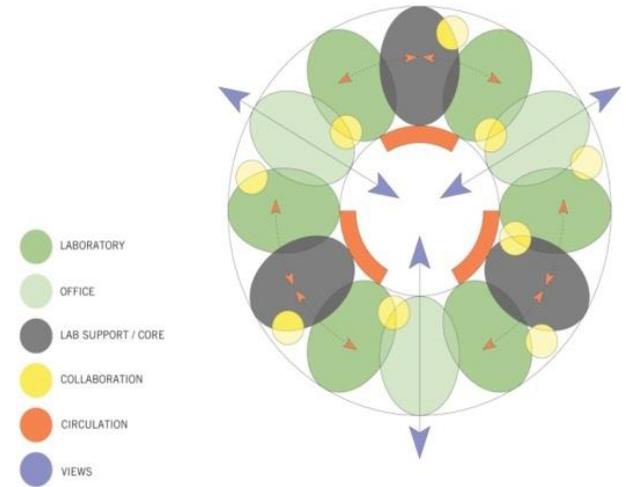
Showcase Symposium: Next Generation Leaders

- Two-day symposium, focusing on fostering team science
- Included presentations, team talks, lightning talks and poster sessions, rapid fire “sales pitches” of posters
- Inauguration of **Next Generation Leader Council**



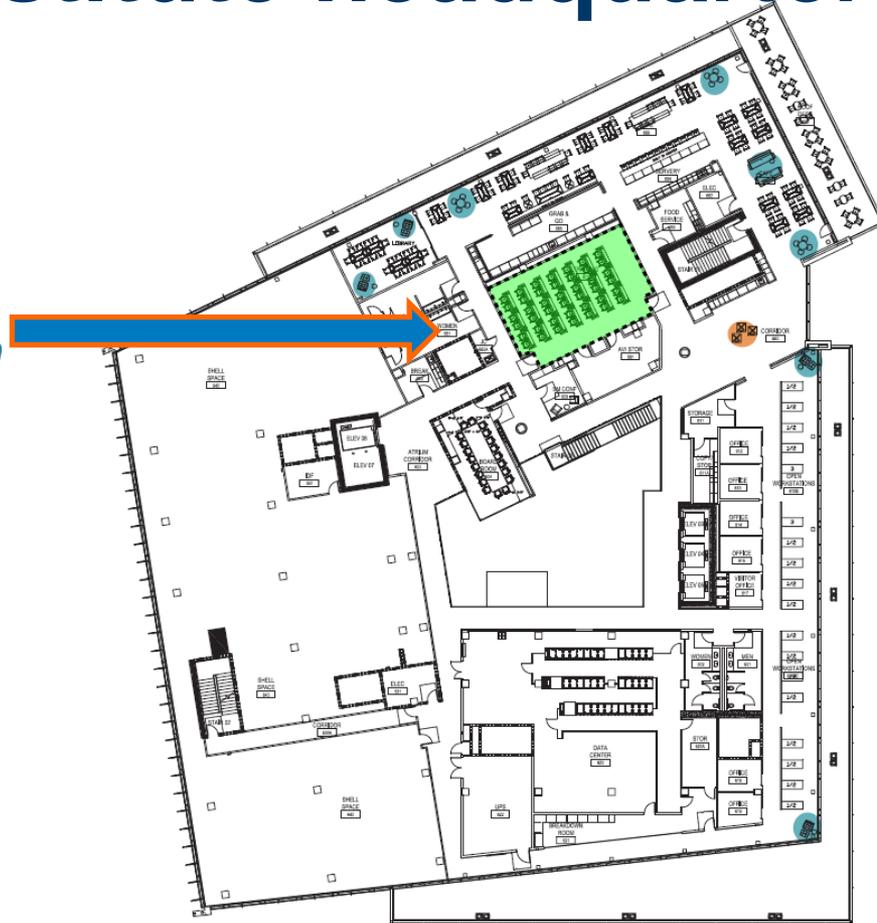
Training for the future: Re-tooling across the Lifespan

Coming Fall 2015: New home for Allen Institute for Brain Science Headquarters



Dedicated Training Center at new Allen Institute headquarters

Dedicated training room on 6th floor of the new building



= training hub for interdisciplinary Neuroscience

Development of a “Learning Center” on brain-map.org

The screenshot shows the Allen Brain Atlas website interface. At the top, there is a navigation bar with 'ALLEN INSTITUTE' and 'BRAIN ATLAS' on the right, and 'HOME', 'GET STARTED', 'HELP', and 'DATA & TOOLS' on the left. A search bar is located on the right side of the navigation bar. Below the navigation bar, the main content area is divided into several sections:

- DATA HIGHLIGHT**: A large image showing a histological section of a brain slice.
- DATA & TOOLS**: A grid of four images representing different data types: 'MOUSE BRAIN', 'HUMAN BRAIN', 'MOUSE CONNECTIVITY', and 'DEVELOPING HUMAN BRAIN'.
- WHAT'S NEW**: A section with a yellow arrow icon, containing a list of recent updates: 'Nature Profiles of Two Allen Institute for Brain Science Resources' and 'Events & Training'.
- ALLEN INSTITUTE PUBLICATIONS**: A section with a yellow arrow icon, containing a list of publications: 'DEVELOPING MOUSE', 'NON-HUMAN PRIMATE', 'MOUSE SPINAL CORD', 'GLIOBLASTOMA', 'REFERENCE ATLASES', and 'APPLICATION PROGRAMMING INTERFACE'. Each item has a plus sign icon to its right.
- TUTORIALS**: A section with a yellow arrow icon, containing a list of tutorials.

At the bottom of the page, there is a footer with social media icons (Twitter, Facebook, YouTube, LinkedIn), a 'SEND US A MESSAGE' button, and a 'CITATION POLICY' button. The system tray at the bottom of the browser window shows various application icons and the system clock (12:45 PM 8/21/2014).

Committed to Developing and Partnering on Priority Training Initiatives,
Educational Development, and open to ideas! ***Rainer Prep**

Acknowledging the growing team that makes this happen!



We wish to thank the Allen Institute founders, Paul G. Allen and Jody Allen, for their vision, encouragement, and support.

alleninstitute.org
brain-map.org

Our Distinct Brand: Open Science - Big Science.

Unique Combination of Corporate and Academic Environments

- Scientific Oversight
 - Scientific Advisory Board and Project Advisory Councils
- Corporate Oversight- Corporate Board

- **Budgetary Control**
 - 10-year budgetary plan
 - External funding match (20%)

- **Team work**
 - Focused on common goal
 - Team success=Institute success



Team Structure

- new integrated framework of positions and career plan