

2013 Annual Report

BUILDING CONNECTIONS

Connections are at the core of everything we do. We map the patterns of neural connections in the brain, connect scientists across disciplines to generate new ideas, and share resources and tools that have fostered global connections among the neuroscience community.

Our mission to understand the human brain is fueled by each of these connections. Our Big Science approach and Open Science model have made us leaders in the world of brain science, and key drivers in the global conversation about the nervous system in health and disease.



Cover Image

A "dotogram" from the Allen Mouse Brain Connectivity Atlas. Each circle represents one of 21 cortical injection experiments, and the size of the circle is proportional to the detected axonal fiber density at that location.

OPEN SCIENCE BIG IMPACT

The human brain is the most complex piece of organized matter in the known universe. Understanding how this organ gives rise to perception, action, memory and consciousness is the outstanding intellectual problem of our age. Nerve cells and their synapses are the fundamental units of all the brain's extraordinary capabilities, so we must systematically study them in their natural habitat: the living brain. This is our central mission.

We have had an amazing year. Joining our growing team are physicists, mathematicians, neurobiologists, engineers, computer scientists, and other field experts. Our team-based, milestone-driven approach remains singular within the neuroscience community. A six-story building in the heart of Seattle's bio-science corridor in South Lake Union is quickly taking shape, and will be ready to move in by fall of 2015.

Even as we prepare for our new initiatives, two significant multi-year projects were recently completed. The Allen Mouse Brain Connectivity Atlas traces the internal wiring in unprecedented detail throughout the mouse brain — the first time this has been done in any animal species (with the exception of the roundworm). The BrainSpan

Atlas of the Developing Human Brain, a partnership with Yale, USC, Harvard, and UCLA and funded by the NIH, maps all the genes turned on during development of the human brain. Both of these projects depend on standardized, large-scale data generation and open access data portals to create unique resources for scientists worldwide. The underlying data for each of these resources have been publicly and freely available for several years before our recent publications on these projects in *Nature*, the world's most eminent peer-reviewed scientific journal.

The neuroscience community is in the midst of an extraordinary moment in history. In 2013, a year after the Allen Institute announced its ambitious ten-year goal to generate a complete catalogue of neuronal cell types in the mouse and human cerebral cortex, the European Union announced their own brain research initiative, and President Obama announced BRAIN 2025. The Allen Institute has participated in and helped shape both of these large-scale initiatives, true to our commitment to open science.

Join us in our voyage of discovery. As Carl Sagan said, "Somewhere, something incredible is waiting to be known."

Christof Koch, Ph.D.
Chief Scientific Officer

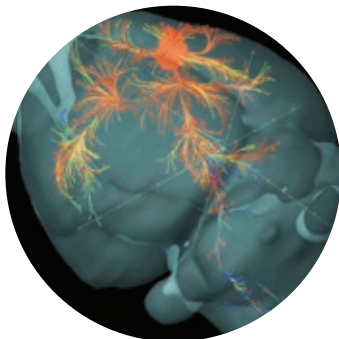
Allan Jones, Ph.D.
Chief Executive Officer



CONNECTING THE BRAIN

WIRING THE MOUSE BRAIN

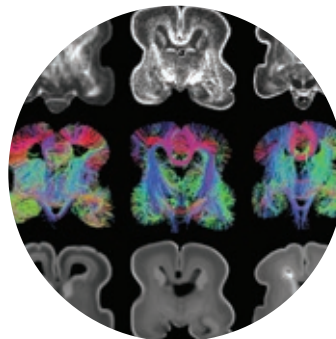
The **Allen Mouse Brain Connectivity Atlas** is the first comprehensive, large-scale data set showing how the entire mouse brain is wired. The data for the atlas was collected in an entirely new and exceptionally standardized way, allowing thousands of experiments to coexist in a common three-dimensional reference space. Understanding how the brain is wired is a crucial step to making sense of how the brain encodes information, and can provide important clues into what goes wrong in many brain diseases and disorders.



A 3D view of the axonal connections originating from the primary motor cortex.

OUR BRAINS' BEGINNINGS

Our brains are what make us human, and the **BrainSpan Atlas of the Developing Human Brain** acts as a high-resolution blueprint for how our uniquely human brains develop. The atlas details which genes are turned on and off at different critical time points in human development at an unprecedented level of anatomical resolution. The BrainSpan Atlas allows scientists to explore the crucial pieces needed for the brain to form in a healthy way, and to better understand the causes underlying diseases and disorders like autism.



MRI and diffusion tensor imaging reveal development of human brain structure and connectivity.

Big Science and Open Science are at the heart of the Allen Institute. We build our robust, high quality data into useful online resources that anyone around the globe can use to make their own discoveries.

PICTURED *(left to right)*

Chinh Dang
Chief Technology Officer
Amy Bernard, Ph.D.
Director, Structured Science
Ed Lein, Ph.D.
Investigator

Julie Harris, Ph.D.
Assistant Investigator
Hongkui Zeng, Ph.D.
Senior Director, Research Science
Lydia Ng, Ph.D.
Director, Technology



CONNECTING THE SCIENCES

Neuroscientists. Engineers. Mathematicians.
Physicists. Computational Scientists.

Our teams of diverse scientists are making
unprecedented connections across
disciplines to generate the ideas that
will change how we study the brain.



146

Articles published by Allen Institute authors

47²⁰¹⁴
(to date)

36²⁰¹³

16²⁰¹²

8²⁰¹¹

8²⁰¹⁰

10²⁰⁰⁹

9²⁰⁰⁸

7²⁰⁰⁷

2²⁰⁰⁶
1²⁰⁰⁵
2²⁰⁰⁴



A circular wiring diagram of connections among 215 distinct regions throughout the mouse brain.



Teams at the Allen Institute take novel approaches to the problems they face, building new technologies and finding new perspectives in order to better understand the brain.

PICTURED TOP (left to right)

Anton Arkhipov, Ph.D.
Assistant Investigator

Tim Blanche, Ph.D.
Assistant Investigator

Jack Waters, Ph.D.
Associate Investigator

Colin Farrell, Ph.D.
Director, Manufacturing
and Process Engineering

Peter Saggau, Ph.D.
Senior Director,
Research Engineering

PICTURED BOTTOM (left to right)

John Hohmann, Ph.D.
Director, Data Annotation

Hanchuan Peng, Ph.D.
Associate Investigator

Veronica Maldonado, Ph.D., D.V.M.
Director, In Vivo Sciences

Nuno da Costa, Ph.D.
Assistant Investigator

Stefan Mihalas, Ph.D.
Assistant Investigator

Amy Bernard, Ph.D.
Director, Structured Science

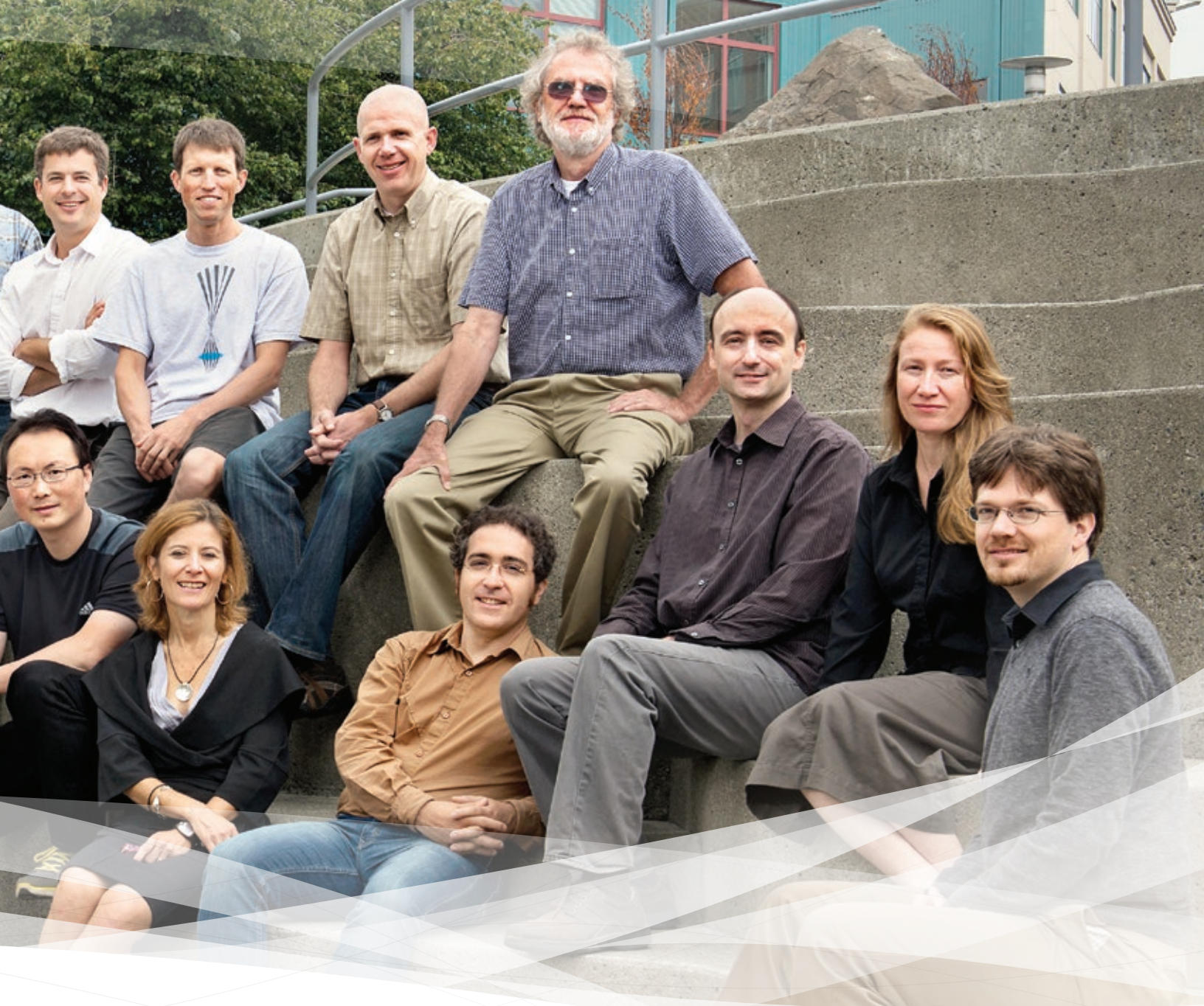
Shawn Olsen, Ph.D.
Assistant Investigator

ENGINEERING

New science demands new technology. When scientists at the Allen Institute want to ask questions using tools that do not yet exist, they rely on Peter Saggau and Colin Farrell to help them create, test and scale up the technologies they need, from new microscopes to better standards for data collection. “Even though we are involved in different ends of what scientists need from technology, the two of us brainstorm together frequently, relying on each other for different types of expertise,” says Peter Saggau, Senior Director of Research Engineering.

MODELING, ANALYSIS AND THEORY

Bridging nearly every team at the Allen Institute are the computational scientists behind the Modeling, Analysis and Theory group. These scientists collaborate closely with experimentalists, working with the data they collect to make models of individual cells, to simulate the circuits in regions of the brain, and to work toward theories of how the brain’s computations lead to what we see. “How does your brain computationally understand simple elements like colors, shapes and edges, and how are those computations implemented in behavior?” asks Stefan Mihalas, Assistant Investigator. “We need predictive models and theories to go from raw data to this level of understanding.”



NEURAL CODING

The Neural Coding group is focused on understanding how vision works in the cortico-thalamic system by deciphering the code that our neurons use to process visual information. Understanding how individual cells and synapses function, and how those pieces interact to form systems that can encode visual data, requires looking at the brain at many different scales. “Our team works together a bit like a string quartet,” explains Nuno da Costa, Assistant Investigator. “Our instruments and methods are at different scales, but as a group, we harmonize in order to answer important and challenging questions about how vision and the visual brain work.”

STRUCTURED SCIENCE

At the foundation of the Allen Institute for Brain Science is our unique and structured approach to integrating technology, engineering and program management in order to accomplish targeted research goals. Focusing our efforts through this Structured Science architecture allows us to generate data that is both high quality and at scale, while remaining nimble enough to adapt to new and increasingly complex research projects. “Our Structured Science approach allows us to create the scalable and shareable science that has made our work so valuable to the scientific community,” says Amy Bernard, Director of Structured Science.

CONNECTING THE WORLD

Training programs span the globe



Top 20 countries from which people download our data

(Listed by amounts of data downloaded)

- USA
- Japan
- Canada
- Germany
- Switzerland
- United Kingdom
- Australia
- Finland
- Italy
- Sweden
- France
- South Korea
- Spain
- Brazil
- Norway
- Singapore
- Netherlands
- New Zealand
- Austria
- China

Top 20 cities from which people download our data

(Listed by amounts of data downloaded)

- Seattle
- New York
- Fribourg
- Tokyo
- San Francisco
- Greater Boston
- Toronto
- Portland
- Stanford
- Pohang
- West Chester
- Chevy Chase
- Baltimore
- Beijing
- Saint Louis
- Helsinki
- Dallas
- Chiba
- Ferrara
- Santa Cruz

United Kingdom

- Cambridge University
- Kings College University
- Oxford University
- Royal Infirmary of Edinburgh
- University of Glasgow

Netherlands

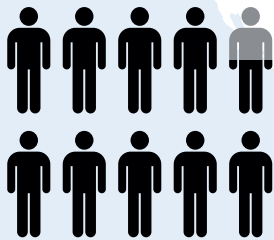
- Netherlands Institute of Neuroscience

United States

- 3Scan
- Baylor College of Medicine
- Boston University
- California Institute of Technology
- Columbia University
- Duke University
- Genentech
- Harvard University
- Massachusetts Institute of Technology
- Mount Sinai School of Medicine
- National Institute of Environmental Life Sciences
- NIH Library
- Portland State University
- Stanford University
- The Scripps Research Institute
- UC Berkeley
- UC Irvine
- UC Los Angeles
- UC San Diego
- UC San Francisco
- Uniformed Services University of the Health Sciences
- University of Utah, Scientific Computing and Imaging Institute
- University of Washington
- UT Southwestern

Canada

- McGill University
- University of British Columbia
- University of Calgary
- University of Toronto
- University of Waterloo
- University of Western Ontario



947

= 100 Trainees

Courses and workshops

Course in Molecular Neuroanatomy
Okinawa Institute of Science and Technology
Okinawa, Japan

Summer Workshop on the Dynamic Brain (co-hosted with the University of Washington)
Friday Harbor Laboratories
Friday Harbor, Washington

From the beginning, the goal of the Allen Institute has been to make our findings openly available to the scientific community – and the world. With our comprehensive data sets and the easy accessibility of all our online tools, the Allen Institute is fostering an entirely new kind of global community among everyone who studies the brain.

Petabytes of data generated (to date)

3.5

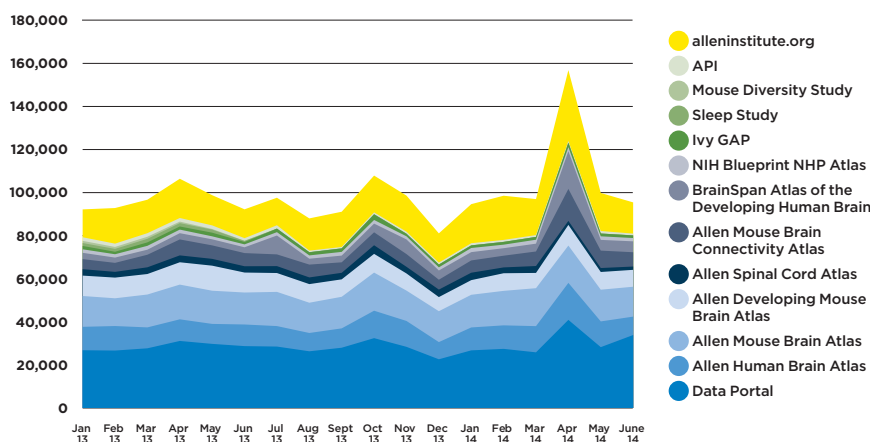


(Equivalent to 46.6 years of continuous HD video)

Journals in which we've published

- Annual Review of Neuroscience
- arXiv
- Bioinformatics
- BMC Bioinformatics
- BMC Genomics
- BMC Neuroscience
- Brain, Behavior and Evolution
- Cell
- Cell Metabolism
- Cell Reports
- Cerebral Cortex
- Cognition
- Current Biology
- Development
- F1000Research
- Frontiers in Behavioral Neuroscience
- Frontiers in Computational Neuroscience
- Frontiers in Neural Circuits
- Frontiers in Psychology
- Genes, Brain and Behavior
- Human Molecular Genetics
- IEEE Transactions on Biomedical Circuits and Systems
- Journal of Comparative Neurology
- Journal of Neuroscience
- Journal of Vision
- Journal of Visualized Experiments
- Methods in Molecular Biology
- Molecular Psychiatry
- Nature
- Nature Communications
- Nature Neuroscience
- Nature Protocols
- Nature Reviews Neuroscience
- Neural Computation, Neural Devices and Neural Prosthesis
- Neurobiology of Disease
- NeuroImage
- Neuron
- New England Journal of Medicine
- Nucleic Acids Research
- PLoS Computational Biology
- PLoS One
- Proceedings of the National Academy of Sciences
- Quantitative Biology
- Science
- SIAM Journal on Applied Dynamical Systems
- Trends in Cognitive Sciences

Visitor traffic



LEADING THE GLOBAL CONVERSATION ABOUT THE BRAIN

The reach of the Allen Institute for Brain Science extends far beyond the walls of our headquarters in Seattle.

We are a pivotal player in the world's foremost efforts to study the brain at a large scale. Our leaders have chaired councils on the brain for the World Economic Forum and presented at the Presidential Commission for the Study of Bioethical Issues. We are founding partners of BRAIN 2025 and formal partners in the European Human Brain Project.


We are proud to have led the way in bringing Big Science to brain science, and to be key contributors during this unique moment in neuroscience.

“Through the generosity of Paul Allen, the leadership of Allan Jones, and the growing scientific leadership, they’ve changed the world; they are changing the world. None of this [progress] would have happened without them.”

— **Phil Rubin**, Principal Assistant Director for Science at the Office of Science and Technology Policy in the Executive Office of the President of the United States, at the NeuroFutures 2014 Conference



A top-down 3D view of the cortico-connections originating from multiple distinct cortical areas.



President Barack Obama shakes hands with Allan Jones, while the head of DARPA Arati Prabhakar and Terry Sejnowski of the Salk Institute look on.

PICTURED BELOW (left to right)

Terry Sejnowski, Francis Crick Professor, Salk Institute

Allan Jones, CEO, Allen Institute for Brain Science

Arati Prabhakar, Director, DARPA

Robert Conn, President, The Kavli Foundation

Amy Gutmann, President, University of Pennsylvania and Chair, Presidential Commission for the Study of Bioethical Issues

President Barack Obama

Cora Marrett, Deputy Director, National Science Foundation

Gerald M. Rubin, Vice President, HHMI and Executive Director, Janelia Research Campus

Francis Collins, Director, National Institutes of Health

William Newsome, Director, Stanford Neurosciences Institute and co-chair of BRAIN Initiative working group

Miyoung Chun, Executive Vice President of Science Programs, The Kavli Foundation



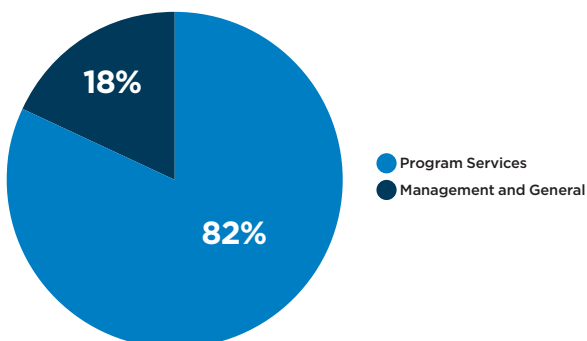
FINANCIAL SUMMARY

The Allen Institute for Brain Science Fiscal Years 2013 and 2012

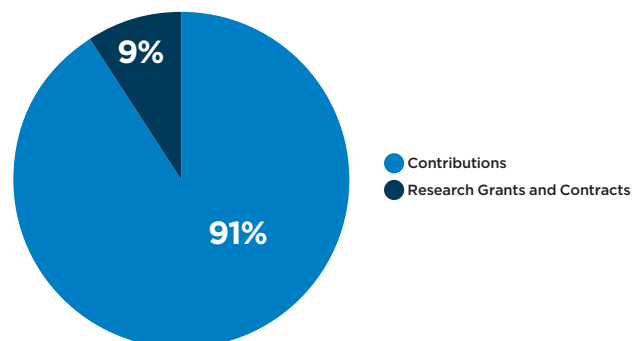
(In Thousands)

	2013 (Audited)	2012 (Audited)
Support and Revenue		
Contributions	\$ 126,894	\$ 47,000
Research Grants and Contracts	3,923	4,888
Other	553	195
Total Support and Revenue	131,370	52,083
Expenses		
Program Services	36,548	35,302
Management and General	7,983	6,757
Total Expenses	44,531	42,059
Change In Net Assets	\$ 86,839	\$ 10,024
Net Assets, Beginning of Year	77,232	67,208
Net Assets, End of Year	\$ 164,071	\$ 77,232

Expenses 2013



Funding Sources for 2013 Operating Expenses



Our Team

Founders

Paul G. Allen
Jody Allen

Leadership

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Chief Executive Officer

Chinh Dang
Chief Technology Officer

Christof Koch, Ph.D.
Chief Scientific Officer

David Poston
Chief Operating Officer

John Phillips, Ph.D.
Executive Director,
Structured Science

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Allen Institute for Brain
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Officer, Vulcan Inc.

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Senior Fellow, Paul G.
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Phyllis Wise, Ph.D.
University of Washington

Staff

More than 250 dedicated
employees

More than 90 researchers
with Ph.D. degrees

49%



Employee Growth Since 2012

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