THE
PAUL G. ALLEN
FRONTIERS GROUP

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THE PAUL G. ALLEN FRONTIERS GROUP NAMES FIVE ALLEN DISTINGUISHED INVESTIGATORS

Awards totaling $7.5 million given to pioneering researchers on the frontiers of epigenetics, aging and evolution

SEATTLE, WASH. — **June 15, 2017** — The Paul G. Allen Frontiers Group today announced five new Allen Distinguished Investigator (ADI) awards to researchers conducting pioneering research in epigenetics, aging and evolution. Each ADI is funded at $1.5 million over three years, totaling $7.5 million in funding.

“Each of these awards is given to researchers with the bold ideas and new perspectives we need to make the next big leap in bioscience,” says Tom Skalak, Ph.D., Executive Director of The Paul G. Allen Frontiers Group. “Epigenetics, aging and evolution are all fields with great impact on human health and wellbeing, but that currently face significant gaps in knowledge. With these awards, we hope to make strides toward the kind of breakthrough insights that can change the direction of an entire area of research.”

Three awards are given in the rapidly growing field of epigenetics, or how genes are turned on and off, which is crucial to how cells function and has been increasingly implicated in many diseases, including cancer. These projects address the need to create new technology to study and understand how factors such as the three-dimensional shape of the genome and the presence of regulatory molecules impact the behavior of cells.

Two additional awards are made in the fields of aging and principles of evolution. In aging, the creation of a universal epigenetic clock—or a way to gauge actual tissue age across many different species—could lead to new insights on the impact of aging and its connection to other age-related diseases like cancer and dementia. While evolution is typically modeled as a series of small mutations, new knowledge suggests that large, highly mobile sections of the genome can flow rapidly among organisms: a strategy employed by infectious bacteria to evade antibiotics. Preventing the next pandemic will require understanding and modeling these mobile genetic elements in bacteria and humans.

The Allen Distinguished Investigator program supports early-stage research with the potential to reinvent entire fields. Allen Distinguished Investigators are passionate thought leaders, explorers and innovators who seek world-changing breakthroughs. With grants typically between $1 million and $1.5 million each, the Frontiers Group provides these scientists with support to produce new directions in their respective fields.

The new ADI recipients are:

Epigenetics

Fei Chen, Ph.D., *Broad Institute*, and **Jason Buenrostro, Ph.D.,** *Broad Institute and Harvard University*

Since the three-dimensional configuration of DNA is crucial to determining which genes are expressed in a given cell, Chen and Buenrostro will develop a set of technologies to directly visualize the architecture of the

genome and sequence individual regulatory elements within cells. This fundamental new capability will enable researchers to understand how spatial organization of the genome is regulated, and to ask new questions about how changes in the epigenome lead to changes in both normal and disease cell types directly within tissues.

Jan Ellenberg, Ph.D., *European Molecular Biology Laboratory*, and **Ralf Jungmann, Ph.D.,** *Max Planck Institute of Biochemistry & LMU Munich*

Ellenberg and Jungmann will take an interdisciplinary approach combining chemical biology and biophysics to develop a novel technology to use barcoded fluorescent proteins to “paint” DNA sequences with specific epigenetic marks, and super-resolution microscopy to visualize those painted sequences at the level of single genes. With this tool, they will be able to map the complete 3D architecture of the epigenome in single human cells, and analyze how the structure changes during gene activation and repression.

Charles A. Gersbach, Ph.D., *Duke University*

The brain comprises an incredible diversity of cell types that act together to govern many complex functions. Studying these cell types in isolation, and understanding the role of epigenetic regulation in brain tissues, poses many technical challenges. Gersbach will aim to develop new technology to allow researchers to induce any epigenetic state in any cell type or tissue, and as a first application, use this technology to generate specific cell types of neurons in order to study drug response, disease, and the impact of epigenetic regulation on learning and memory.

Aging

Steve Horvath, Ph.D., *University of California, Los Angeles*

Because aging is a leading risk factor for multiple chronic diseases, including cancer, cardiovascular disease and neurodegenerative disorders like Alzheimer’s and Parkinson’s, finding a way to slow the biological aging process could offer a powerful medical tool. Horvath has recently developed a way to measure the age of any human tissue by looking at a combination of chemical changes to the DNA. This “epigenetic clock” is highly correlated with chronological age across the entire lifespan and even predicts life expectancy. Horvath will seek to enhance the clock so that it becomes a universal measure of aging across different species. The resulting epigenetic clock could shed light on a broad range of scientific questions, including why animals have different lifespans, how the environment influences lifespan, and potential trajectories to cancer and immune disorders as well as uncovering possible therapies for slowing the aging process.

Microbial Evolution

Rachel Whitaker, Ph.D., *University of Illinois Urbana-Champaign*

Recent research has unearthed regions of the genome that are capable of moving rapidly between cells, creating a sea of dramatic and unpredictable genetic changes. These mobile genetic elements (MGEs) are particularly exploited by infectious bacteria, which evade antibiotics through rapid evolution driven by MGEs. While the scientific response to infectious disease has focused on identifying new ways to target and kill bacteria, antimicrobial resistance, virulence, and many other properties of pathogens are evolutionary problems driven by mobile elements. An evidence-based predictive understanding of the forces of evolution that lead to the emergence and spread of these traits is needed in order to stop them. Whitaker’s project will create models of MGEs and their evolutionary roles within a human system, and compare and refine those models against longitudinal data in order to capture and better understand this crucial evolutionary process.

About The Paul G. Allen Frontiers Group
The Paul G. Allen Frontiers Group is dedicated to exploring the landscape of science to identify and fund pioneers with ideas that will advance knowledge and make the world better. Through continuous dialogue with scientists across the world, The Paul G. Allen Frontiers Group seeks opportunities to expand the boundaries of knowledge and solve important problems. Programs include the Allen Discovery Centers at partner institutions for leadership-driven, compass-guided research, and the Allen Distinguished Investigators for frontier explorations with exceptional creativity and potential impact. The Paul G. Allen Frontiers Group was founded in 2016 by philanthropist and visionary Paul G. Allen, and is a division of the Allen Institute, an independent 501(c)(3) medical research organization. For more information, visit allenfrontiersgroup.org.

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