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Whitehead Institute Faculty and Fellows

Ask a visiting scientist to describe Whitehead Institute and three themes emerge immediately: the exceptional quality of the scientific staff, the collaborative spirit, and the ethos that encourages researchers at every level to share new ideas and benefit from the insights and experience of their colleagues.

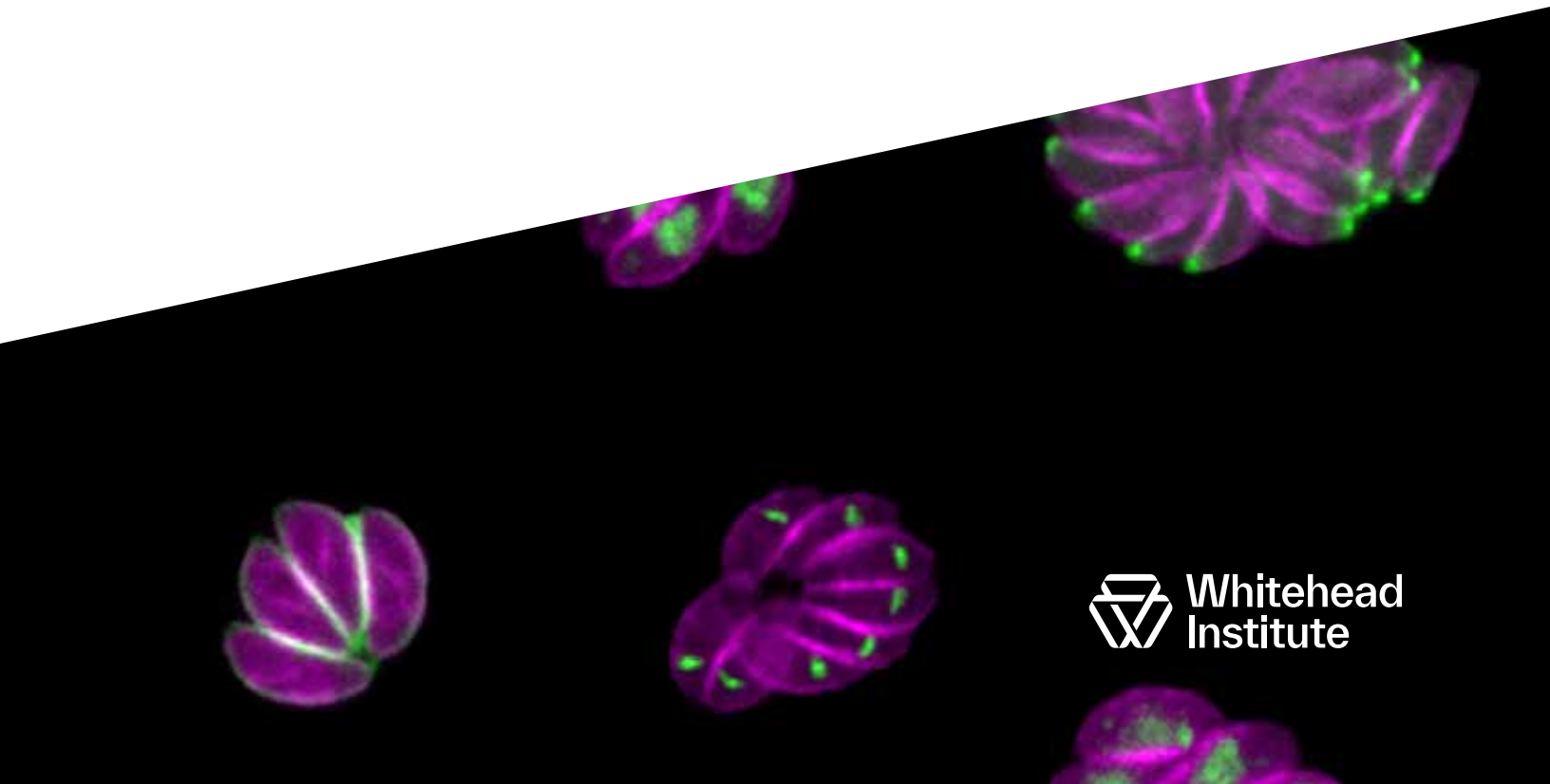
The key to this combination of excellence and accessibility is, of course, the faculty. "From the beginning, we sought researchers who had terrific scientific instincts, but we were also looking for people who would feel comfortable in our open environment," says Founding Member Gerald Fink. "The exchange of energy and new ideas never stops, from the formal research retreat, to the faculty lunches, to the countless informal conversations in hallways and lounges."

Whitehead Institute faculty, known as Members, are selected through a joint appointment process with the Massachusetts Institute of Technology (MIT) Department of Biology. Whitehead Institute is solely responsible for their salary and research. Whitehead Fellows are researchers who skip the postdoctoral stage of their training and are given the space and resources necessary to run their own labs and pursue independent research agendas.

"We are deepening science's knowledge of the basic biological processes driving cancer, neurodegenerative disease, diabetes, and many other conditions. Strengthening the pipeline from discoveries at the bench to creating rationally designed treatments will help shape the therapies of the future" says Ruth Lehmann, Whitehead Institute Director.

"As an independent institution, we offer the Faculty greater flexibility than they might find elsewhere," says Vice President and Chief Operating Officer Martin Mullins. "A large portion of our research support comes from competitive federal grants, but we also have significant support from foundations, corporations, and individuals, as well as the endowment begun by Whitehead Institute Founder Edwin C. "Jack" Whitehead. These private funds provide the seed money to explore new territories—to do the initial experiments that will later reach fruition."

The synergy of creative people in a supportive environment has produced extraordinary results. Senior Members have made vital contributions to human health and younger scientists have extended the frontiers of biology in ways that no one could have predicted.



Members

David Bartel studies microRNAs and other small RNAs that specify the destruction and/or translational repression of mRNAs. He also studies mRNAs, focusing on their untranslated regions and poly(A) tails, and how these regions recruit and mediate regulatory processes. His lab found that microRNAs affect most human protein-coding genes, either by regulating them or by shaping their evolution.

Iain Cheeseman investigates the process of chromosome segregation and cell division. In particular, he uses proteomics, biochemistry, cell biology, and functional approaches to examine the composition, structure, organization and function of the kinetochore—the group of proteins that assemble at the centromere and are required for chromosome segregation and cell division.

Olivia Corradin investigates the role of noncoding DNA variants in defining human disease pathogenesis and susceptibility.

Gerald R. Fink, a Founding Member of the Institute, developed baker's yeast as a model for studying fundamental biological mechanisms. Fink has also studied how the pathogenic yeast *Candida albicans* avoids detection by the immune system.

Mary Gehring studies epigenetic reprogramming in the model plant Arabidopsis. She is particularly interested in determining how epigenetic information is transmitted between generations.

Siniša Hrvatin studies states of stasis, such as hibernation, as a means to harness the therapeutic potential of these biological adaptations.

Rudolf Jaenisch, a Founding Member and one of the founders of transgenic science, has made important contributions to cloning technology and to studies of embryonic stem cells. Jaenisch's lab studies how gene expression is regulated by epigenetic mechanisms, which affect how cell structures are produced without altering genes in the process.

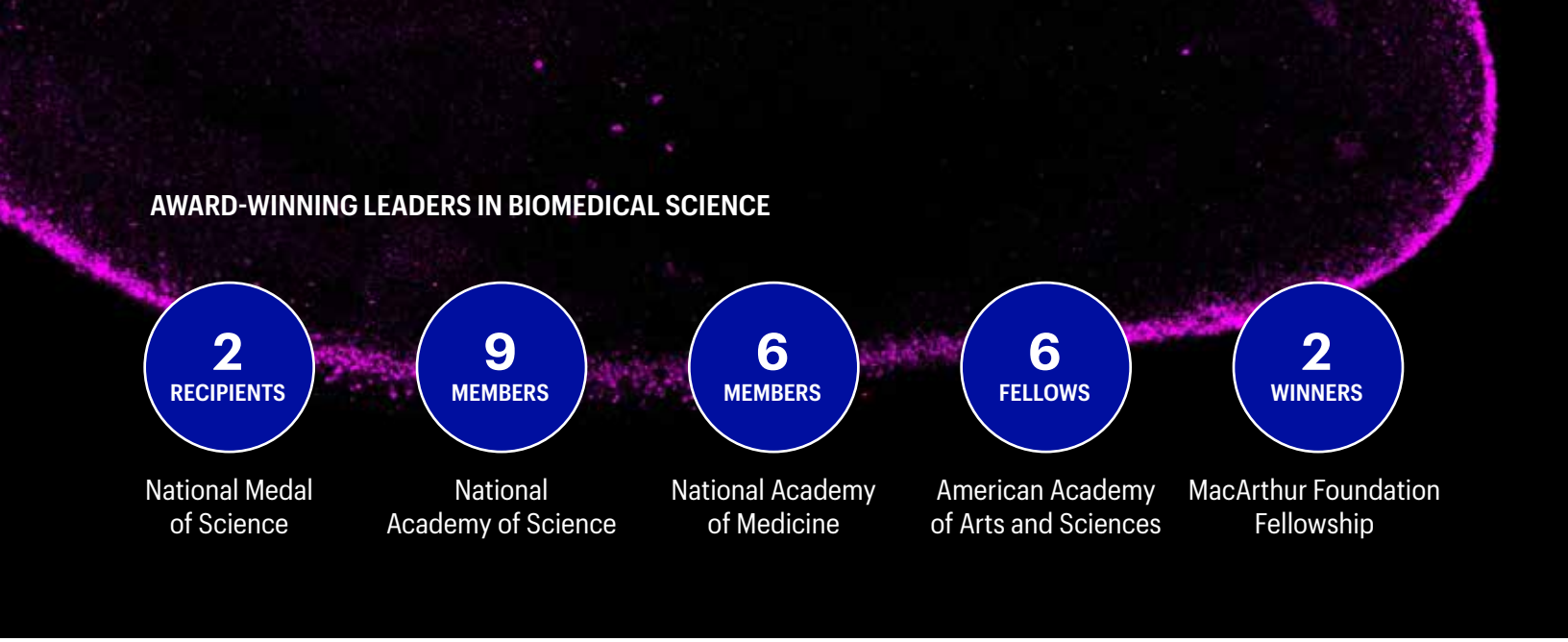
Ankur Jain studies how molecules in a cell self-organize. In particular, he is interested in understanding how membrane-free cellular compartments such as RNA granules form and function. His lab develops new biochemical and biophysical techniques to investigate these compartments and to understand their dysfunction in human disease.

Ruth Lehmann, Whitehead Institute Director, studies germ cells, the only cells in our body that escape the deadly fate of all other cells and instead, via egg and sperm, maintain immortality through generations. Lehmann also discovered key conserved genes that specify germline fate and the link between RNA localization and spatially restricted protein synthesis.

Pulin Li investigates how circuits of interacting genes in individual cells enable multicellular functions, such as self-organizing into complex issues. She combines approaches from synthetic biology, developmental/stem cell biology, biophysics, and bioengineering to build and quantitatively analyze these multicellular behaviors.

Harvey F. Lodish, a Founding Member of the Institute and leader in the field of membrane biology, has isolated and cloned numerous proteins that reside on the surface of cells and play a role in cell growth, glucose transport, and fatty acid transport. His results have important implications for the treatment of cancer, diabetes, heart disease, and obesity. Additionally, the Lodish lab studies the isolation and growth of hematopoietic stem cells, which generate all blood and immune cells.

Sebastian Lourido studies the molecular events that enable apicomplexan parasites to remain widespread and deadly infectious agents. He studies the important human pathogen, *Toxoplasma gondii*, to model features conserved throughout its phylum and seek to expand our understanding of eukaryotic diversity and identify specific features that can be targeted to treat apicomplexan parasite infections, such as malaria.



David C. Page studies germ cell origins and development, the genomics of sex chromosomes, and the differential impact of XX and XY chromosomes on cellular function throughout the body. One of his core goals is to elucidate the sex-biased mechanisms underpinning health and disease.

Peter W. Reddien is researching the regeneration of tissues and organs by studying the planarian *Schmidtea mediterranea*, a flatworm whose ability to regenerate almost any tissue has long fascinated biologists. Reddien led the first large-scale study of gene function during regeneration in planarians.

Robert A. Weinberg, a Founding Member of the Institute and pioneer in cancer research, discovered the first human oncogene and the first tumor suppressor gene. Today, much of his research focuses on cancer stem cells, new models of breast cancer development, and cancer metastasis.

Jonathan Weissman studies how proteins fold in the cell and how this process can go awry, causing disease. His lab also builds innovative tools for exploring organizational principles of biological systems including ribosome profiling, which globally monitors protein translation, and CRISPRi/a for controlling the expression of human genes and rewiring the epigenome.

Jing-Ke Weng uses model plants that represent several major lineages to study how complex metabolic traits evolve in a Darwinian fashion. Weng is interested in how such step-wise processes produced in plants elaborate metabolic pathways and tightly paired hormones and receptors.

Yukiko Yamashita studies the mechanisms that regulate asymmetric stem cell division, and their implications for cancer and other diseases. She is exploring when a stem cell divides what determines which daughter cell will remain as a stem cell and which will differentiate into another tissue type.

Richard Young is a leader in the study of gene transcription, the process that cells use to read and interpret the genetic instructions encoded in DNA. The Young lab creates and uses state-of-the-art genomic tools to map the genome-wide circuitry of living cells. Achievements include identifying the locations of key gene regulators in human embryonic stem cells.

Fellows

Lindsey Backman studies the human microbiome, its constituents, and the ways that its resident bacteria protect the enzymes they rely on for survival.

Tobiloba Oni seeks new methods of understanding, detecting, and potentially treating pancreatic cancer.

Kipp Weiskopf studies mechanisms that control myeloid cell activation in tumors to develop new treatments for cancer.