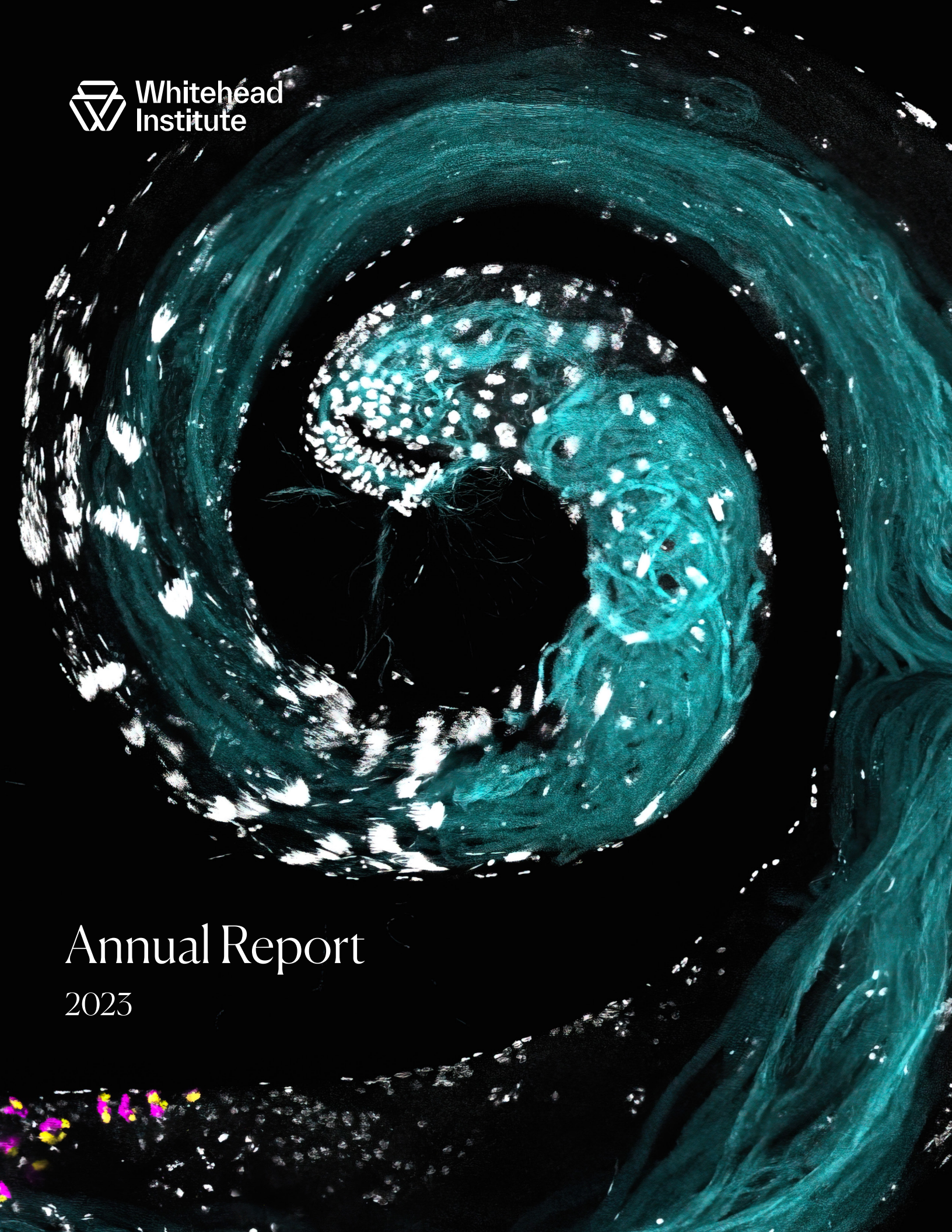
Whitehead Institute



Annual Report

2023

Contents

The values underpinning our work

This past year, Whitehead Institute marked its 40th anniversary by creating a contemporary restatement of our long-standing mission, and by articulating the values we deem essential to our success.

That mission—**forging new frontiers in science, uncovering insights today that unlock the potential of tomorrow**—reflects our determination to build on decades of pioneering discoveries by making new, paradigm-shifting insights that lead to significant improvements in human health.

In a similar way, the values we established reflect both who we have been and who we need to be as a scientific community, if we are to succeed in pursuing that mission. These are our four core values and how we apply them:

Ingenuity—We are nimble and proactive problem solvers, pursuing novel approaches and inventive solutions.

Courage—We believe in breaking boundaries: taking risks, making mistakes (and learning from them), approaching every challenge with rigor and integrity.

Belonging—We empower everyone in our community to thrive, embracing a diversity of people and ideas, and treating each other with dignity and respect.

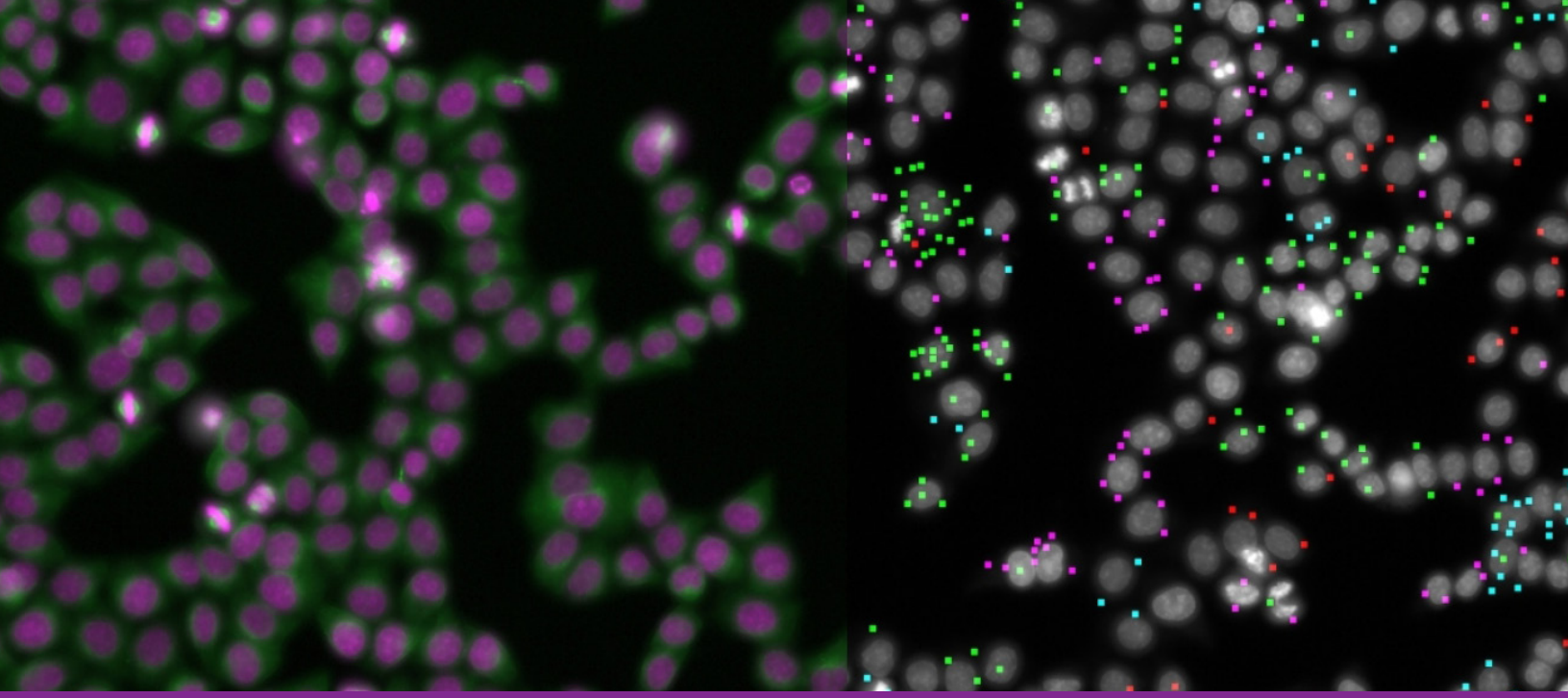
Learning—We are eternal learners, curious and open-minded; and compassionate teachers, training emerging scientific leaders to be collaborative, innovative, and rigorous.

This Annual Report brims with examples of these values in action, such as: The *ingenuity* evident in the new tools and methods our researchers develop. The *courage* required to propose new mechanisms for gene regulation and genome function. The sense of *belonging* fostered through our Diversity, Equity and Inclusion initiatives. The way our mentoring programs catalyze *learning* among scientists at all stages of their careers.

I encourage you to read on—learn about the myriad ways our scientists are striving to create knowledge that will, in years to come, meaningfully enhance human well-being

Sincerely,

Ruth Lehmann
President and Director



Our Science

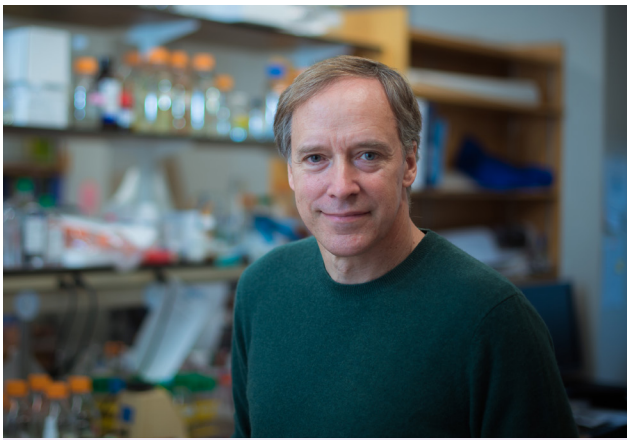
Whitehead Institute scientists are making paradigm-shifting insights into the fundamental principles of life — seeking to tackle the complexities of life and to address challenges of global scope from disease to climate change. Listen to updates on our accomplishments; then enjoy a selection of news stories and multimedia features spanning Whitehead Institute science in 2023.

Sounds of science

Take a walk through the following "sound garden," in which our investigators describe some of their notable accomplishments in 2023. In order to learn more, visit the collection of audio clips in the digital version of this report in which the researchers describe the highlights of their year.

Lindsey Backman, Valhalla Fellow

My research focuses on the biochemical strategies that bacteria exploit to compete with other microbes within the human microbiome. We're using a combination of structural, biochemical, and genetic techniques to probe these questions. Understanding the strategies that pathogens exploit to outcompete beneficial bacteria could lead to novel therapeutic targets.



David Bartel, Member

We've found that targeted destruction of microRNAs is important in animal development. Normally microRNAs direct the destruction of messenger RNAs, but we observed six fruit fly microRNAs that direct destruction of other microRNAs. If one of those is mutated and cannot direct microRNA destruction, embryonic flies develop defects. We're eager to study other effects related to microRNA destruction.

Iain Cheeseman, Member

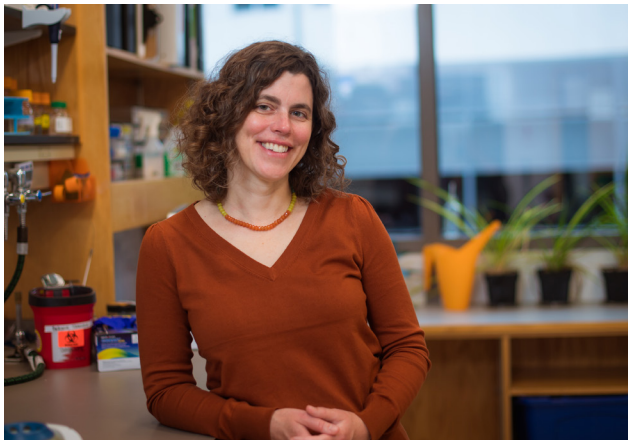
Our lab has always been interested in the process of cell division and chromosome segregation. You may assume core cellular processes happen the same way over and over again. But those processes are not as constant or identical as anticipated—this has become a dominant theme across all projects in the lab.

Olivia Corradin, Member

We focus on genetic differences in neurons and glia across brain regions. We found that enhancers specific to the nucleus accumbens, a brain region controlling the reward circuitry pathway, can contribute to substance use disorders. We see a clear connection between these enhancers and the heritability of things like opioid use disorder.

Gerald Fink, Member

I'm quite excited to be writing the history of the Whitehead Institute. I'm an experimentalist, and Whitehead Institute was, at its time, a radical experiment. Whitehead Institute has many novelties, including the Whitehead Fellows program and building design. The Institute's preeminence is due, to a large part, being both part of, and independent of, MIT.



Mary Gehring, Member

In Arabidopsis, four genes encode DNA demethylases. If we tried studying the fourth gene by mutating it, the plant couldn't live due to a reproduction defect. This year we got around that lethality, creating a plant with all four DNA demethylases disrupted. We can now understand more broadly what the genes' targets are.

Allison Hamilos, Valhalla Fellow

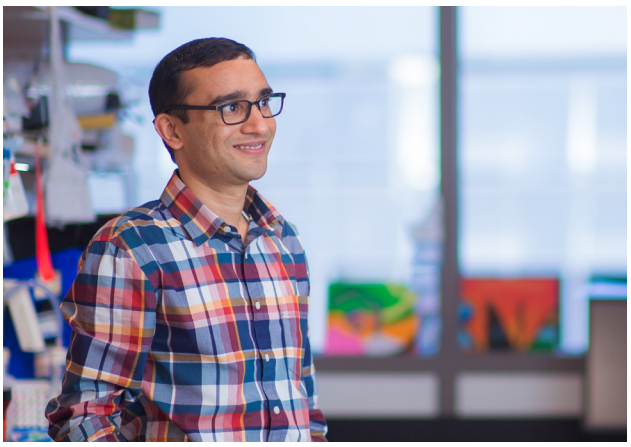
What's intriguing to me is this question of how we make decisions when the right answer might not even exist. We're interested in understanding how the axis of dopamine, which seems to influence levels of spontaneity, can be harnessed in the clinic to treat conditions such as Parkinson's disease.

Siniša Hrvatin, Member

We study torpor and hibernation at two different levels, working both with cells and animals. We have observed, very preliminarily, a remarkable result: it appears that certain markers of aging, specifically epigenetic clocks, seem to be slowing down dramatically in animals that are in torpor.

Rudolf Jaenisch, Member

Bats can handle many pathogenic viruses and are thought to be the source of SARS-CoV-2. We started working with bat iPS cells and got some very exciting results: while bat cells can get infected with SARS-CoV-2, they can control viral gene expression and replication. They don't produce any progeny virus, whereas infected human cells produce whopping amounts of virus.



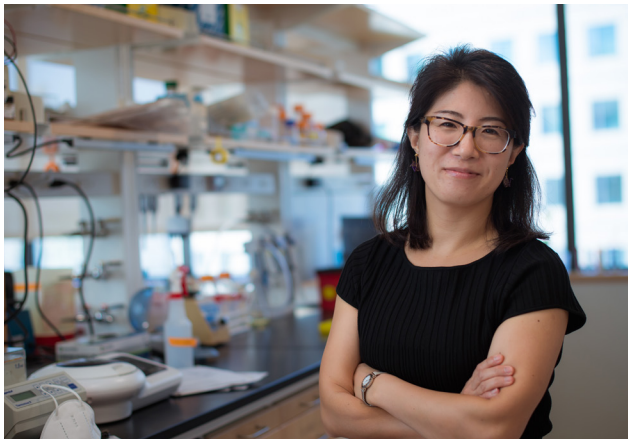
Ankur Jain, Member

Part of my lab focuses on non-membrane bound compartments called condensates. Condensates recruit specialized proteins and participate in many diverse biological functions. We have been investigating how these bodies assemble, which has implications towards understanding the ways that certain genetic mutations, linked with degenerative diseases, manifest themselves.

Ruth Lehmann

Member, President and Director

In Drosophila, polarity is established within the egg cell. At both poles, RNAs are enriched in high concentrations. We hadn't been able to observe how these RNAs become active after fertilization. So, we developed imaging techniques to follow RNAs in real life synthesizing protein products as the embryo developed.



Pulin Li, Member

We are investigating how cells self-organize into structures or make collective decisions. A key question has been how a cell population controls its overall level of response to stimulation. We found that cell-to-cell communication affects what fraction of the population responds and we're exploring this principle in different tissue contexts.

Harvey Lodish, Member

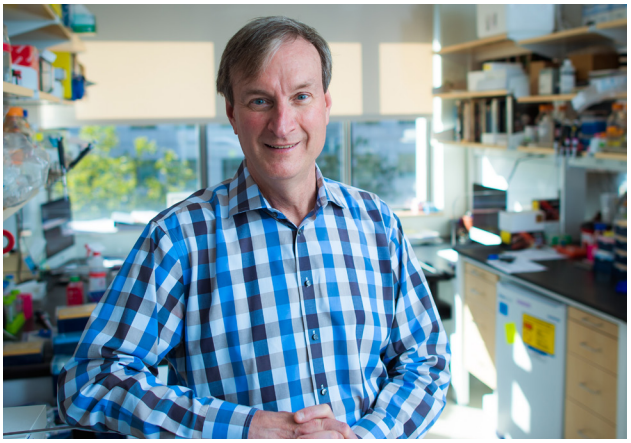
I work with a combination of university and political leaders to help them think through how one can take discoveries out of the university, and build biotech companies. Particularly, how to grow biotech companies from a startup, into a flourishing company that is manufacturing a product and beginning clinical tests.

Sebastian Lourido, Member

Two exciting studies came to fruition recently. One used a CRISPR-based approach to precisely edit genes in the parasite *Toxoplasma gondii*, allowing us to determine individual genes' function with unprecedented precision. The second assessed how individual proteins respond to small molecules; it enabled us to identify proteins at work during key transitions in the parasite's life cycle.

Tobiloba Oni, Valhalla Fellow

Cancer cells make up only a portion of a pancreatic tumor; the remaining cells actually support the cancer cells. We investigate how tumor cells shape their micro-environment. And we've identified new strategies to alter the microenvironment, enabling immune cells to destroy cancer cells.



David Page, Member

We've been learning that while the first X chromosome in biological males (XY) and females (XX) is essentially the same, the second X in females — called "Xi" and long considered inactive — is tremendously relevant. Our lab is focusing extensively on Xi's function and impact, and will probably do so for many years to come.

Aditya Raguram, Fellow

How do we get large macromolecules, like proteins, inside cells where they can perform a therapeutic function? My lab will study vesicular transport processes using functional genomics approaches. We think about ways to study the factors involved in protein export and import into cells, and how we can manipulate them for new delivery strategies.

Peter Reddien, Member

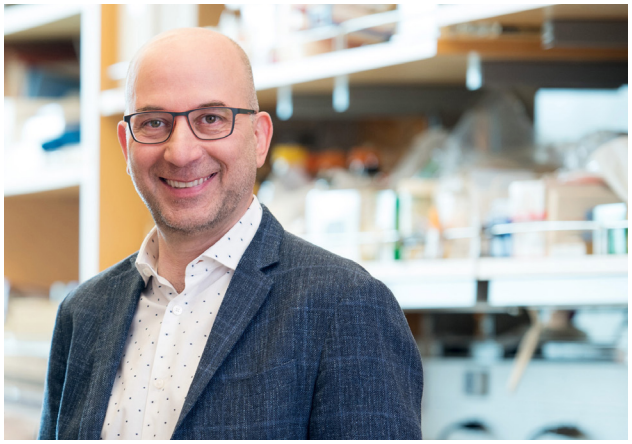
In studying how planarians initiate replacement of injured or lost tissues, we discovered a central role for the *equinox* gene. *equinox* is expressed in the skin that covers a wound and is necessary for stem cells to know what kinds of cells are needed for replacement tissues. It's exciting to have found a gene that may be one of the keys to regeneration.

Robert Weinberg, Member

A common fate of disseminated cancer cells is that they enter a tissue and become dormant for months or years. Then suddenly, they start proliferating and create a clinical relapse. We've gathered convincing evidence that what provokes that awakening is cancer cells receiving signals from surrounding inflamed tissue.

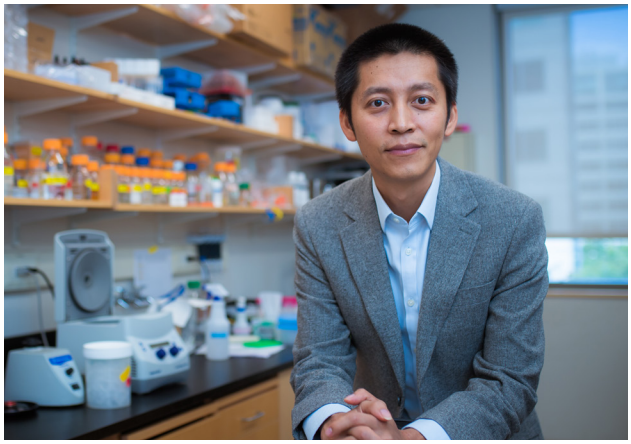
Kipp Weiskopf, Valhalla Fellow

In the lab we've found that certain lung cancers respond to new combination therapies that stimulate the immune system to attack cancer cells, and we're now applying them to other cancers. In parallel, we're learning a lot about genes and regulatory pathways controlling how immune cells called macrophages function within tumors.



Jonathan Weissman, Member

This year we introduced two significant tools that enable scientists to pursue systematic approaches to biological discovery. One tracks tumor evolution in vivo, using "molecular recorders" that inscribe a cell's history in its DNA. The second — called genome-wide perturb-seq — maps the function of every gene expressed in a specific cell.



Jing-Ke Weng, Member

We study plant peptides, applying a process developed by our lab to use them to create potentially therapeutic molecules. One we're working on now comes from stinging tree venoms: It has an action mechanism similar to the chemotherapy drug Taxol, and holds promise to be developed into a new cancer treatment.

Yukiko Yamashita, Member

Ribosomes are the key protein synthesis enzymes, and ribosomal DNA (rDNA) — which codes for ribosome components — exist as repeated sequences. These repeats are susceptible to loss, which results in cellular aging. We began uncovering how germ cells, which transmit genome through generations, maintain rDNA repeats such that the lineages of life continue through an evolutionary time scale.

Richard Young, Member

Researchers have learned that cellular proteins and other biopolymers can condense into membraneless structures called condensates to perform cell functions. We're investigating whether the behaviors of these condensates might explain long-standing mysteries in biology. And we're identifying how genetic variation and the environment alter condensate behavior to cause metabolic and neurological disease, thus leading to novel therapeutic strategies.

Lenses on Whitehead Institute science

Whitehead Institute researchers address significant scientific questions from varied perspectives and approaches. The following story collections offer a multifaceted look at two of these questions.

The first explores advances that our scientists are making to better understand how the brain works in health and in disease. It includes an in-depth article on brain function, a podcast on the neuroscience of hibernation, and videos on opioid use disorder and the role RNA "clumping" plays in neurological disorders.

The second collection explores our researchers' eye-opening discoveries about once-thought-useless parts of cells. It includes a cartoon explainer and an in-depth article exploring the roles of repetitive DNA, seemingly random genomic differences, the "inactive" X chromosome, and "parasitic" genetic elements that may help preserve fertility in flies.

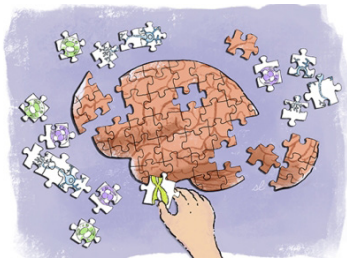
New ways of thinking about brain research

Whitehead Institute researchers are making discoveries that are helping us rethink what we know about the brain and paving the way for therapies to treat some of the most challenging brain disorders and diseases.

How the brain works in health and disease is a question that has long fascinated scientists. Researchers seek to decode the inner workings of the brain, to understand how it forms, and how it fails. Such discoveries will give us insights into ourselves and our behaviors, and will be necessary in order to prevent and treat brain disorders and diseases. However, researchers face a number of challenges in studying the brain, from its complexity to how hard it is to observe in action.

Whitehead Institute researchers are creating innovative approaches to understand how the brain functions. They are learning more about how the brain develops, how it degenerates, and how it regulates behaviors. They are gaining insights into diseases and disorders from Huntington's disease, to Rett syndrome, to substance abuse disorders, and are developing tools that they hope could lead to medical therapies.

Explore this multimedia collection to learn more about brain-related research at Whitehead Institute.



Discovering how to think about the brain and its associated diseases and disorders

Read about brain-related research at Whitehead Institute.

AudioHelicase special: Getting a handle on hibernation

Whitehead Institute Member Siniša Hrvatin discusses his research on the neuroscience of hibernation.

Video: Searching for genes linked to opioid use disorder (OUD)

Figuring out the genetic risk of developing opioid use disorder (OUD) is difficult, because there are many genes, and combinations of genes, that can lead to OUD in any one person. Whitehead Institute Member Olivia Corradin is using a new approach to narrow in on important risk genes.

Video: Repeat expansion disorders — how RNA may gum up the works

What happens when an RNA molecule contains too many repeats of the same short sequence of bases, or RNA building blocks? Whitehead Institute Member Ankur Jain and graduate student Michael Das explore how such repeats may contribute to neurodegeneration.

Unsung cellular heroes

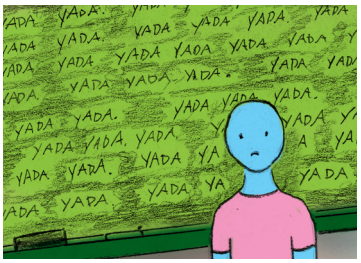
Whitehead Institute researchers are uncovering the functions of cellular components once thought to be of little consequence or even harmful to cells.

The insides of our cells are as alive with activity as a bustling city.

From the DNA that holds the permitting and building instructions, to the workhorse proteins that carry out everyday maintenance and operation, the more that researchers learn about what each part does and how it does it, the better they understand how our bodies work—as well as what might be going awry in the case of disease.

The functions of many parts of our cells have been well understood for years or decades. However, some have gained a reputation for serving little or no purpose, or even for being harmful to the cell, like a steep, unpaved side road. Whitehead Institute researchers have given some of these supposedly useless parts a second look, using new techniques and approaches or considering them from a new angle, and discovered that some serve important, unrecognized functions. To learn more about the previously underappreciated roles that these cellular components play in our biology, read through the series below.

Read our cartoon explainer on repetitive DNA, sequences that can appear like a clip stuck on replay, to learn about what these monotonous sequences are; and then learn about what Whitehead Institute researchers have found that they can do. Then discover the powerful voice of a supposedly silent chromosome; see how researchers sifted through the white noise of genomic data until they could pick out notes cluing them into the genetic factors of opioid use disorder; and read the story of how an alleged genetic parasite turned out to be an unsung hero preserving fruit fly fertility.



The many roles of repetitive DNA; The many roles of repetitive DNA—a cartoon explainer

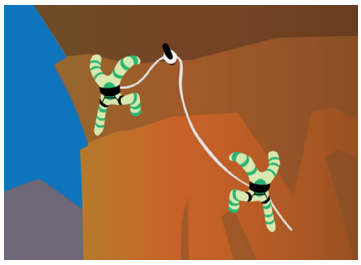
Repeated sequences of DNA are everywhere. In fact, two thirds of the human genome are made of repetitive elements. With this cartoon explainer, learn how repetitive DNA plays a role in health and disease.

Making sense of repetitive DNA

Once considered genomic "junk," repetitive sequences in DNA are being discovered to have important roles in our biology. Whitehead Institute researchers are investigating different types of these repeated sequences, from repetitive DNA regions to excessive repeats within genes, in order to understand what roles they play in cells and how they contribute to health and disease.

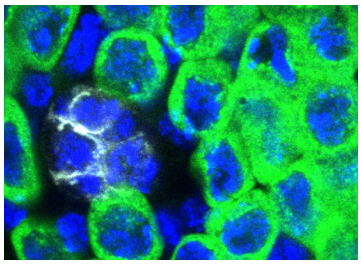
Looking at genomes from a new angle reveals patterns hidden in seemingly random differences

Whitehead Institute Member Olivia Corradin and colleagues have developed a system to find patterns in seemingly random differences between the genomes of people affected and unaffected by a disease. They can use these patterns to identify genes that contribute to complex diseases and disorders, such as opioid use disorder.



Inactive X chromosome moves from second fiddle to the conductor's podium

Whitehead Institute Member David Page and colleagues have discovered that the so-called inactive X chromosome contributes a lot more to gene expression—and gene regulation—than its name implies.



Help from an unexpected corner: a "genetic parasite" protects fertility

Research from Whitehead Institute Member Yukiko Yamashita's lab finds that a retrotransposon, a genetic element often thought of as a parasite, actually plays an important role in rejuvenating an important region of DNA, preserving fertility in flies.

Selected science news

Browse through the following articles highlighting some of the research our investigators pursued during the past year. The work ranges from studying germ cell and microRNA function to exploring new ways to prompt an immune response against cancer cells to investigating the epigenetics of plant reproduction.

Harnessing the immune system to fight cancer

Cultivating better plants

Positive feedback loop drives transition of *Toxoplasma gondii* to its chronic stage

Balance between proteins keeps sperm swimming swiftly

It takes three to tango: transcription factors bind DNA, protein, and RNA

Scientists unveil the functional landscape of essential genes

New players in an essential pathway to destroy microRNAs

Focus on function helps identify the changes that made us human

Germ cells move like tiny bulldozers

Innovation Centers propel discovery ... At the core of Whitehead Institute

Whitehead Institute's Innovation Centers are scientific facilities providing state-of-the-art equipment and unique expertise in areas including bioinformatics, flow cytometry, functional genomics, genome technology, metabolite profiling, microscopy, and quantitative proteomics.

The studies and methods developed with the Centers' engagement are often key to the investigations being pursued in the Institute's laboratories. And, because of the cutting-edge studies they make possible, the Centers' impact ranges far beyond Whitehead Institute researchers' pioneering discoveries.

Below are snapshots of some of the work done by the Innovation Centers.

Increasingly, biomedical research produces vast troves of data; making full use of that information is a major challenge. The Bioinformatics and Research Computing Center (BaRC) works at the intersections of biology and computer science, helping Institute researchers analyze and interpret their data-rich experiments. "The center not only facilitates a growing number and array of projects undertaken across the Institute," says BaRC Director George Bell, "it supports and catalyzes research that simply could not be undertaken in many Whitehead labs without our participation."

The human genome includes more than 20,000 protein encoding genes. Understanding their roles requires going beyond simple gene expression to look at the many ways genes are regulated. To study gene regulation, the Genome Technology Center uses tools such as transcription factor binding mapping, chromosome conformation capture, and gene expression analysis. Understanding how gene regulation responds to stress is critical to finding the causes of — and developing treatments for — disease. Center Director Tom Volkert notes that "Whitehead Institute has been recognized as helping to pioneer the expanding use of the tools that enable researchers to track gene activity." In parallel, the Functional Genomics Innovation Center helps investigators uncover the genes involved in diverse cellular processes in a wide variety of model systems — primarily using different adaptations of the CRISPR/Cas9 system that can target many genes in a single experiment. "In addition to consulting with Institute labs on design and implementation of pooled screening approaches," says Center Director Heather Keys, "we collaborate with researchers to develop new and better ways to deliver CRISPR/Cas9 machinery and other screening technologies to cells."

> "The center... supports and catalyzes research that simply could not be undertaken in many Whitehead labs without our participation." — BaRC director George Bell

The Quantitative Proteomics Center, which was launched in 2022, helps to create, adapt, and implement new technologies for analyzing proteins. This field is rapidly evolving, observes Center Director Fabian Schulte. "For a while, mass spectrometry has enabled researchers to identify proteins that are involved in human diseases. What excites me the most about this technology is that it keeps pushing the technological boundaries of what was considered to be impossible until recently. This requires the use of specialized software and very powerful computer servers to keep up with the amount of data being produced."

The Metabolite Profiling Center supports researchers studying metabolism, the chemical reactions that enable organisms to live and function. "Most of the projects we support involve studying the action of small molecules, but we do that by looking at many different biological systems," says the Center's supervisor Tenzin Kunchok. "For example, recently we helped Institute researchers engineer yeast to create a more efficient biofuel from an underutilized part of corn plants."

The Flow Cytometry Center helps researchers sort different cell types and analyze their mechanisms and functions. The work often starts by engineering cells to have a molecular tag that makes them emit light with a specific wavelength; and specialized machines detect differences in wavelength and sort the cells with the tag. "This enables researchers to, for example, screen a cell population for specific genes or to clone the cells for future experiments," Center Director Patrick Autissier explains.

The W.M. Keck Microscopy Facility is home to ten powerful light microscopes serving an array of purposes. For example, the microscopes can visualize contrast in cell samples — enabling a researcher to see certain structures within the cells at high resolution — and can record cell division in progress to see how these structures change over time. Center Director Cassandra Rogers notes that, "We image not only human cells and tissues, but also model organisms such as plants, planarians, zebrafish, and fruit flies — as well as non-biological materials."

But, more than serving as facilitators of pioneering research, the Centers' teams help launch and advance scientific careers. "The Innovation Centers' staffs often serve as educators and mentors for the many postdocs, graduate students, and visiting scientists who work with us while they're here," says Heather Keys. "We have both technical and institutional knowledge to provide, which can enable these folks to navigate their Whitehead experience and, eventually, their career."

Our People

At the heart of Whitehead Institute are the scientists, trainees, and technical experts who drive our research forward. Read on to learn about the achievements and perspectives of individual members of our community, about the people who support our research, and about our commitment to fostering an equitable and inclusive community.

Postdocs' parallel pursuits

Our postdoctoral researchers are both emerging scientific leaders and multi-talented individuals — often balancing the hard work of bench science with an array of creative or physically demanding activities. Here's a snapshot of how six Whitehead Institute postdocs achieve that balance.

Junsik Choi (Gehring lab)

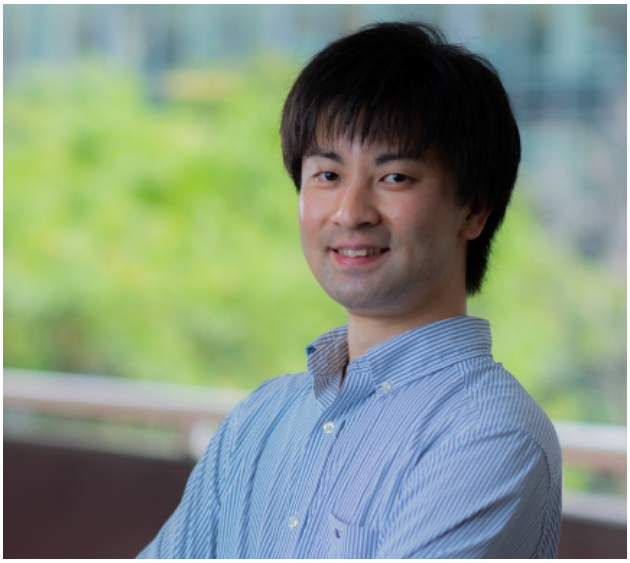
After studying agricultural chemistry and biology at Seoul National University in South Korea, Junsik earned a PhD in plant biology at Cornell University. At Whitehead Institute, he studies epigenetic gene regulation — investigations that could lead to food crop plants better able to thrive in a changing climate. He pursues an array of activities to balance out the intensity of his scientific research. "Since childhood, I've been both a computer game nerd and a classical music enthusiast," Junsik explains. "PC games are always part of my life to relieve stress and to train my reaction times. I'm getting old but am still passionate about reaching a better rank in competitive games. Another way I deal with stress: I fully enjoy our access to the piano in the Whitehead auditorium, where you can often hear people playing after work. Recently, I've also been doing DIY stuff, like doing simple plumbing fixes or car repairs: It felt ironic to hold a PhD but have no idea how to fix a broken tail light. Now, it feels really good when I succeed in a DIY project — it offers a bit of healing when my work at the lab bench isn't going well."

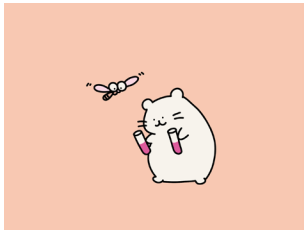
Sheri Grill (Lehmann lab)

Having earned a PhD in molecular, cellular, and developmental biology at University of Michigan, Sheri is studying how germ cells — the precursor cells that become eggs and sperm — activate the correct genes that give them their potential to, eventually, become every cell type in a newly formed body. Although music has long been an important part of Sheri's life — growing up playing flute, she harbored a dream to be a singer, and earned degrees in both music and science — volleyball is her nonscientific passion. "I started playing back in middle school, and it's how I spend much of my time outside the lab," she explains. "It's been the one constant in my life that I would say I truly cannot live without. These days, I play with the MIT women's volleyball club; we practice several times a week and compete in tournaments on the weekend." In many ways, Sheri observes, research is like competitive team sports: "There is an inherent competitiveness to pushing scientific boundaries. But in the lab, we are working really hard together — competing as a team — to move our research forward. Having been a competitive team athlete, I'm comfortable pushing to try and advance science as much as I can."

Marine Krzisch (Jaenisch lab)

Marine — who grew up in France and earned her PhD in fundamental neuroscience from University of Lausanne in Switzerland — is developing research models that better represent how cells in the human brain function and are affected by neurological diseases such Fragile X syndrome, Alzheimer's, and Parkinson's. "When I was very young, I wanted to save people and being a firefighter seemed like an exciting job," she recalls, "as did being an ambulance driver or police officer. Over time, that shifted to wanting to be a veterinarian and then — in part because two family members have psychiatric disorders — settled in a passion for neuroscientific research." In parallel, Marine started studying martial arts when she was fifteen, and that's been her main activity outside of school or work since. "I began with karate; then, during graduate school, started training in Sanda, the fighting aspect of Wushu. Later, I studied kickboxing with a former professional kickboxer. When I first came to the U.S., I focused on amateur boxing, running, and lifting weights. Recently, I've started learning Brazilian Jiu Jitsu and I love it. Research can be full of frustration and anxiety; but I find combat sports are a good way to release frustration and reduce anxiety. It's also helped strengthen my confidence."





Tomohiro Kumon (Yamashita lab)

Tomo studies satellite DNA, which was once considered genomic "junk" but actually appears to play important roles in cell function. His childhood interest in nature and animals set him on a path toward science and research; it also served as a lens for his love of cartooning. "Since I was a kid, I've enjoyed drawing animal cartoons," he says. "During my PhD program at University of Pennsylvania, I started drawing mice because I used them in my research and they're so cute. I'd hang my cartoons all around the lab. I continued cartooning at Whitehead, but the pandemic prompted me to learn to draw digitally and to share my art through an Instagram account. The drawings are inspired by things I see in the lab and by interesting research I read about. I've also created drawings based on my own papers — and I hope to have one of my cartoons accepted as a cover image for the journal that publishes my future studies. . . Although, since my current research uses Drosophila, not mice, I need to get more practice drawing flies."

Jesse Platt (Young lab)

Jesse, who received his MD and PhD from University of Pennsylvania, is both a researcher and a practicing gastroenterologist and hepatologist. He studies how the insulin receptor functions and is learning about the role that biomolecular condensates within cells play in this process. How does he balance the intensity of being a clinician-scientist? "I used to ride my bike a lot, and go running with my wife. But lately I've found that rock climbing is a great 'de-stresser.' My climbing is all in the gym: I'm really terrified of heights, and I can't imagine myself doing it for real. But the combination of the physical workout and the sense of danger makes me stop thinking about work." Since he was a teen, Jesse's also been a big collector — with a particular passion for collecting vintage rock and roll t-shirts from the early 70s. "I love music, and the reason I got into this is that when I was in college, I really wanted a Clash t-shirt, but they were expensive and I couldn't afford them. But over time, I've collected a lot of great shirts — like one worn by the staff at Woodstock in 1969. Today though, I'm trying to buy fewer of them; my wife says we don't have any room in our house."

Haley Licon (Lourido Lab)

Haley, who received a PhD in molecular and cellular bioscience from Oregon Health and Science University, is interested in the genetic mechanisms that help parasites progress through their life-cycle stages. Her research focuses on potential vulnerabilities in the life cycle of the disease-causing parasite *Toxoplasma gondii*. When not in the lab, Haley is likely to be found outdoors — sometimes rock-climbing, more often taking a long run. "Growing up in the southwest, being outside was a big part of childhood and remains an important part of my life," she explains. "I prefer endurance trail-running and my favorite landscape to run through is high desert. But I've found that one of the best ways to get to know a city is to run through it, and I've come to enjoy running in Boston with no goal other than to get to know the area and see all the little things that give neighborhoods their individual characters. Endurance running has also helped build my capacities for patience and persistence in the lab: Sometimes you get lucky and have a productive run of data collection; but there are plenty of demoralizing periods that you just have to push through until something works."

Four accomplished leaders join Whitehead Institute Board of Directors

The Whitehead Institute Board of Directors has elected four new members, each for six-year terms: Sally Kornbluth, cell biologist and president of Massachusetts Institute of Technology (MIT); Raja H. R. Bobbili, managing director at a Boston-based investment firm; Michael Chambers, founder of a major biotechnology production company; and Terrance (Terry) McGuire, early-stage investor in medical and information technology companies. They were recruited to the board by nominating committees that were chaired by MIT president emerita Susan Hockfield and Terry McGuire, and that included Boston Children's Hospital president and CEO Kevin Churchwell, long-term Institute board members and philanthropists Brit d'Arbeloff and Susan E. Whitehead, and MITIMCo president Seth Alexander.

"We are thrilled to welcome Sally, Raja, Michael, and Terry to our governance team," says board chair Sarah Keohane Williamson. "Their extraordinary knowledge and experience — and their global perspectives on advancing health through biomedical research — match perfectly with Whitehead Institute's mission of forging new frontiers in science and uncovering insights today that unlock the potential of tomorrow."

Sally Kornbluth became MIT's president in January 2023, following her eight-year tenure as provost of Duke University. She earned bachelor's degrees in political science and in genetics from, respectively, Williams College and Cambridge University, and a PhD in molecular oncology from Rockefeller University. She completed postdoctoral training at the University of California, San Diego, then in 1994, joined the Duke faculty. In 2006, she became vice dean for basic science at the Duke School of Medicine, a post she held until she became Duke's provost in 2014. Her research has focused on the biological signals that tell a cell to start dividing or to self-destruct — processes key to understanding cancer and various degenerative disorders. Among other honors, Kornbluth is an elected member of the National Academy of Medicine, the National Academy of Inventors, and the American Academy of Arts and Sciences.

Raja Bobbili is a managing director at Abrams Capital, where he helps lead investments across a range of industries and asset classes. Born in India and raised in Zambia, Bobbili earned his undergraduate degree from the Massachusetts Institute of Technology, then spent two years at McKinsey & Company as a management consultant. Subsequently, he earned JD and MBA degrees in a joint program at Harvard Law School and Harvard Business School. In 2017, Bobbili was named to the Forbes "30 Under 30" list for finance. He has served on the MIT Corporation and the Harvard Business School Alumni Board, and is active on multiple corporate boards.

Michael Chambers stood at the helm of Aldevron as its founding CEO. With a focus on nucleic acid, protein, and enzyme production, Aldevron has consistently pushed the envelope, innovating quality systems and technologies to drive the genetic medicine sector forward. Their efforts caught the attention of the global conglomerate Danaher, leading to Aldevron's acquisition in 2021. In this evolving landscape, Chambers continues to provide strategic advice on opportunities, encompassing automation and the miniaturization of biomanufacturing processes. Beyond Aldevron, Chambers is at the forefront of a bold investment initiative aimed at democratizing genomic medicines, AI, and other game-changing technologies. His influence in the biotech world is further underscored by his board memberships with Sarepta Therapeutics, Lykan Biosciences, Agathos, Calviri, and the Centurian Foundation. Educationally grounded at North Dakota State University, Chambers boasts degrees in chemistry, microbiology, and biotechnology. Today, he divides his time between the vibrant cities of Boston and Fargo, sharing his life with his wife, Victoria, and their daughters.

Terry McGuire, a founding partner of venture capital firm Polaris Partners, earned an MBA from Harvard Business School, an MS in engineering from the Thayer School of Engineering at Dartmouth College, and a BS in physics and economics from Hobart College. During his career, he has invested in more than 80 companies and co-founded three others. Collectively, these companies raised more than $7 billion in equity and corporate capital and achieved a peak value of more than $70 billion. Among many recognitions, McGuire was chosen for Scientific American's Worldview 100 and Forbes' Top Life Sciences Investors. He is former chairman of the National Venture Capital Association; chaired the Thayer School board; and served on more than a dozen public and private organizations' boards.

Whitehead Institute appoints two accomplished early career researchers as Whitehead Fellows

Two new members of the Whitehead Fellows Program — Allison Hamilos and Aditya Raguram — launched their Whitehead Institute labs in September 2023.

The Whitehead Fellows Program provides highly talented and accomplished recent PhDs the opportunity to launch their own research programs, instead of working as postdoctoral researchers in a senior scientist's lab. Since its founding in 1984, the Program has become the model for advancing the careers of biomedical research's most promising young scientists. Its alumni have gone on to stellar research careers and major leadership roles in research, academia, and industry.

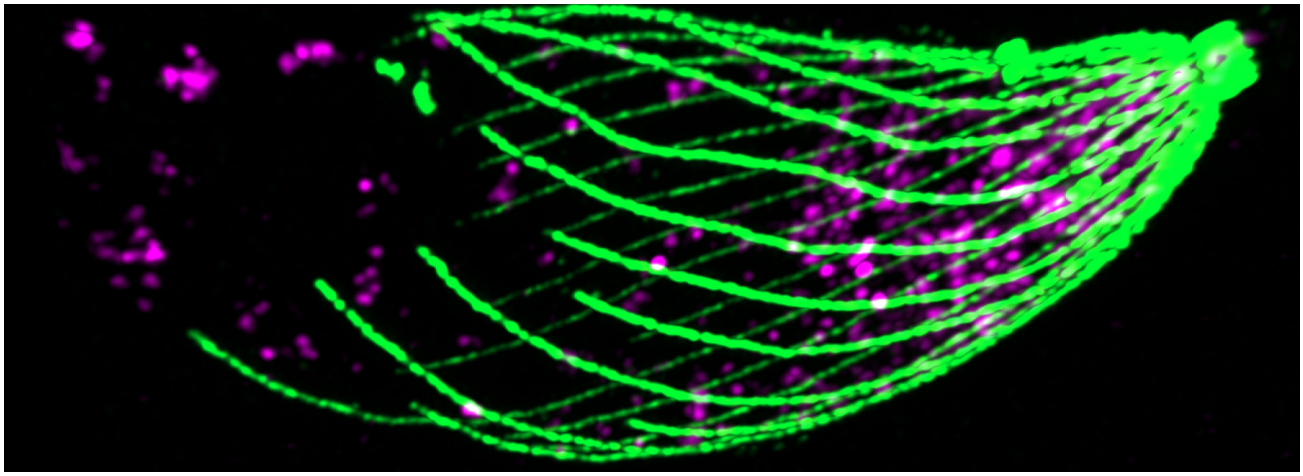
"Not only do these two scientists possess extraordinary skills and knowledge, they are original thinkers whose investigations will expand the breadth of research we conduct at the Institute," says Whitehead Institute president and director Ruth Lehmann.

Hamilos, who is a Valhalla Fellow within the Whitehead Fellows Program, earned bachelor's degrees in chemistry and biology from Massachusetts Institute of Technology (MIT), a PhD from the Harvard Program in Neuroscience, and an MD from Harvard Medical School. Her doctoral research focused on dopamine neurons and related neural circuitry in mice; and her findings that dynamic dopaminergic activity controls the timing of movement initiation led her to propose a mechanism for the relationship of timing and motor deficits in Parkinson's disease. At Whitehead Institute, Hamilos is continuing to study dopamine neurons, to better understand how dopaminergic circuits may underpin spontaneous behavior and how they may contribute to neurological disease.

"As a scientist, I've always followed my curiosity, which has led me down a variety of research paths, from optogenetics and computational modeling to biomedical engineering and X-ray crystallography," Hamilos says. "I'm excited to be part of Whitehead Institute, because its creative and collaborative culture offers a great opportunity for leveraging all those methods to better understand the underpinnings of neurological disease."

Raguram holds a bachelor's degree in chemistry and physics and a PhD in chemical biology, both from Harvard University. During his doctoral research with David R. Liu at the Broad Institute, Raguram developed several technologies for precision genome editing and protein delivery. Most recently, he co-invented a new method for efficiently delivering genome editing proteins into cells within a living organism using engineered virus-like particles. At Whitehead Institute, the Raguram lab is investigating mechanisms of intercellular biomolecule transfer to inform the development of new macromolecular delivery modalities.

"A deeper understanding of how diverse molecular cargos are transferred between cells might reveal ways in which we could use these pathways to deliver therapeutic molecules of our choosing," Raguram explains. "I'm thrilled to have joined the Whitehead Institute community and look forward to leveraging the Institute's extraordinary scientific platforms — as well as its faculty's deep knowledge of cell biology — to both study and manipulate these fascinating molecular transport processes."



A novel path leads to a new, powerful research capability

In September 2022, a grant from the Valhalla Foundation enabled the Whitehead Fellows Program to add a new facet: an opportunity for highly promising young scientists from diverse academic backgrounds to receive brief, in-depth training on particular scientific techniques. The focused training will permit them to make faster progress in pursuing their independent research programs.

Lindsey Backman, the new initiative's first participant, is building on her PhD research to explore how microbes in the human gut compete for resources using oxygen-sensitive enzymes that can accomplish challenging chemical reactions. But before formally launching her Institute lab, she wanted to learn specific microbiological techniques such as microbial culture assays and bacterial genetics. Those areas of research expertise were not represented at Whitehead Institute, so Lindsey spent the first six months of her Whitehead Fellowship working with Deborah Hung at the Broad Institute and Massachusetts General Hospital. In the Hung lab, she learned how to utilize sophisticated microbiology techniques and to perform bacterial genetics experiments — which enabled her to both create a more interdisciplinary lab program and bring new areas of research to Whitehead Institute.

Backman opened her lab at Whitehead Institute in March 2023 and is using a combination of structural, biochemical, and genetic methods to learn how anaerobic bacteria can thrive despite temporary oxygen exposure and oxidative stress in the human microbiome. To that end, she set up a unique anaerobic chamber tailored for bacterial culturing under controlled levels of oxygen. The first known installation of such equipment, it adds a powerful capability to the Institute's already broad array of research technologies.

Sander appointed as chief financial officer and treasurer

Laura Sander, who served as Whitehead Institute's first chief financial officer and treasurer from 2010 to 2016, recently returned to those roles. In the intervening years, Laura served as Suffolk University's senior vice president for finance and administration and treasurer.

In the course of her 35-year career in not-for-profit, public- and private-sector finance, Laura has also served as vice president at Moody's Investors Service, JP Morgan Securities, and Fidelity Investments. In addition, she was assistant treasurer at Harvard University and a budget analyst at the Congressional Budget Office.

In the following interview, she discusses her experiences and perspective on returning to the Institute.

Whitehead Institute: What drew you to a career in the financial sector — and then to academic organizations?

Laura Sander: I was a history major at Grinnell College, and always thought I'd be a lawyer. But two things occurred: my GRE scores were much better than my LSAT scores; and, although I'd never thought of myself as a numbers person, I realized how much I think about things in a quantitative way. Like, how much did something change? Is it worth investing now, or should we wait?

When I went to public policy school, I realized that the financial issues mission-based organizations face are more engaging to me than those in for-profit organizations. I've also found that finance is an excellent way to understand an organization: its priorities, how it functions, and whether it's operating as effectively as possible.

Since I'm mission oriented — I care about helping to create better outcomes for people — I was naturally drawn to higher education by its ability to lift up people and provide them more opportunity. In a similar way, Whitehead Institute first attracted me because of its potential to improve people's lives — and because I understood how important it was for the organization to maximize its resources and operate efficiently.

WI: What drew you back to the Institute?

LS: I've always been drawn by its mission. Basic research is fundamental to scientific advancement that improves human health, and Whitehead Institute is an extraordinary place. Not only is the research undertaken here special, so too is the dedicated support that the administration provides. It's very clear what we're all about.

I was particularly interested in coming back because of all the meaningful advancements taking place under Ruth's leadership. Also, the energy here is infectious. I've walked around the labs and there's a positive buzz. There's even great energy around the espresso machine, where people greet each other while they wait in line whether they know each other or not.

WI: In your mind, what are some of the most significant questions facing academic research centers like Whitehead Institute?

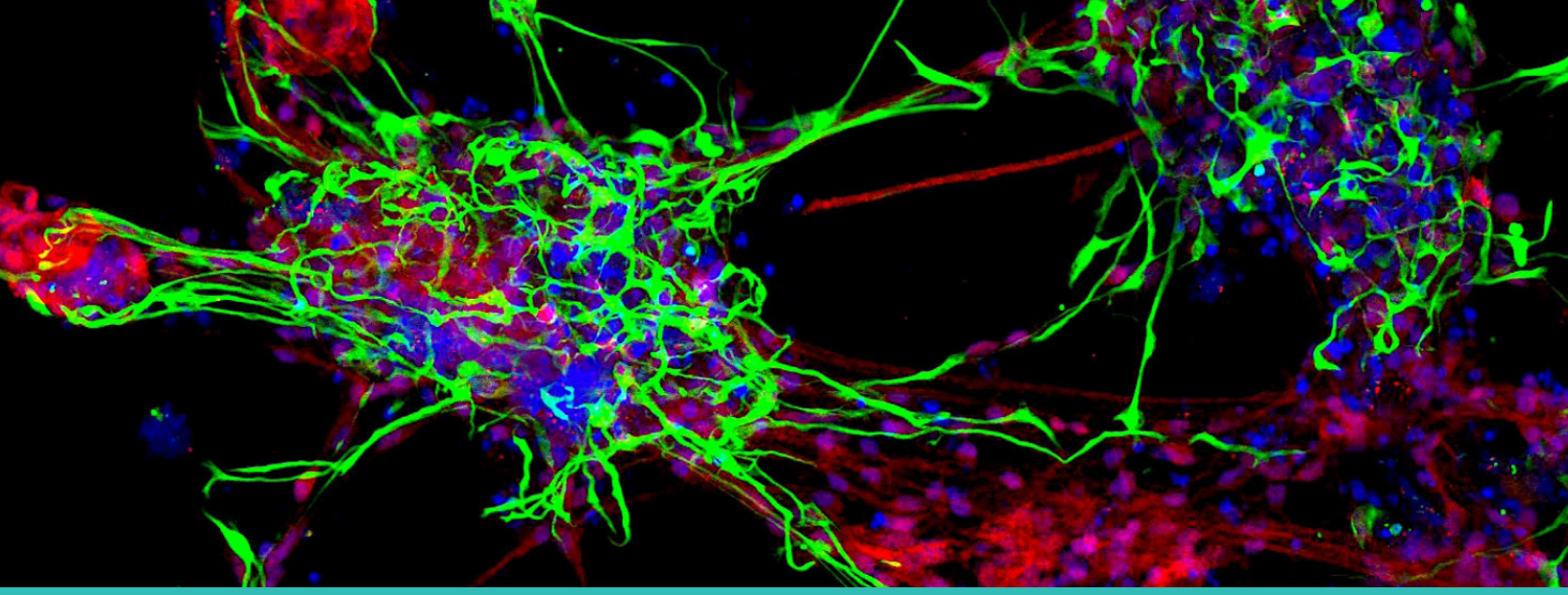
LS: The not-for-profit world continues to have significant issues around equitable access — and that includes the challenge of increasing the range of people given an opportunity to participate in scientific discovery. One of the specific things that excites me about the Institute is Ruth's commitment to equitable access and to creating an inclusive, multifaceted environment.

As a society, we have allowed financial issues to interfere with access and create hurdles to people fulfilling their potential. In particular, there are lots of challenges in achieving the right funding mix for not-for-profit organizations striving for financial sustainability. How much should we rely on our endowment versus grants versus licensing research discoveries or other operating revenue sources? The challenges to funding research and education are not new, but they really came hard and fast over the past three years because of COVID.

A challenge for any organization — and especially for those engaging in pioneering research — is balancing current needs and resources against the desire for long term financial sustainability in pursuing a powerful mission. It is all too easy for an organization's board or administration to take short-term actions intended to support the mission, but which have negative consequences in the longer term.

Lately, I have also become interested in shared governance: At academic research centers, the interplay between the board's role and the administration's role is made more complex by the faculty's important role. How do you consider all the viewpoints in the short term and in the longer term? Who's accountable for balancing the present against the future? Who has the responsibility for certain decisions and how does that play out?

I find it fascinating to be involved in helping to address all of these challenges and questions for an organization committed to forging new frontiers in science, uncovering insights today that unlock the potential of tomorrow.



Our Culture

Whitehead Institute's robust culture is rooted in its values of ingenuity, learning, belonging, and courage. It's powered by our scientists' skill, knowledge, creativity, and collaborative spirit. It fosters an environment where some of the world's brightest trainees are guided to do their best work. And it reflects our commitment to being a multifaceted and inclusive community, where each person can thrive. Read on to learn more.

Whitehead Institute mentoring is multifaceted

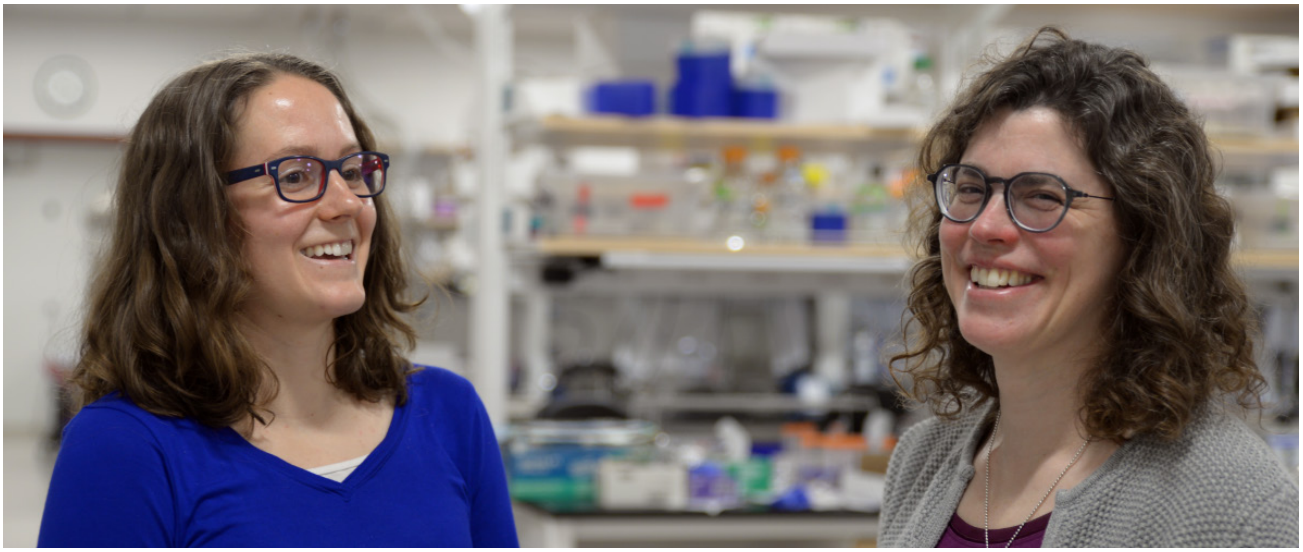
Fundamental to Whitehead Institute's mission of forging new frontiers in science is helping to train and develop the scientists whose curiosity, skill, and perseverance will lead them to make paradigm-shifting discoveries and to create path-breaking new research tools.

Whitehead prides itself on attracting some of the brightest graduate students and postdoctoral researchers and providing an environment in which they can do their best work. One of that environment's highlights is a multifaceted set of mentoring and professional development activities that have proven valuable for mentees and mentors alike.

To start, each of the Institute's trainees receives both scientific and professional guidance from the principal investigator in whose lab they work. That relationship often continues long after their work at the Institute ends. But the mentorship provided by Whitehead Institute Members is just one element of the organization's support for the scientific and career development of the next generation's biomedical research leaders.

The Postdoc Training Program

While research is the core of a postdoc's training, the *Whitehead Postdoc Training Program* (WPTP) helps Institute postdocs develop the other kinds of knowledge and skills needed to succeed in science. For example, WPTP has offered training sessions on subjects ranging from research ethics and bioinformatics to networking and writing effective resumes and grant applications. It's also presented career planning seminars, discussions on alternative science careers, and sessions on how to balance research, family life, and personal development.



Many of these activities are organized by the Whitehead Institute Postdoc Association (WIPDA), which works to create the strongest-possible environment for postdocs. "In recent years, the WIPDA has worked with the Institute's administration toward goals such as increased compensation, improved benefits, and advancing the Institute's diversity, equity, and inclusion initiatives," says WIPDA co-chair Jullien Flynn, a third-year postdoc in Whitehead Institute Member Yukiko Yamashita's lab. Last year, the WIPDA helped launch the *Second Mentor Program* — which aims to enrich the range of guidance and expertise available to postdocs by creating opportunities for formal relationships with second or even third mentors. The program arose because many postdocs wanted greater interaction with primary investigators across the Institute.

"Some postdocs want to get career advice from researchers who are at various stages of their careers or who are on different career trajectories" notes Flynn. "Others are looking for guidance from more senior researchers, or those who share a specific aspect of their identity."

Flynn was guided by a group of postdocs in sketching out a way of addressing those needs; then she led a planning and implementation team comprising WIPDA representatives, Human Resources staff, and members of Whitehead Institute's Diversity, Equity, and Inclusion Council. The planning team had whole-hearted support from Whitehead Institute Director Ruth Lehmann, and included Whitehead Institute Member Siniša Hrvatin. "This new mentoring program is a great example of how listening to our trainees' ideas leads to programs that benefit our community," Hrvatin says. "As a junior faculty member who was a postdoc not long ago, I've been excited to share what I've learned about applying for faculty jobs and transitioning into a faculty role. I've also found that my interactions with postdoc mentees help build stronger connections between our labs."

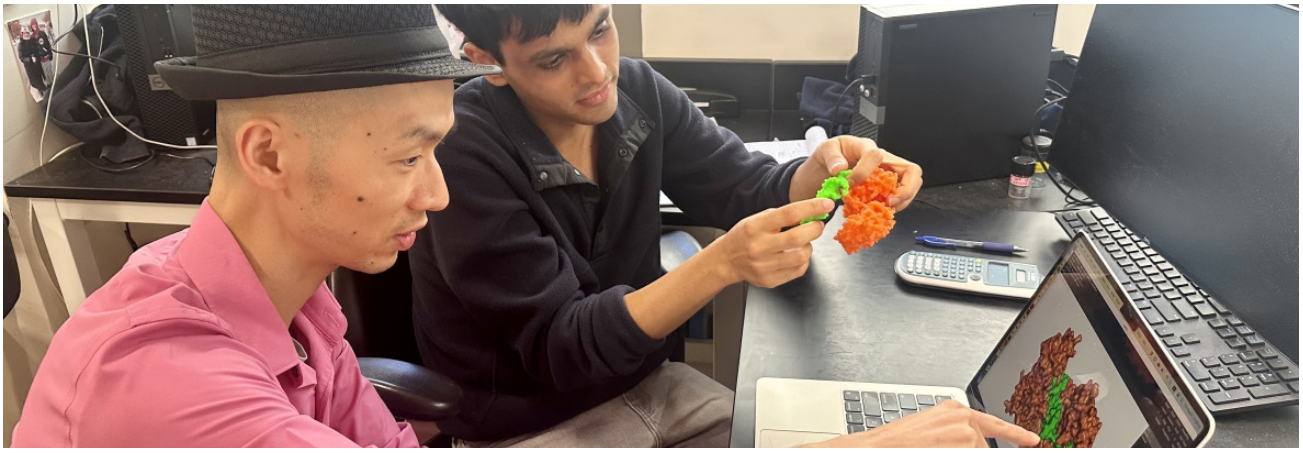
> "This new mentoring program is a great example of how listening to our trainees' ideas leads to programs that benefit our community." — Whitehead Institute Member Siniša Hrvatin

The *Second Mentor Program* was launched at the 2022 annual Scientific Retreat, with an initial goal of a 25 percent participation rate. But, within six months, more than half of Institute postdocs had already engaged in the program. And the Program had hosted a continuing series of sessions where postdocs gave practice faculty job talks and received feedback from their second mentors and other Institute scientists.

Casting a wide net(work)

All of Whitehead's primary investigators are participating in the *Second Mentor Program*. But, because the Institute aims to provide connections to scientists in a broad range of fields, organizations, and career paths, it's brought another resource to bear: the Whitehead Institute Networking Directory (WIND), a database of former and current Whitehead postdocs. Collectively, the Institute alumni included in WIND represent a great resource for advice on career and research questions — and an expanding professional network for young scientists embarking on their careers.

"WIND is one way we are harnessing the diversity of experiences and expertise from our growing community of alumni," says Whitehead Institute Member Iain Cheeseman, who advocated for the Directory's development. "Among many benefits, it demonstrates the array of career paths available to our postdocs; and it offers a conduit



to deeply informed advice about those paths. It's also a fantastic way for our alumni to 'pay it forward' and to make mutually beneficial contacts."

Postdocs as mentors

Another new facet of the Institute's mentoring activities is the *Postdoc/Graduate Student Mentoring Initiative*. Launched in 2022 as a collaboration of the WIPDA and the Graduate Student Committee, the Initiative pairs individual postdocs with Massachusetts Institute of Technology students conducting their PhD research in Whitehead Institute labs. Its goal is to support graduate students at a crucial point in their budding scientific careers, but the benefits flow two ways.

Pushkal Sharma, a fifth year PhD student conducting research in Whitehead Institute Member Ankur Jain's lab, was one of the inaugural mentees. "Our lab is fairly new," he says, "so I joined the program to connect with someone who could provide another perspective." He was paired with Kehui "Coffee" Xiang, a postdoc and Cancer Research Institute Irvington Fellow in Whitehead Institute Member David Bartel's lab.

"Touching base with Coffee every few weeks helps me view the challenges I'm dealing with from a different vantage point," Sharma explains. "He provides very useful insights, especially on day-to-day project management. Sometimes we get very concrete, discussing nitty-gritty aspects of our projects. Other times we talk about general experiences we've had and how we dealt with them."

For Xiang, being a mentor offers multiple benefits. "I enjoy and learn from the conversations Pushkal and I have," Xiang says. "He's doing interesting work and is getting a very different kind of lab experience than what I've had. I'm also gaining experience in a formal mentoring relationship, which is important because I hope to run my own lab in the future.

"The fact is," Xiang notes, "while we have this formal mentor/mentee relationship, I see Pushkal as a colleague too. So we talk about science and the lab and also about life. He's given me advice based on his own life experience and has helped me think about my career. So we've been learning from each other."

The Institute also has an expanding series of programs that mentor middle and high school students and teachers in learning about biological research. Read about those initiatives below in the Education and Outreach *section.*

Collaboration — a key part of scientific discovery

Collaboration is a lesson of great importance in science, where it is often key to answering complex questions and addressing multifaceted global challenges. Whitehead Institute scientists have long recognized the importance of collaboration in driving discovery and developing new tools to advance biomedical research. Here are a few recent examples.

Pooling knowledge and resources

Some challenges demand a range of expertise and technical capacities not available in a single lab. That was the case when a project requiring both experimental and computational approaches spurred a collaboration between the labs of Whitehead Institute Member Iain Cheeseman and Broad Institute Core Member Paul Blainey. Together, the labs developed a way to remove the function of particular genes across hundreds of cells, simultaneously, and visualize the effects under a microscope. That platform's resulting knowledge is now available to researchers across the globe, via the web portal Vesuvius.

The labs' collaboration started off informally. "We started with an exchange of reagents and ideas, and it became more concrete over time," explains Kuan-Chung Su, a Cheeseman lab postdoc who co-led the project. Over time, the labs began sharing tools needed to advance development of the platform. Cheeseman's lab contributed components of the CRISPR/Cas9 gene editing system that they used to turn off certain genes in a sample of cells. Blainey's lab developed the technology used for measuring gene expression in the cells.

When the labs met to analyze the data, they were astounded by how much meaningful information it offered. "We gained insights on cell processes well beyond those we normally focus on," Su says. "And, recognizing that the data would be useful to many other scientists, we collaborated in creating Vesuvius to share it."

Generating new ideas

Scientists from diverse disciplines sharing ideas can lead to wholly new ways of approaching problems. That's the experience of Alessandra Dall'Agnese, a postdoc in Whitehead Institute Member Richard Young's lab. A collaboration with scientists from Massachusetts Institute of Technology (MIT) and clinicians at Massachusetts General Hospital and Dana-Farber Cancer Institute has offered her new perspectives on how cellular condensates — small membraneless droplets within cells — play an important role in many aspects of gene regulation.

> "Science is very competitive and the more we can help each other succeed, the more at ease — and effective — we all will be. Our different perspectives and approaches will build upon each other." - Alessandra Dall'Agnese

For example, Dall'Agnese says, "Clinicians can offer unique perspectives based on working directly with patients. Having a conversation with a physician can guide you to important problems that a scientific paper may not illuminate."

But she's also benefited from the perspectives of researchers in other areas of science. When Dall'Agnese was having difficulty figuring out how a change in a particular protein within a condensate would have an effect on cellular signaling, she sought input from Arup Chakraborty, MIT Institute Professor of Chemical Engineering, Physics, and Chemistry, who is a frequent collaborator with the Young lab.

"He offered a physics-based approach to solving the problem," Dall'Agnese explains, "and that kind of unexpected synergy between fields can provide a more holistic approach to tackling tough questions in science and medicine.

"The fact is," she says, "science is very competitive and the more we can help each other succeed, the more at ease — and effective — we all will be. Our different perspectives and approaches will build upon each other."

Collaborating while mentoring

Collaborative research can also provide opportunities for early-career scientists to learn from more senior investigators. Whitehead Institute postdoc Chen Weng is benefiting from "collaborative mentorship" from Whitehead Institute Member Jonathan Weissman and Boston Children's Hospital physician scientist Vijay Sankaran.

Together, they are studying the long-term behavior of hematopoietic stem cells (HSCs), which give rise to different types of blood cells through a process called hematopoiesis. They are trying to understand how one-third of people over age 70 develop a condition called clonal hematopoiesis — in which one line of HSCs can crowd out all others, potentially causing leukemia and increasing risk of cardiovascular diseases. Weng wants to know how the behavior of HSCs differs between young and elderly people.

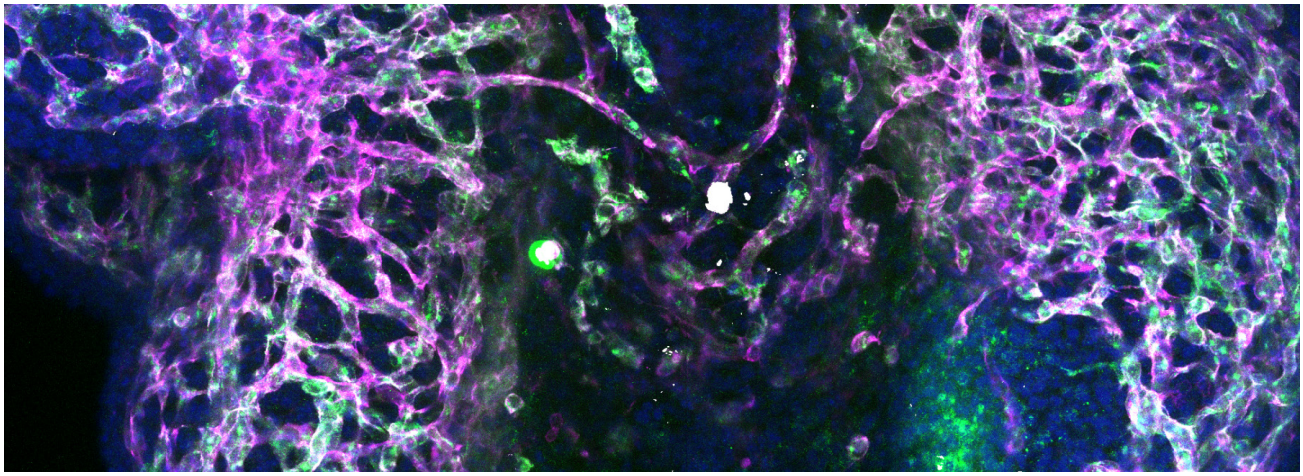
"Initially, Vijay and I were thinking about this cool idea about understanding blood and aging," Weng recalls. "But, we realized the existing technology to do this from human samples was not powerful enough. We wanted to do something even better."

So the two reached out to Weissman who, with colleagues from Whitehead Institute and several other institutions, had developed a way to engineer mouse cells to trace the evolution of a tumor over time. They suggested adapting that cell-engineering technology into an approach for research on human cells.

"Developing a system to use with patients could provide basic biological insights and have a strong clinical impact," Weng said. "More important than the experiment itself, though, are the thoughts and views behind it. We have a lot of conversations about seeing what we can push forward for better understanding of human health."

Weng divides his time between the Weissman and Sankaran labs, and the three meet regularly to discuss the collaboration. Weissman provides expertise on developing techniques used to study genetic material in cells, while Sankaran gives expertise on hematology and blood cell production.

Together, they provide Chen with key guidance across multiple fields, all the while innovating and addressing important biological questions.



Acting on our commitments to diversity, equity, and inclusion

Whitehead Institute's ability to continue as a leader in biological research and training depends on our being a diverse, equitable, and inclusive community — a place where each person can thrive both individually and as part of a cohesive, highly effective organization. Therefore, the Institute is pursuing a multifaceted Strategic Plan for Diversity, Equity, and Inclusion (DE&I) focusing on four core commitments:

- Improving the hiring, retaining, and promoting of diverse talent
- Creating and maintaining an inclusive culture that promotes physical and mental well-being and respect for all Whitehead Institute community members
- Developing partnerships to increase engagement and outreach with local communities to improve accessibility, particularly for individuals from groups underrepresented in biomedical sciences
- Encouraging open dialogue and facilitating learning opportunities to address DE&I topics and making them available to the entire Whitehead Institute community

The first Whitehead Institute Diversity, Equity, and Inclusion Annual Report was published this past spring (and is available here). In issuing the report, Institute President and Director Ruth Lehmann observed that, "Enhancing diversity, ensuring equity, and fostering a safe and welcoming culture are fundamental to the Institute's mission of creating new knowledge and preparing scientific leaders.

"For that reason, I am excited to see the commitments of our five-year strategic plan take shape and bring about change. And I look forward to our continued collective efforts as we implement other aspects of the strategic plan this upcoming year."

Following are just a few highlights of those continuing DE&I-focused efforts.

The Institute's DE&I Council — comprising representatives of faculty, trainees, and administrative and research staff — was formed to advance the Institute's DE&I commitments. Its members also serve as ambassadors for diversity, equity, and inclusion throughout the Whitehead Institute community.

A group of DE&I Inclusion Networks were launched to create programming and events and build connections across the Institute. Currently, there are Networks focusing on the Asian American and Pacific Islander (AAPI), Black and African Diaspora, First Generation College Graduate, Latinx/Hispanic, LGBTQIA, and Parent communities, and on Women — as well as an Accessible Whitehead Alliance and a DEI Allies group. The Networks have sponsored a range of activities including, for example, celebrations of Lunar New Year and Juneteenth, screening of a documentary on mental health, and a book club discussion of "The Autobiography of a Transgender Scientist" by Ben Barres.

The DE&I Seminar Series — which enables the Institute community to learn from and engage with prominent speakers from across the sciences, social sciences, and humanities — continued with three presentations: Cultivating Community and Accessible Research Spaces for Queer and Trans Researchers; Black History: Civil Rights and Social Justice; and Creating Accessible PowerPoint Presentations.

The High School Internship Program, launched this past summer, enabled six students in grades 10 to 12 from historically underrepresented groups to work directly with our Members, post-docs, and staff scientists, exploring biomedical science and gaining experience with hands-on research. The interns were hosted by the Cheeseman, Oni, Page, Reddien, and Young labs, and were guided through projects that ranged from extracting and analyzing RNA from mouse tissue samples to analyzing mass spectroscopy data on prostate cancer cells' surface to using molecular biology and biochemistry tools for studying cell signaling.

The entire Institute community — including faculty, staff, trainees, and regular visitors — engaged in a formal, small-group DE&I and Gender Inclusion Training program that promotes interpersonal engagement. And we laid the foundation for a Allyship and Bystander Training Program for our community.

Finally, the Science for the Non-Scientist Series was relaunched, introducing the exciting science taking place at Whitehead Institute to those in our community who are not scientists. The Series features trainees from across the organization presenting their research in a jargon-free, easily understandable way.

Diversity, equity, and inclusion seminar series

Creating Accessible PowerPoint Presentations 101

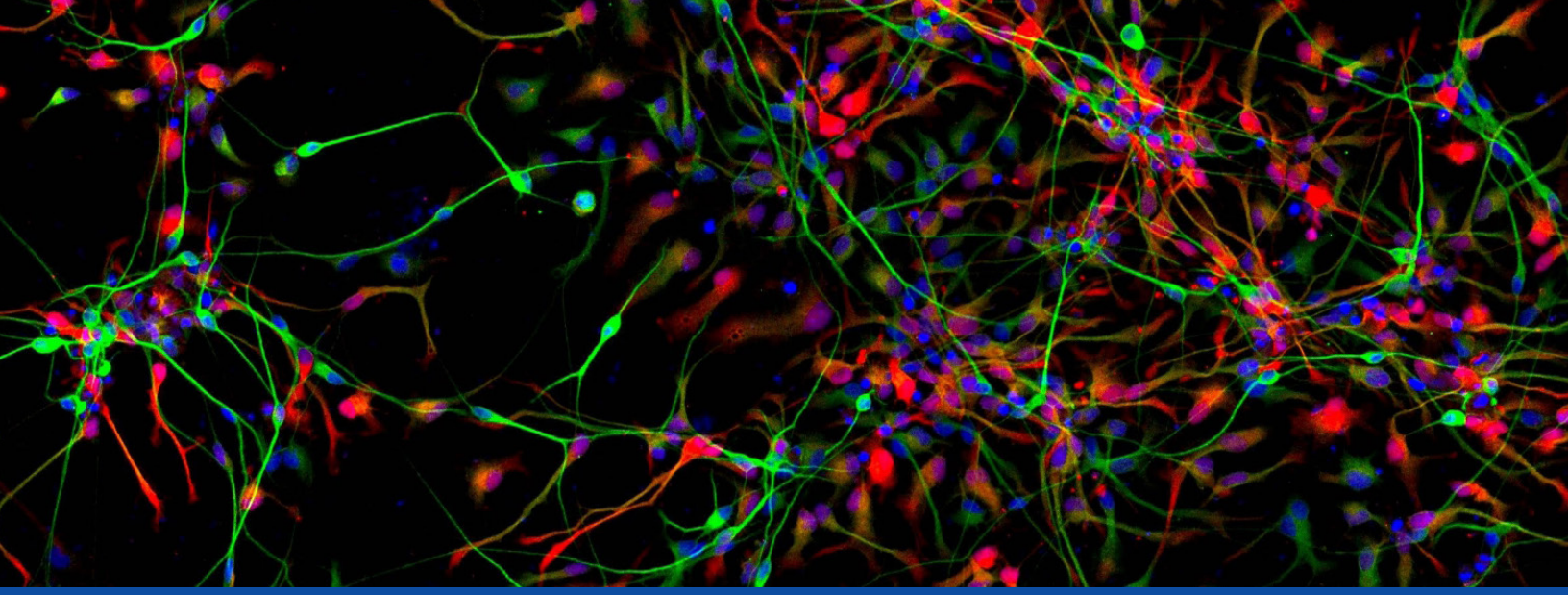
Lynn DeCouto, marketing and communications manager for Work Without Limits, taught the community six ways to make PowerPoint presentations accessible to individuals who are visually impaired or have other disabilities.

Black History: Civil Rights and Social Justice

Dr. Menah Pratt, vice president for strategic affairs and diversity at Virginia Polytechnic Institute and State University, presented a talk on the history and experience of African Americans and on race, gender, and class in America.

Cultivating Community and Accessible Research Spaces for Queer and Trans Researchers

Dr. Robin Aguilar, a queer and trans PhD candidate, science communicator, writer, and illustrator at UW Genome Sciences, presented a talk on the voices and perspectives of trans and gender-nonconforming researchers who have been over-looked across STEM disciplines.



Our Impact

Whitehead Institute's accomplishments reflect both the exceptional talent it attracts and its unique environment – one informed by our values of ingenuity, belonging, courage, and learning. Within this supportive and collaborative community, our scientists are driving major discoveries, creating important research tools and methods, and spurring translation of their work into new therapeutics. Read on to learn more.

Realizing tomorrow's potential

Whitehead Institute is a pathbreaking organization pursuing an exciting mission: forging new frontiers in science, uncovering insights today that unlock the potential of tomorrow.

We do that by enabling world-class investigators to pursue paradigm-shifting discoveries; by encouraging the design of important new research technologies; and by training some of the brightest young minds in science.

Whitehead Institute is committed to exploring fundamental questions of biology — and thereby providing foundational knowledge needed to address challenges ranging from cancer and infectious diseases to climate change's impact on human health.

Our scientists are pioneering new ways of understanding how cells function, such as revealing how particular compartments in our cells — called condensates — impact gene expression in important ways. They are also discovering previously unconsidered possibilities about the genome, such as how DNA segments once considered "junk" may be crucial to life. And they are laying bare the basic mechanisms of plant reproduction, which could lead to creation of nutritious, drought- and heat-resistant crops.

At the same time, Whitehead Institute researchers are forging new frontiers in science by creating tools and methods that allow scientists to ask new questions and answer once-intractable conundrums. For example, they've led development of a comprehensive functional map of genes that are expressed in human cells; and created stem cell-based organoids that more realistically show how a disease may affect human cells than do other lab models.

And, as it drives science forward, the Institute also fosters the next generation of leading researchers: training tomorrow's scientific innovators; nurturing their curiosity, intellectual courage, and collaborative spirit.

I encourage you to learn more about the pioneering work being done at Whitehead Institute — and about the extraordinary researchers who are pushing past today's boundaries to realize tomorrow's potential.

Sarah Keohane Williamson
Chair, Board of Directors

A continuum of impact

Whitehead Institute is renowned for its researchers' impact in expanding the understanding of life's fundamental mechanisms, and I am fascinated by the multifaceted nature of that impact. Our investigators are driving science forward through the novel, paradigm-altering questions they ask and the innovative methods they create to answer those questions; through the uncommon skill and creativity they apply to their research; and through their extraordinary capacity to nurture their trainees' talents and abilities.

I am also awed by the range of their impact: It can be measured from the molecular level — by their discoveries about the tiniest inner-workings of the cell and the minutest interactions between cells — and at the level of global society, when their discoveries ultimately lead to new ways of diagnosing and treating diseases affecting millions of people around the world.

For me, it is interesting to observe how the nature of our researchers' impact is mirrored in the continuum of support offered by our philanthropic donors. On one end of that continuum, of course, is the endowment gift through which Jack Whitehead established the Institute. Today, our endowment serves a purpose much like a building's foundation: providing the fundamental support that allows the rest of the structure and its operating systems to be built, maintained, and expanded on.

That means that if we are to continue to succeed in our mission of forging new frontiers in science, Whitehead Institute must have an array of robust funding sources. Thus, we seek out grants from major foundations and corporations — groups which generally support research that has advanced beyond the proof-of-concept stage. And we are earning licensing fees from organizations developing new pharmaceuticals and biotechnologies based on Whitehead Institute discoveries.

Completing the continuum of support are the individual donors who play an essential role in fueling our researchers' work. Donor support is what enables our scientists to seed new projects, test unorthodox ideas, explore the implications of unexpected results, and open whole new realms of research. Individual donors are as courageous as our faculty are in pursuing innovative science, and we are extremely grateful to them.

Our individual donors' contributions comprise a continuum of giving: from providing $100 annual gifts, $5,000 multi-year pledges, and $50,000 bequests to making multi-million dollar gifts — such as those that have created the Valhalla Fellowships, underwritten the Dr. Vincent J. Ryan Orphan Plant Project, and established the *Brit J. d'Arbeloff Center for Women's Health*.

Each donor and funder plays an irreplaceable role at Whitehead Institute, regardless of where their gift stands on the continuum of giving. We are enormously grateful for their support.

We are also confident that the resources they provide will produce continuing returns in the improved health and well-being of present and future generations.

With great appreciation,

Sharon J. Stanczak
Vice President for External Affairs

Whitehead Institute establishes the David Baltimore Chair in Biomedical Research

Honoring one of the world's most accomplished and respected scientists — and the Founding Director of Whitehead Institution for Biomedical Research — Whitehead Institute has established the David Baltimore Chair in Biomedical Research. The Chair both honors Baltimore's six decades of scientific, academic, and policy leadership and advances his vision of innovative basic biomedical research.

Announcing the Chair's creation, Whitehead Institute President and Director Ruth Lehmann observes, "David Baltimore has fundamentally shaped the development of key fields of science. He has guided the strategic direction of dozens of science and education-focused organizations. And he has advanced the careers of generations of individual scientists.

"But David's legacy of impact shines most distinctly in Whitehead Institute: the organization that he partnered with Jack Whitehead to plan and create; which he led for eight years and guided to become one of the world's preeminent biomedical research centers; and where his example and his wisdom continue to guide its scientists."

Baltimore's career has traversed research, teaching, academic administration, and science policy advocacy. His extraordinary range of achievements include Nobel prize and the National Medal of Science winning research on reverse transcriptase, immunology, and cancer; leadership of Whitehead Institute, Rockefeller University, California

Institute of Technology, and the American Association for the Advancement of Science; and pioneering advocacy of policies addressing recombinant DNA, AIDS research and treatment, and genomic editing. Recognizing the breadth of his tremendous impact, the Lasker Foundation awarded Baltimore the 2021 Lasker-Koshland Special Achievement Award in Medical Science.

"David has also been a role model and mentor, colleague and collaborator for hundreds of scientists," says Lehmann, who is also a professor of biology at Massachusetts Institute of Technology (MIT). "And, as he intended, the heart of Whitehead Institute is its extraordinary faculty and Fellows, whose intellectual risk-taking and deeply collaborative approach encourages startling new ideas to propel science forward."

Celebrating the establishment of the Chair

On September 22, 2023, the Institute celebrated David Baltimore and the establishment of the David Baltimore Chair in Biomedical Research. More than 125 people attended, filling the Institute's McGovern Auditorium, and scores more participated remotely. The event was highlighted by remarks from David Baltimore, Whitehead Institute Director Ruth Lehmann, Founding Member and former Director Gerry Fink, and Whitehead Institute Member Mary Gehring (pictured left), the inaugural holder of the Baltimore Chair.

The Baltimore Chair is intended to be held by a senior Member of the Institute and — in addition to providing a tangible investment in that eminent investigator's long-term research program — will be a vibrant recognition of their distinguished record of accomplishment.

The Chair's first incumbent is Whitehead Institute Member Mary Gehring, who previously held the Institute's Landon T. Clay Career Development Chair and is a professor of biology at MIT. Gehring studies how plant epigenetics modulate plant growth and development. Her long-term goal is to provide the scientific foundations for the development of food crop plants that are more resilient, and for increasing the seed production of "orphan crops" that are already able to withstand the heat, drought, and changing soil conditions becoming more widespread with climate change. Thus, her work promises key insights into ensuring food security for the world's growing population.

The Chair is underwritten through an endowment created by a growing group of donors, including many of Baltimore's present and former colleagues, former students and trainees, and friends from around the world. That group includes lead donors Michael and Victoria Chambers, Kaia and Jonathan Goldstein, Peter Hecht, Kathryn and Peter Kim, Phillip and Ann Sharp, Irving Weissman and Ann Tsukamoto-Weissman, the Whitehead Family, and a generous anonymous donor.

Fundraising for the Baltimore Chair endowment was guided by a leadership committee comprising: Irving Weissman, Professor of Pathology and of Developmental Biology at Stanford University; Phillip Sharp, Nobel Laureate, Institute Professor at MIT, and Whitehead Institute board member; and Institute board members Susan Whitehead, Jonathan Goldstein, and Churchill Franklin.

A continuing focus on the importance of beginnings

Neither Tomora nor Garey Ellis are basic science researchers, but they have an intuitive appreciation for people who create solutions by focusing on the root cause of things. And they understand the value of providing consistent support for Whitehead Institute investigators' pursuit of pioneering scientific discoveries.

Indeed, Tomora and Garey are philanthropic pioneers at the Institute: Donors since 2003, they were the first to commit to making ongoing monthly contributions to support our research programs. Over the past 20 years, their steadfast contributions have totaled nearly $100,000.

"We were initially connected with Whitehead Institute by our friend and fellow philanthropist, Letty Gochberg, who recognized our interest in science, health-oriented research, and education," Tomora recalls. But that's getting ahead of their story.

Garey was eleven when his parents — his father, a handyman; his mother, a housekeeper — moved the family from Jamaica to New York City. Those parents translated high expectations to their seven sons. Perhaps that's why — even though he was diagnosed with dyslexia in his 20's — Garey attended Morehouse School of Medicine and graduated from Ross School of Medicine, where he developed expertise in public health, wellness education, and the treatment of eating disorders. Early in his career, he served as deputy director for a program funded by UCLA/Johnson & Johnson Health Care Institute, where he created programs to help parents of Head Start students effectively manage the children's healthcare.

Tomora, who was raised in Greenville, South Carolina, earned a bachelor's degree in history and a master's degree in experimental psychology and is currently pursuing a doctorate in psychology. She was working with the 1996 Olympics in Atlanta, where she and Garey met. Not long after — seeking a way to improve the lives of children in Garey's adopted hometown of New York — the couple founded (and have since led) the non-profit *Inner Force Economic Development Corp* as well as the *Inner Force* family of daycare centers. *Inner Force Tots* is one the largest early childhood learning centers in Brooklyn and Tomora's training in psychology and knowledge of mental health were critical in creating the standards and curricula for its programs. Collectively, the *Inner Force* organizations offer pre-school, after-school, and summer enrichment programs for at-risk children and early teens. In addition to education activities, they provide community-level initiatives on health challenges such as asthma, diabetes, and obesity.

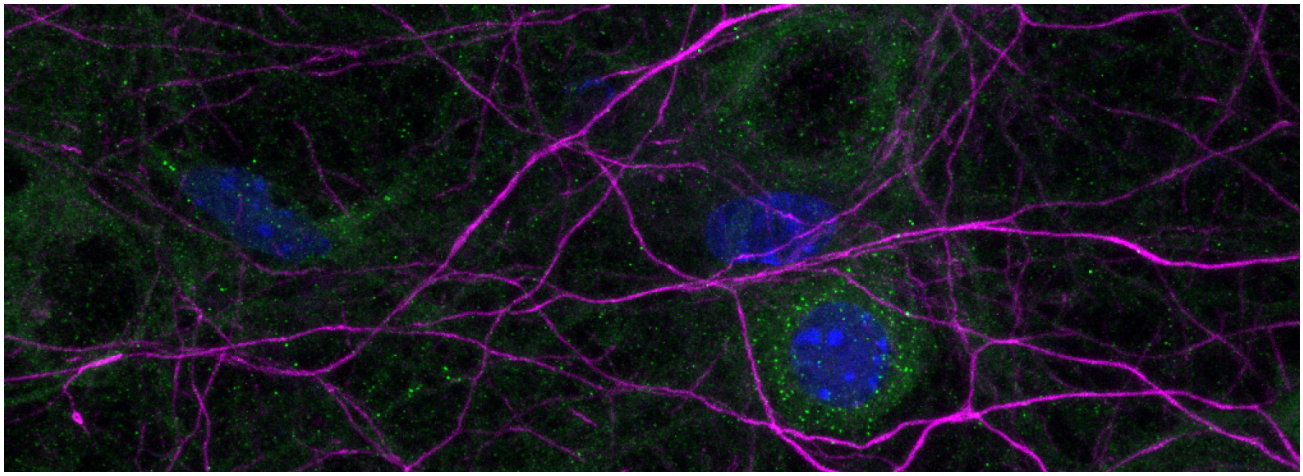
In the early 2000's, they met Letty Gochberg, who had helped found one of the Institute's public engagement groups. "Through that connection, we were able to engage some of our groups' students in Whitehead Institute programs for school-age kids," Garey explains. "That was the catalyst for Tomora's and my personal engagement with Whitehead."

Over the years, the couple participated in many Institute symposia and workshops — sometimes accompanied by their children — and two of their sons attended Whitehead's summer program for middle school students.

The Ellis's abiding connection to Whitehead Institute makes sense. Both they and the Institute are dedicated to solving problems of human health by learning about and addressing how, where, and why those problems first emerge: Tomora and Garey focusing on kids' healthy physical, intellectual, and emotional development; the Institute's scientists focusing on the complex cellular, genetic, and epigenetic roots of health and disease.

"We are so pleased to be part of the Whitehead community," Garey says.

Tomora adds, "We're especially pleased to be able to provide continuing support for scientists who are thinking outside the box to address really tough biomedical challenges."



In conversation with Cori Bargmann, Whitehead Institute alumna

Cori Bargmann is the Torsten N. Wiesel Professor at Rockefeller University, where she heads the Lulu and Anthony Wang Laboratory of Neural Circuits and Behavior. Bargmann did her PhD research in the lab of Whitehead Institute Founding Member Robert Weinberg. There, in addition to helping identify the role of the Ras protein in bladder cancer, she characterized the oncogene neu/Her2. Her work helped spark the development of new breast cancer therapies.

After earning her PhD in biology from Massachusetts Institute of Technology (MIT) in 1987, Bargmann undertook postdoctoral research in Robert Horvitz's lab at MIT, investigating molecular mechanisms of the nervous system. In the decades since, her groundbreaking research has used the tiny roundworm C. elegans to make a series of discoveries about the relationships between genes, experience, and behavior. That work has earned her election to the National Academy of Sciences and National Academy of Medicine; she has received numerous awards, including the Breakthrough Prize in Life Sciences, the Kavli Prize in Neuroscience, and the Benjamin Franklin Medal in Life Sciences; and for 21 years, she was an Investigator of the Howard Hughes Medical Institute.

Bargmann co-chaired the committee that created the blueprint for President Obama's BRAIN Initiative. In addition, from 2016 to 2022, she served as the inaugural Head of Science for the Chan Zuckerberg Initiative (CZI) — overseeing development of a program that awarded almost $1 billion for innovative biomedical research. In this brief interview, she offers perspectives on her experiences as a biomedical researcher and leader.

Whitehead Institute: Tell us a bit about your path from cancer research in the Weinberg lab to studying worms as a way to understand neurological development and function and behavior?

Cori Bargmann: Bob Weinberg is a fantastic person and an amazing researcher, and I'm still astonished when I think about the science that happened in that lab. But I have always been interested in the brain and in neuroscience; I just hadn't figured out how to study it genetically. It was clear that instinctive behaviors — like the way a baby goose will imprint on its mother and then follow her around wherever she goes; or how honey bees learn waggle dances — must be innately hardwired in the genome. As a grad student, I couldn't imagine a way to investigate how that worked. Eventually, as a postdoc, I recognized it was possible to use simple animals as biological models for studying the connections between genes, molecular activity, and an organism's behavior — much the way that Bob and others had done in studying cancer cell — and that defined the direction of my subsequent research using *C. elegans*.

WI: Would you offer an example of how your discoveries about worms' basic biology created opportunities for better understanding human biology?

CB: We identified functions served by many different molecules and the process by which the worm employs them. For instance, we discovered a lot about the mechanisms involved in the worm's sense of smell, and identified specific molecules involved in how smell-related nerve cells make connections with each other — a process called axon pathfinding. One of the most surprising pieces of information was that these molecules are shared by all animals, including ourselves. That means the process of wiring nerves together evolved a single time and has just been reused time and again, employed in different combinations that came from that initial building block. As a result, if a scientist identifies an axon pathfinding guidance factor in a very simple animal, very often she can also see it at work in more complex organisms such as humans. That connection enables us to draw significant conclusions about human development and biological function that we cannot study directly at the same level of detail in people.

WI: In 2016, when you were first appointed Head of Science at CZI, Mark Zuckerberg and Priscilla Chan set an ambitious goal for the program: "Curing, preventing, or managing all human diseases by the end of the 21st century." How did you approach a goal of such magnitude?

CB: I have to say my first reaction was to laugh, and it was a while before I could say the goal aloud with a straight face. But Priscilla is a pediatrician, Mark a very sophisticated technologist; and I came to understand their well-thought-out perspectives on what the initiative could help achieve. Two of those perspectives stand out in my mind. First, they wanted researchers to think about human biology, health, and disease comprehensively and cohesively — not just considering one disease or organ system at a time.

Second, they wanted us to play the long game: start from a vision of where we want to be, not limiting ourselves by looking only through the lens of where we are today. For example, consider where biomedicine stood 100 years ago in 1924, when half of all children died before puberty, there were no antibiotics, there was no chemotherapy for cancer, and we didn't know that cholesterol could lead to heart disease or have drugs to control it. But there were researchers with ambitious visions for what could be achieved over time; and, over the long term, they had monumental impact.

By combining the long-term "destination" perspective with a more comprehensive and integrative view of biology and biomedicine, then aiming to prevent, manage, or cure all human diseases by the end of the 21st century is not unreasonable.

Community outreach and education at the Institute

Helping build the pipeline of future biomedical researchers is an important facet of Whitehead Institute's mission of forging new frontiers in science. The Institute has an expanding series of initiatives designed to engage middle and high school students (and teachers) in learning about cutting edge biological research. Through the Institute's K-12 programming, students are inspired to pursue their interest in science, technology, engineering, and math (STEM) and explore scientific careers. The Institute believes hands-on scientific programs are crucial for developing critically thinking young adults and cultivating the next generation of scientists.

Whitehead Institute's outreach and education offerings include:

Seminar Series for High School Teachers

This monthly program offers educators the opportunity to explore topics at the forefront of biomedical research. Interested educators are paired with Whitehead partners — Whitehead scientists who serve as a resource during the school year. Partners are eager to answer questions, discuss their fields of expertise, and even visit schools to meet with students. The series, which attracts 50-60 high school teachers each year, begins in November and lectures are held the first Monday of every month through June. *Visit wi.mit.edu/program/seminar-series-high-school-teachers.*

Spring Lecture Series for High School Students

This program offers students an opportunity to learn about cutting edge topics in biomedical research. The three-day program, held over spring vacation, features lectures from leading scientific experts, hands-on laboratory sessions, visits to local biotech organizations, and opportunities to meet with young Whitehead scientists.
Visit wi.mit.edu/program/spring-lecture-series-high-school-students.

Expedition: Bio

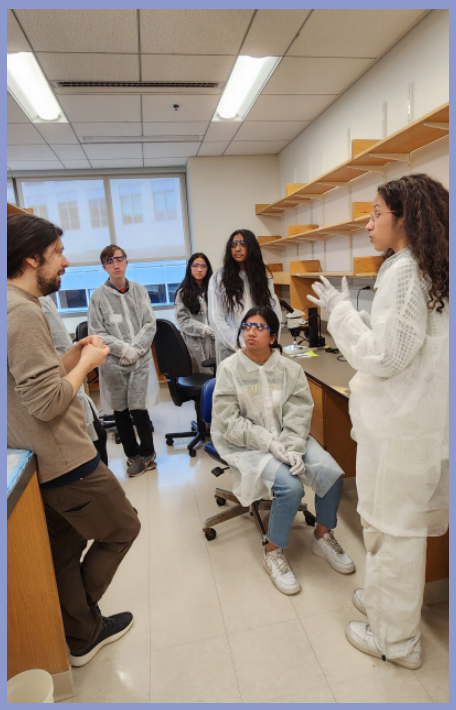
Designed as a two week exploration into the amazing biology that thrives in the world around us, this summer science program for rising 7th and 8th grade students provides immersion in hands-on activities inside and outside the classroom. Through laboratory experiments, and discussions with scientists, the program allows students to learn first-hand how researchers are answering some of biology's most challenging questions — and to have an awful lot of fun doing it! *Visit wi.mit.edu/program/expedition-bio.*

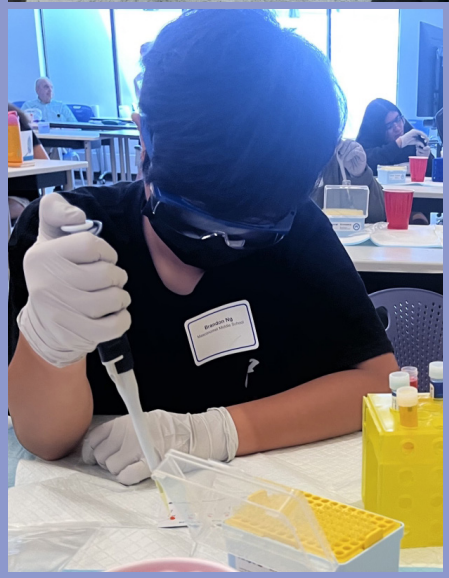
BioNook

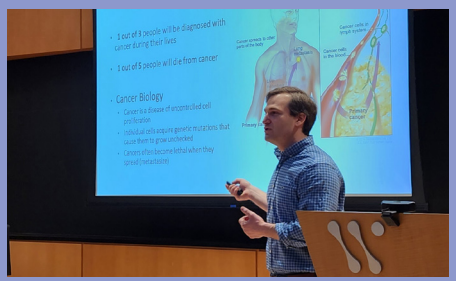
BioNook is Whitehead Institute's online biology resource, offering exciting learning enrichment for students, parents, and teachers. Find videos, podcasts and stories on Whitehead Institute Science, as well as virtual workshop opportunities through BioNook's After School Science Club, and ideas for nature-based activities. *Visit wi.mit.edu/bionook.*

Expedition: Bio

High School Student Program

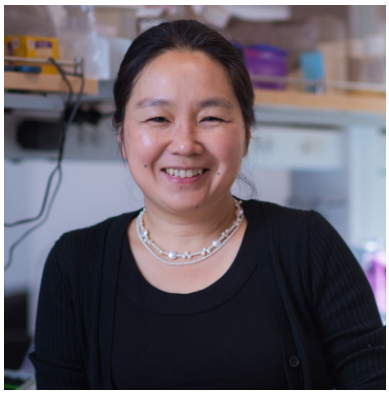






Celebrating our achievements

Here is a sampling of the honors and major grants received by Whitehead Institute researchers this past year.



Yukiko Yamashita elected to the American Academy of Arts and Sciences (AAAS).

Election to the AAAS — an independent policy organization addressing science, arts, democracy, education, and global affairs — is one of the nation's most prestigious recognitions of highly accomplished individuals. Also a 2011 recipient of the MacArthur Fellowship, Yamashita holds the Institute's Susan Lindquist Chair for Women in Science.

Mary Gehring and Sebastian Lourido named to Whitehead Institute Chairs.

Gehring, who was recently promoted to professor of biology at Massachusetts Institute of Technology (MIT), has become the inaugural holder of the David Baltimore Chair in Biomedical Research. Lourido, who recently received tenure as associate professor of biology at MIT, has been appointed to the Landon T. Clay Career Development Chair.

Iain Cheeseman elected as a Fellow of the American Society for Cell Biology (ASCB).

An honor bestowed by his scientific peers, the selection recognizes Cheeseman's decades of research achievements and his continuing efforts to advance the field of cell biology. His discoveries are helping define the molecular mechanisms by which accurate chromosome segregation and cell division occur and how these processes are rewired across different physiological conditions. Cheeseman is the fourth current Whitehead Institute Member to be elected as a Fellow of the ASCB, preceded by Ruth Lehmann, Harvey Lodish, and Yukiko Yamashita. In addition, Lehmann served as ASCB president in 2021 and Harvey Lodish in 2004.

Siniša Hrvatin recognized as both a Searle Scholar and a Pew Scholar in the Biomedical Sciences.

The Searle Scholars Program supports the research of exceptional young faculty in the biomedical sciences and chemistry, and its Scholars are considered among the most creative researchers pursuing careers in academic research. The Pew Scholar program supports early-career investigators of outstanding promise who are pursuing scientifically risky work that could benefit human health. Both awards support Hrvatin's work developing tools and approaches for studying how animals enter hibernation — investigations that could help identify new ways to protect neurons from ischemic injury and to preserve tissues and organs for transplantation. Hrvatin is the fourth Institute Member to be named a Pew Scholar.

Atharv Oak honored by the MIT Undergraduate Research Opportunities Program (UROP).

Oak, who has conducted research in the Weissman lab for two years, won an MIT School of Science *Outstanding UROP Student Award*, which recognizes exceptional contributions by undergraduate researchers.

Luiza Saad chosen for the Pew Latin American Fellows Program in the Biomedical Sciences.

Saad, a researcher in the lab of Whitehead Institute Member Peter Reddien, is one of 10 postdoctoral fellows from across Latin America to receive two years of funding to conduct research. Her investigations focus on the mechanisms that govern regeneration in the shell-less mollusk *Berghia stephanieae*, which she is working to establish as a novel model for gaining insights into the principles of regeneration. Saad is the second Whitehead Institute researcher to have been named a Pew Latin American Fellow in recent years.

Kathrin Kajderowicz received a Paul & Daisy Soros Fellowship for New Americans.

An MIT PhD student conducting research in the Hrvatin lab, her investigations focus on how hibernating animals survive extreme cold temperatures — work that could lead to improved therapeutic hypothermia technologies for humans. The Paul & Daisy Soros Fellowship provides merit-based support for graduate studies by highly promising immigrants and children of immigrants. The young scholars are selected for their achievements and their potential to make meaningful contributions to the United States.

Anaïs Tsai and Ruth Lehmann received a Howard Hughes Medical Institute Gilliam Fellowship for Advanced Study.

The Fellowship — which is awarded jointly to graduate students and their advisors — invests in young researchers from populations historically excluded and underrepresented in science, so that they are prepared to become scientific leaders. Tsai is an MIT doctoral candidate researching molecular influences on germline genome architecture during embryonic development, working under Lehmann's guidance.

Conversations about science

This past year, thousands of people participated in Whitehead Institute's series of online and in-person conversations and presentations, which offer insights from leaders in biomedical science, biotechnology, public health, and foundational biological research. Here are a few highlights.

In two editions of Director's Dialogues, Whitehead Institute Director Ruth Lehmann spoke with Paula Johnson — who is President of Wellesley College, a physician, and a biomedical researcher — and with New York Times science writer and author Carl Zimmer. The discussion with Johnson focused on women's health, the role of women as leaders in science and higher education, and on ways to create the conditions for women to thrive. Zimmer and Lehmann spoke about the importance — and challenges — of achieving broad scientific literacy in an era of pandemic infectious diseases, climate change, and the development of new gene editing therapies.

The inaugural session of Whitehead in the City treated a robust audience of New York-area researchers, Whitehead Institute alumni, and Institute supporters to a rich conversation between Lehmann and esteemed Rockefeller University neuroscientist Cori Bargmann. They discussed Bargmann's decades of basic science research, in which she uses a tiny roundworm to make discoveries about the relationships between genes, experience, and behavior. Bargmann, who did postdoctoral research in the lab of Whitehead Institute Founding Member Robert Weinberg, also shared the insights she gained as inaugural Head of Science for the Chan Zuckerberg Initiative — where she helped develop a program that awarded almost $1 billion for innovative biomedical research.

The Whitehead Connects series features prominent biotech, pharma, healthcare, and venture capital leaders discussing the most important developments, challenges, and opportunities facing the biomedical science enterprise. In this past spring's Connects, Vicki Sato offered insights and guidance to graduate students, postdocs, and early career researchers about opportunities to apply basic biological research within the biomedical industry. Her talk drew on her experience as a Harvard University faculty member, senior executive at major biotech companies, and member of President Biden's Council of Advisors on Science and Technology.

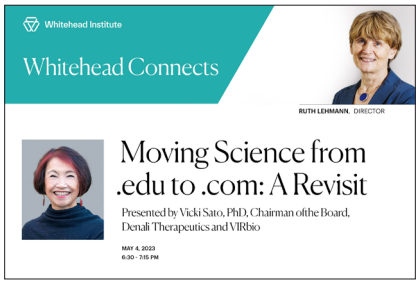
The Scientific Webinars series spotlighted the work of three Whitehead Institute Members. David Page discussed his lab's studies on the ramifications of the genetic differences between males and females, focusing on the impact that differing sex chromosome constitution (XX vs. XY) may have on the functioning of cells across the body. Sebastian Lourido discussed his lab's latest findings on how parasites establish long-lived chronic infections in their hosts, and touched on discoveries that could lead to strategies for preventing or treating those infections. And Mary Gehring explained how her work on plant epigenetics could lead to food crop plants that are both more nutritious and heartier in the face of climate change.

Recordings of these and other editions of the Director's Dialogues, Whitehead in the City, Whitehead Connects, and Scientific Webinars are available on our YouTube channel.

Find information about upcoming events at *wi.mit.edu/events*.

2023 Events

Toward Heartier Food Crops: Pursuing Non-Genetic Regulation of Plant Traits



Moving Science from .edu to .com: A Revisit

Small RNAs that Regulate Genes and Treat Disease

Whitehead In the City: Advancing Science Through Technology and Collaboration

The Importance of Broad Scientific Literacy: Lessons from Covid, Climate Change, and More

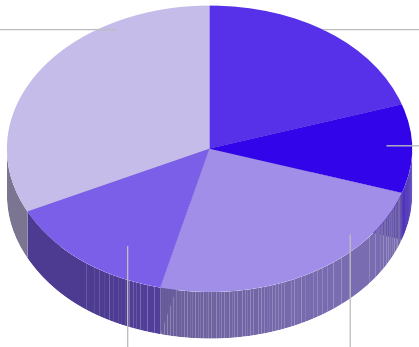
Why Sex Matters in Health and Disease

Women's Health, Women Leaders: A Conversation with Paula Johnson, President, Wellesley College

Financial Summary

Revenues & Support

2023 TOTAL **$98.6 M**



32%
INVESTMENT SUPPORT
31.5 M

20%
CORPORATE & FOUNDATION SUPPORT
20.2 M

10%
GIFTS & OTHER REVENUE
9.7 M

14%
FEDERAL GRANTS
13.3 M

24%
NET INTELLECTUAL PROPERTY REVENUE
23.9 M

2022

Investment Support
28.4 M [32%]

Corporate & Foundation Support
18.4 M [20%]

Gifts & Other Revenue
9.3 M [10%]

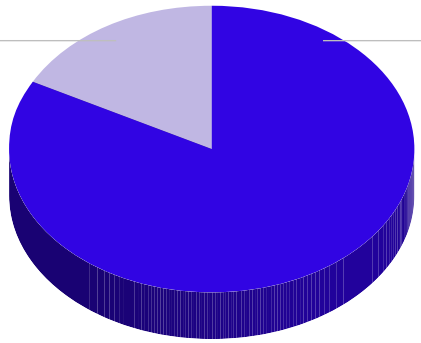
Net Intellectual Property Revenue
19.4 M [22%]

Federal Grants
14.0 M [16%]

TOTAL
$89.5 M [100%]

Operating Expenses

2023 TOTAL **$97.7 M**



17%
GENERAL & ADMINISTRATIVE
16.6 M

83%
RESEARCH
81.1 M

2022

Research
76.0 M [82%]

General & Administrative
16.2 M [18%]

TOTAL
$92.2 M [100%]

Whitehead leadership

Director and Member
Ruth Lehmann, *President and Director*

Founding Members
Gerald R. Fink
Rudolf Jaenisch
Harvey F. Lodish
Robert A. Weinberg

Members
David Bartel
Iain Cheeseman
Olivia Corradin
Mary Gehring
Siniša Hrvatin
Ankur Jain
Pulin Li
Sebastian Lourido
David Page
Peter Reddien
Jonathan Weissman
Yukiko Yamashita
Richard A. Young

Whitehead Fellows
Lindsey Backman
Allison Hamilos
Tobiloba Oni
Aditya Raguram
Kipp Weiskopf

Board of Advisory Scientists
Catherine Dulac
Stephen Elledge
Dan Littman, *Chair*
Harmit Malik
Geraldine Seydoux
Joanna Wysocka

Whitehead Institute Board of Directors
Seth Alexander
Raja H. R. Bobbili
Michael Chambers
Kevin B. Churchwell
Brit J. d'Arbeloff
Churchill Franklin
Jonathan M. Goldstein
Susan Hockfield
Paul L. Joskow, *Vice Chair*
Sally Kornbluth
Dennis H. Langer
Robert S. Langer, *Director Emeritus*
Mark C. Lapman
Ruth Lehmann, *President*
Terrance McGuire
Robert Satcher
Phillip A. Sharp
Peter J. Whitehead
Susan E. Whitehead
Sarah K. Williamson, *Chair*

Additional Officers
Martin Mullins, *Vice President*
Laura Sander, *Treasurer*
Sharon Stanczak, *Secretary*
Monique Taylor, *Assistant Secretary*

Faculty and Fellows
Whitehead Institute principal investigators are world-class scientists dedicated to improving human health through fundamental biomedical research. Under the Institute's close affiliation with the Massachusetts Institute of Technology, Whitehead Institute Members also are members of MIT's biology department or other MIT departments.

The Whitehead Fellows program allows exceptionally talented young scientists to establish independent research programs without undertaking the full range of normal faculty duties.

Director and Editor Lisa Girard
Assistant Editor Merrill Meadow
Writers Greta Friar, Merrill Meadow, Margaux Phares, Amy Tremblay, Madeleine Turner

Cover image Jaclyn Fingerhut

Primary Photography Gretchen Ertl

Additional Photography Erik Jacobs, Amy Tremblay, Madeleine Turner

Photography also provided courtesy of Cori Bargmann, Raja H. R. Bobbili, Michael Chambers, Garey and Tomora Ellis, Sally Kornbluth, Terrance (Terry) McGuire, Sarah Williamson

Illustrations Jennifer Cook-Chrysos, Steven Lee

Scientific Images Michelle Frank, Luke Funk, Miram Meziane, Pavana Rotti, Eden Yifrach

Digital Design WDB Agency, additional design work by Subbiah Design

455 Main Street
Cambridge, MA 02142
wi.mit.edu