McGovern Institute for Brain Research

The McGovern Institute for Brain Research at MIT is committed to meeting two great challenges of modern science: understanding how the brain works and discovering new ways to prevent or treat brain disorders. The McGovern Institute was established in 2000 based on a gift from Lore Harp McGovern and the late Patrick J. McGovern.

Faculty

During the period July 1, 2021, to June 30, 2022, we had 15 faculty and seven associate members.

Resource Development

Fundraising from individuals and private foundations remains a priority at the McGovern Institute. Although staff members were unable to host in-person donor cultivation events for much of the fiscal year and travel was halted, the McGovern Institute continued to raise significant gifts and pledges to fund our research.

Diversity and Neurodiversity in the Workforce Initiative

The McGovern Institute continues to share the support of a diversity, equity, inclusion, and justice (DEIJ) officer, funding a research scholars program giving minority students research experience to prepare for graduate school and supporting building-wide DEIJ efforts. The institute and most of our centers, including the Poitras Center for Psychiatric Disorders Research and the K. Lisa Yang and Hock E. Tan Center for Molecular Therapeutics in Neuroscience, offered fellowships with a preference for underrepresented minorities. We continued to partner with Neurodiversity in the Workplace on an internship program for neurodiverse individuals, including individuals on the autism spectrum. This program identified a group of qualified neurodiverse candidates, and Neurodiversity in the Workplace provided weekly coaching for the paid interns and training support for supervisors.

Outreach

The McGovern Institute continues to focus on outreach with the goal of increasing the diversity of neuroscience researchers in the institute. We are developing digital content for both in-person and external outreach.

Our volunteer outreach program to communicate brain science to the public includes graduate students, postdoctoral associates and fellows, post-baccalaureates, and technicians. During the spring of 2022, McGovern scientists conducted tours with lab components for public middle and high school classes, including a hands-on demonstration table for a computer science day at a Cambridge public middle school. Other plans include both virtual and in-person tours and hands-on lab components for visitors as young as 12 to US veterans and active military.

Yang Post-Baccalaureate Program

Continuing with our efforts to build a more diverse pipeline of people in brain science and neuroengineering, our Yang Post-Baccalaureate Program gives recent college graduates from disadvantaged backgrounds an opportunity to earn up to two years of research experience and mentorship from McGovern Institute faculty and postdoctoral scholars. The goal of the program is to give individuals the research experience they need to successfully apply for graduate school in neuroscience, possibly in MIT's brain and cognitive sciences or biological engineering program. Our recruitment focus is recent college graduates from disadvantaged backgrounds, including individuals who are underrepresented minorities, individuals with disabilities, and first-generation college students.

Addiction Initiative

Our addiction initiative is ongoing with support from McGovern Institute co-founder Lore Harp McGovern and continues to be led by Professor Fan Wang. Our scientists and engineers are collaborating to develop a fundamental understanding of the biological underpinnings of addiction and create new scientifically driven strategies to treat this complex disorder.

Centers

Our centers leverage the latest technologies in fast-moving fields such as intelligence and intractable brain disorders.

K. Lisa Yang and Hock E. Tan Center for Molecular Therapeutics in Neuroscience

This center aims to change how we treat brain disorders by developing innovative molecular tools that precisely target dysfunctional genetic, molecular, and circuit pathways. Our focus is on genetic engineering using CRISPR tools, delivery of genetic and molecular cargo across the blood-brain barrier, and translation of basic research into the clinical setting. The center serves as a hub for researchers with backgrounds ranging from biological engineering and genetics to computer science and medicine.

Hock E. Tan and K. Lisa Yang Center for Autism Research

This center supports and catalyzes new research approaches and potential treatments for individuals affected by autism, emphasizing novel projects difficult to fund through traditional grants. By concentrating research efforts on new models, therapeutic approaches, and a push toward understanding changes in the human brain, the center aims to better detect, treat, and potentially prevent the most severe forms of autism spectrum disorder.

K. Lisa Yang Integrative Computational Neuroscience (ICoN) Center

This center pioneers computational models of brain function that unify multiple levels of biological data, from molecules and circuits to behavior.

Poitras Center for Psychiatric Disorders Research

The Poitras Center has enabled numerous discoveries and technical advances, many of which have been published in top scientific journals such as *Nature*, *Science*, and *Cell*. The center has made possible national and international collaborations with renowned researchers and clinicians and provided a vital source of support for the next generation of neuroscientists and biological engineers.

New Centers

The K. Lisa Yang Bionics Center has been created to develop and implement new technologies for prosthetic limbs, including artificial sensory stimulation and optogenetic control. Professors Hugh Herr and Edward Boyden will head the center. Hugh is a double amputee and widely recognized for his innovative research in prosthetics. The K. Lisa Yang Brain-Body Center, led by Matoula S. Salapatas Professor in Materials Science and Engineering Polina Anikeeva, has been established to create novel tools to explore the multidirectional, multilevel interplay between the brain and other body organ systems with the goal of advancing therapies and predictive diagnostics to achieve healthy minds in healthy bodies.

McGovern Institute Board

The McGovern board meets quarterly. Membership of the board for FY2022 was as follows: Lore McGovern, Elizabeth McGovern, Nergis Mavalvala, Robert Langer, James Poitras, Joshua Sanes, Morgan Sheng, Allyson Tevrizian, and Lisa Yang.

McGovern Institute Leadership Board

The board, which meets once per year, participates in programming at the McGovern Institute and interacts with the director and faculty members throughout the year, providing critical funding and strategic advice to the institute. The board met virtually during AY2022 due to ongoing Covid-19 pandemic restrictions.

Major Events

Postdoctoral fellows Dheeraj Roy and Ying Zhang from the McGovern Institute and the Broad Institute organized a virtual MIT seminar series focused on the thalamus (Thalamic Function in Health and Disease) at which leaders in thalamic neurobiology shared their recent work. The speakers were Xiaoke Chen, Henry Yin, Jeanne Paz, Sabine Kastner, Farran Briggs, Guillaume Hennequin, Kai Hwang, and Sonja Hofer.

Addiction Initiative Group Meeting Series

With thanks to co-founder Lore McGovern for funding, the McGovern Institute held an addiction meeting series for labs to gather, hear talks, and collaborate. Groups met once per month with either an outside speaker or lab featured monthly. Polina Anikeeva, Edward Boyden, John Gabrieli, Ann Graybiel, Alan Jasanoff, and Fan Wang and their McGovern Institute labs participated in the talks.

K. Lisa Yang ICoN Mini-Symposium

The K. Lisa Yang ICoN Center sponsored a mini-symposium titled Integrative Modeling of Brain Function and Behavior on April 6, 2022. The event, organized by Ila Fiete and hosting speakers Robert Datta (Harvard Medical School), Jeffrey Magee (Baylor College of Medicine), Bartlett Mel (University of Southern California), Abigail Person (University of Colorado, Denver), and Xiao-Jing Wang (New York University), featured a poster session with presenters supported through the center.

McGovern Institute Spring Symposium

On April 26, the McGovern Institute hosted Frontiers in Neuropsychiatric Disease Research, Models, and Treatment Avenues, a mini-symposium featuring research sponsored by the Poitras Center. Speakers at the in-person event included Guoping Feng, Kerry Ressler, Susan Whitfield-Gabrieli, and Feng Zhang.

Phillip A. Sharp Lecture in Neural Circuits

Naoshige (Nao) Uchida from Harvard University was invited to give the Sharp Lecture. However, due to scheduling issues, he will not present his lecture until fall 2022.

Edward M. Scolnick Prize in Neuroscience

David Ginty (Harvard), the 2022 winner, presented his talk "The Sensory Neurons of Touch: Beauty Is Skin Deep" on June 1.

Building 46 Colloquium Series

This series, supported by the McGovern Institute, Picower Institute, and Department of Brain and Cognitive Sciences, continued in a hybrid format during AY2022.

Core Facilities

The McGovern Institute operates several core laboratories that serve the local neuroscience community, including members of the McGovern Institute.

Martinos Imaging Center at MIT

The Martinos Center provides access to neuroimaging technologies, including two 3T magnetic resonance imaging (MRI) scanners for human brain imaging, a 9.4T MRI scanner for small animal imaging, a magnetoencephalography scanner, and an electroencephalography system. There is also a coil fabrication lab and a mock MRI scanner to help subjects (especially children) adapt to the scanning environment. The center was closed for the better part of AY2022 as a result of ongoing Covid-19 pandemic restrictions but has since reopened.

Two-Photon Microscopy Core

This core features a sophisticated two-photon system with four lasers to support two-color imaging and uncaging. The system includes two workstations configured for slice physiology and whole animal work and has been upgraded to include an electrophysiology system. The core, managed by McGovern Institute investigator Mark Harnett, is provided free of charge to those in Building 46.

OpenMind Computing Cluster

This cluster was established in 2014 to provide the MIT brain research community with access to state-of-the-art computing resources. The cluster, housed at the Massachusetts Green High Performance Computing Center in Holyoke, has a 10 G link to the MIT campus. With a gift of $4 million, the expanded OpenMind cluster serves the entire neuroscience community, and the funds will be used to purchase new hardware, foster collaboration inside and outside of MIT, and provide advanced training in computing for neuroscience. Funding will also support expert personnel for neuroscience/data computing.

Awards and Honors

- Omar Abudayyeh received a Termeer Scholars Award and was named to the Endpoints list of 20 Under 40 in Biopharma.
- Polina Anikeeva was presented a Pioneer Award by the National Institutes of Health.
- Fernanda De La Torre (graduate student, Josh McDermott and Robert Yang labs) was awarded a Paul and Daisy Soros Fellowship for New Americans.
- Robert Desimone received the Ralph W. Gerard Prize in Neuroscience from the Society for Neuroscience.
- Michale Fee was elected to the American Academy of Arts and Sciences.
- Guoping Feng was named a fellow of the American Association for the Advancement of Science.
- John Gabrieli received the Samuel Torrey Orton Award from the International Dyslexia Association.
- Jonathan Gootenberg was presented a Termeer Scholars Award and was named to the Endpoints list of 20 Under 40 in Biopharma.
- Nancy Kanwisher received the Award in the Neurosciences from the National Academy of Sciences.
- Rebecca Saxe was elected to the American Academy of Arts and Sciences.
- Guangyu Robert Yang was named a Searle Scholar.
- Feng Zhang was named a member of the National Academy of Medicine.

Research Highlights

- Having more conversations to boost brain development (*Developmental Cognitive Neuroscience*): Engaging children in more conversation may be all it takes to strengthen language processing networks in their brains, according to a new study conducted by John Gabrieli. His lab has shown that when families change their communication style to incorporate more back-and-forth exchanges between children and adults, key brain regions grow and children's language abilities advance.
- Mapping the cellular circuits behind spitting (*eLife*): When hungry worms encounter bad-tasting chemicals, they stop eating and spit. Robert Horvitz and his lab have found that a muscle in their mouths does two different things simultaneously to make this switch possible, splitting up activity in a way that scientists have never seen before.

- Scientists harness human protein to deliver molecular medicine to cells (*Science*): Feng Zhang has developed a new way to deliver molecular therapies to cells. The system, called SEND, can be programmed to encapsulate and deliver different RNA cargoes. SEND harnesses natural proteins in the body that form virus-like particles and bind RNA and may provoke less of an immune response than other delivery approaches. The new platform works efficiently in cell models and, with further development, could open up a new class of delivery methods for a wide range of molecular medicines, including those for gene editing and gene replacement.

- RNA-targeting enzyme expands the CRISPR toolkit (*Nature*): McGovern Fellows Omar Abudayyeh and Jonathan Gootenberg have discovered a bacterial enzyme that could expand scientists' CRISPR toolkit, making it easy to cut and edit RNA with the kind of precision that, until now, has been available only for DNA editing. The enzyme, called Cas7-11, modifies RNA targets without harming cells, suggesting that in addition to being a valuable research tool, it provides a fertile platform for therapeutic applications.

- New programmable gene editing proteins found outside of CRISPR systems (*Science*): Feng Zhang has discovered a new class of programmable DNA-modifying systems called OMEGAs that may be involved in shuffling small bits of DNA throughout bacterial genomes. These ancient DNA-cutting enzymes are guided to their targets by small pieces of RNA. While they originated in bacteria, they have now been engineered to work in human cells. This suggests that they could be useful in the development of gene editing therapies, particularly as they are small (approximately 30% the size of Cas9), making them easier to deliver to cells than bulkier enzymes. The discovery provides evidence that natural RNA-guided enzymes are among the most abundant proteins on earth, pointing toward a vast new area of biology poised to drive the next revolution in genome editing technology.

- Single gene linked to repetitive behaviors and drug addiction (*Neurobiology of Disease*): Making and breaking habits is a prime function of the striatum, a large forebrain region that underlies the cerebral cortex. Researchers in Ann Graybiel's lab have identified a particular gene that controls striatal function as well as repetitive behaviors that are linked to drug addiction vulnerability.

- Tracking time in the brain (*Neuron*): By studying how primates mentally measure time, Mehrdad Jazayeri has discovered that the brain runs an internal clock whose speed is set by prior experience. In new experiences, the brain closely tracks how elapsed time intervals differ from its preset expectation, indicating that for the brain time is relative. The findings help explain how the brain uses past experience to make predictions—a powerful strategy for navigating a complex and ever-changing world.

- Artificial networks learn to smell like the brain (*Neuron*): Using machine learning, a computer model can teach itself to smell in just a few minutes. When it does, Robert Yang's lab has found, it builds a neural network that closely mimics the olfactory circuits that animal brains use to process odors. Animals from fruit flies to humans all use essentially the same strategy to process olfactory information in the brain. But neuroscientists in Yang's lab who trained an artificial neural network to take on a simple odor classification task were surprised to see it replicate biology's strategy so faithfully. The similarities between the artificial and biological systems suggest that the brain's olfactory network is optimally suited to its task. Yang and his collaborators say their artificial network will help researchers learn more about the brain's olfactory circuits. The work also helps demonstrate artificial neural networks' relevance to neuroscience.

- Dealing with uncertainty (*Nature*): As we interact with the world, we are constantly presented with information that is unreliable or incomplete, from jumbled voices in a crowded room to solicitous strangers with unknown motivations. Fortunately, our brains are well equipped to evaluate the quality of the evidence we use to make decisions, usually allowing us to act deliberately without jumping to conclusions. Michael Halassa and his lab have homed in on key brain circuits that help guide decision-making under conditions of uncertainty. By studying how mice interpret ambiguous sensory cues, they have found neurons that stop the brain from using unreliable information. The findings could help researchers develop treatments for schizophrenia and related conditions whose symptoms may be at least partly due to affected individuals' inability to effectively gauge uncertainty.

- Artificial intelligence sheds light on how the brain processes language (*Proceedings of the National Academy of Sciences*): In the past few years, artificial intelligence (AI) models of language have become very good at certain tasks. Most notably, they excel at predicting the next word in a string of text; this technology helps search engines and texting apps predict the next word someone is going to type. The most recent generation of predictive language models also appears to have learned something about the underlying meaning of language. A new study from the labs of Nancy Kanwisher, Ev Fedorenko, and Joshua Tenenbaum suggests that the underlying function of these recent models resembles the function of language processing centers in the human brain. Computer models that perform well on other types of language tasks do not show this similarity to the human brain, offering evidence that the human brain may use next-word prediction to drive language processing.

- A connectome for cognition (*Neuron*): The lateral prefrontal cortex is a particularly well-connected part of the brain. Neurons there communicate with processing centers throughout the rest of the brain, gathering information and sending commands to implement executive control over behavior. Now, the Desimone lab has mapped these connections and revealed an unexpected order within them: the lateral prefrontal cortex, they have found, contains maps of other major parts of the brain's cortex. This organization likely supports the lateral prefrontal cortex's role in managing complex functions such as attention and working memory, which require integrating information from multiple sources and coordinating activity elsewhere in the brain.

- Study finds a striking difference between neurons of humans and other mammals (*Nature*): Neurons communicate with each other via electrical impulses, which are produced by ion channels that control the flow of ions such as potassium and sodium. In a surprising new finding, Mark Harnett has shown that human neurons have a much smaller number of these channels than expected relative to the neurons of other mammals. The researchers hypothesize that this reduction in channel density may have helped the human brain evolve to operate more efficiently, allowing it to divert resources to other energy-intensive processes that are required to perform complex cognitive tasks.

- A key brain region responds to faces similarly in infants and adults (*Current Biology*): Within the visual cortex of the adult brain, a small region is specialized to respond to faces, while nearby regions show strong preferences for bodies or for scenes such as landscapes. Neuroscientists have long hypothesized that it takes many years of visual experience for these areas to develop in children. However, a new study out of the Saxe lab suggests that these regions form much earlier than previously thought. In a study of babies ranging in age from two to nine months, the researchers identified areas of the infant visual cortex that already show strong preferences for faces, bodies, or scenes, just as they do in adults.
- Perfecting pitch perception (*Nature Communications*): New research from Josh McDermott's lab suggests that natural soundscapes have shaped our sense of hearing, optimizing it for the kinds of sounds we most often encounter. Using computational modeling to explore factors that influence how humans hear pitch, McDermott's team found that their model's pitch perception closely resembled that of humans, but only when it was trained using music, voices, or other naturalistic sounds. Humans' ability to recognize pitch—essentially, the rate at which a sound repeats—gives melody to music and nuance to spoken language. Although this is arguably the best-studied aspect of human hearing, researchers still debate which factors determine the properties of pitch perception and why it is more acute for some types of sounds than others. Understanding how our nervous system perceives pitch is critical because cochlear implants, which send electrical signals about sound to the brain in people with profound deafness, do not replicate this aspect of human hearing very well.
- Babies can tell who has close relationships based on one clue: saliva (*Science*): Learning to navigate social relationships is a skill that is critical for surviving in human societies. For babies and young children, that means learning who they can count on to take care of them. Rebecca Saxe has now identified a specific signal that young children and even babies use to determine whether two people have a strong relationship and a mutual obligation to help each other: whether those two people kiss, share food, or have other interactions that involve sharing saliva. Her lab showed that babies expect people who share saliva to come to one another's aid when one person is in distress, much more so than when people share toys or interact in other ways that do not involve saliva exchange. The findings suggest that babies can use these cues to try to figure out who around them is most likely to offer help, the researchers say.
- Where did that sound come from? (*Nature Human Behaviour*): The human brain is finely tuned not only to recognize particular sounds but also to determine which direction they came from. By comparing differences in sounds that reach the right and left ear, the brain can estimate the location of a barking dog, wailing

fire engine, or approaching car. Josh McDermott has now developed a computer model that can also perform that complex task. The model, which consists of several convolutional neural networks, not only performs the task as well as humans do, it also struggles in the same ways that humans do.

- Assessing connections in the brain's reading network (*NeuroImage*): When we read, information zips between language processing centers in different parts of the brain, traveling along neural highways in the white matter. This coordinated activity allows us to decipher words and comprehend their meaning. Many neuroscientists suspect that variations in white matter may underlie differences in reading ability and hope that by determining which white matter tracts are involved, they will be able to guide the development of more effective interventions for children who struggle with reading skills. In the largest brain imaging study to date, John Gabrieli's lab has found that if white matter deficiencies are a significant cause of reading disability, new strategies will be needed to pin them down.
- A new approach to curbing cocaine use (*Addiction Biology*): Cocaine, opioids, and other drugs of abuse disrupt the brain's reward system, often shifting users' priorities to obtaining more drug above all else. For people battling addiction, this persistent craving is notoriously difficult to overcome—but new research from Ann Graybiel's lab points toward a therapeutic strategy that could help. The group found that activating a signaling molecule in the brain known as muscarinic receptor 4 (M_4) causes rodents to reduce cocaine self-administration and simultaneously choose a food treat over cocaine.
- Dendrites may help neurons perform complicated calculations (*Neuron*): Within the human brain, neurons perform complex calculations on information they receive. Mark Harnett has now demonstrated how dendrites—branch-like extensions that protrude from neurons—help to perform those computations. Researchers found that within a single neuron, different types of dendrites receive input from distinct parts of the brain and process it in different ways. These differences may help neurons integrate a variety of inputs and generate an appropriate response.
- On a mission to alleviate chronic pain: About 50 million Americans suffer from chronic pain, which interferes with their daily life, social interactions, and ability to work. Fan Wang wants to develop new ways to help relieve that pain by studying and potentially modifying the brain's own pain control mechanisms. Recent work has identified an "off switch" for pain, located in the brain's amygdala. Wang hopes that finding ways to control this switch could lead to new treatments for chronic pain.
- Singing in the brain (*Current Biology*): Nancy Kanwisher has identified a population of neurons in the human brain that light up when we hear singing but not other types of music. These neurons, found in the auditory cortex, appear to respond to the specific combination of voice and music but not to either regular speech or instrumental music. Exactly what they are doing is unknown and will require more work to uncover.

- New MRI probe can reveal brain's inner workings (*Nature Neuroscience*): Using a novel probe for functional magnetic resonance imaging, Alan Jasanoff has devised a way to monitor individual populations of neurons and reveal how they interact with each other. Similar to how the gears of a clock interact in specific ways to turn the clock's hands, different parts of the brain interact to perform a variety of tasks such as generating behavior or interpreting the world around us.

- An optimized solution for face recognition (*Science Advances*): The human brain seems to care a lot about faces. It has dedicated a specific area to identifying them, and the neurons there are so good at their job that most of us can readily recognize thousands of individuals. With artificial intelligence, computers can now recognize faces with a similar efficiency—and Nancy Kanwisher found that a computational network trained to identify faces and other objects discovers a surprisingly brain-like strategy to sort them all out.

- Study finds neurons that encode the outcomes of actions (*Nature Communications*): When we make complex decisions, we have to take many factors into account. Some choices have a high payoff but carry potential risks; others are lower risk but may have a lower reward associated with them. A new study from Ann Graybiel's team sheds light on the part of the brain that helps us make these types of decisions. The team found a group of neurons in the brain's striatum that encodes information about the potential outcomes of different decisions. These cells become particularly active when a behavior leads to a different outcome than what was expected, which the researchers believe helps the brain adapt to changing circumstances.

- Developing brain needs cannabinoid receptors after birth (*eNeuro*): Doctors warn that marijuana use during pregnancy may have harmful effects on the development of a fetus, in part because the cannabinoid receptors activated by the drug are known to be critical for enabling a developing brain to wire up properly. Now, Ann Graybiel's lab has learned that cannabinoid receptors' critical role in brain development does not end at birth. They found that mice need the cannabinoid receptor CB1R to establish connections within the brain's dopamine system that take shape soon after birth. The finding raises concern that marijuana use by nursing moms, who pass the CB1R-activating compound THC to their infants when they breastfeed, might interfere with brain development by disrupting cannabinoid signaling.

- What words can convey (*Nature Human Behaviour*): From search engines to voice assistants, computers are getting better at understanding what we mean—thanks to language processing programs that make sense of a staggering number of words without ever being told explicitly what those words mean. Such programs infer meaning instead through statistics. A new study out of Ev Fedorenko's lab reveals that this computational approach can assign many kinds of information to a single word, just like the human brain. The rich knowledge her team was able to find within computational language models demonstrates just how much can be learned about the world through language alone.

- Circuit that focuses attention brings in wide array of inputs (*Journal of Comparative Neurology*): In a new brain-wide circuit tracing study using techniques pioneered by McGovern principal research scientist Ian Wickersham, MIT neuroscientists have traced thousands of inputs into a circuit that governs selective attention in mice. Past research has shown that dysfunctions in this circuit are implicated in autism and attention deficit/hyperactivity disorder. The new study extends knowledge about the circuit by detailing it in mice, showing that the mouse circuit is closely analogous to the primate version.

- A brain circuit in the thalamus helps us hold information in mind (*Proceedings of the National Academy of Sciences*): As people age, their working memory often declines, making it more difficult to perform everyday tasks. One key brain region linked to this type of memory is the anterior thalamus, which is primarily involved in spatial memory—memory of our surroundings and how to navigate them. In a study of mice, Feng lab researchers identified a circuit in the anterior thalamus necessary for remembering how to navigate a maze. They also found that this circuit is weakened in older mice, but enhancing its activity greatly improves their ability to run the maze correctly. This region could offer a promising target for treatments to help reverse memory loss in older people without affecting other parts of the brain.

- Convenience-sized RNA editing (*Cell*): Collaborating with the University of Tokyo, Omar Abudayyeh and Jonathan Gootenberg have revealed that the CRISPR enzyme Cas7-11 can be shrunk to a more compact version, making it an even more viable option for editing the RNA inside living cells.

- Three distinct brain circuits in the thalamus contribute to Parkinson's symptoms (*Nature*): Parkinson's disease is best known as a disorder of movement. Patients often experience tremors, loss of balance, and difficulty initiating movement. The disease also has lesser-known symptoms that are nonmotor, including depression. In a study of a small region of the thalamus, the Feng lab identified three distinct circuits that influence the development of both motor and nonmotor symptoms of Parkinson's. Furthermore, they found that by manipulating these circuits, they could reverse Parkinson's symptoms in mice. The findings suggest that those circuits could be good targets for new drugs that could help combat many of the symptoms of Parkinson's disease.

- Artificial neural networks model face processing in autism (*Journal of Neuroscience*): Many of us easily recognize emotions expressed in others' faces. A smile may mean happiness, while a frown may indicate anger. Although it is unclear why, some autistic people are more likely to have a more difficult time with this task. New research by Kohitij Kar in Jim DiCarlo's lab uses AI models to shed light on the inner workings of the visual system to suggest an answer.

Robert Desimone
Director
Doris and Don Berkey Professor of Brain and Cognitive Sciences