



SHOCKING EXPERIENCE

Electric Eels More Talented Than We Imagined, Catania Suggests

BY CARLA GARNETT

What would make you put your bare hand in a tank with an electric eel? Research. That's the answer you might give if you're "Vanderbilt's most shocking dude." A biologist and neuroscientist, Dr. Kenneth Catania studies evolutionary interpretations of animal behavior and how animals process sensory information. He gave a lecture recently as part of the NIH Neuroscience Seminar Series in the Porter Neuroscience Research Center.

Stevenson professor of biological



Dr. Kenneth Catania gives a lecture in the NIH Neuroscience Seminar Series.

sciences at Vanderbilt University and winner of a 2006 MacArthur "genius" grant, the University of Maryland graduate has studied several animals that are not typically examined in neurobiology—the masked shrew, tentacle snakes, the water shrew, even crocodiles.

NICHD's Dr. Harry Burgess, who invited Catania to give the seminar, quipped that

apparently an undergrad internship at the National Zoo "kicked off what looks like [Catania's] lifelong passion for the star-nosed mole."

In 2011, Catania and colleagues patented the cortical representation of somatosensory input from the nasal rays of the star-nosed mole.

Exploring the Unexpected

"We all know the tremendous advances in neuroscience that have been made by studying everything from the giant axon of the squid to the *Aplysia*," Burgess noted. "Here, we tend to work on more traditional model systems. It's important to keep in mind that there's this cornucopia of other models out there that can really provide unique insights...[Catania's] work is inspiring in the sense that it makes people—not just scientists, but also the general public—really excited about science."

SEE **ELECTRIC EELS**, PAGE 6

PRACTICE MAKES PERFECT

Physicians Can Train Like Elite Athletes, Pugh Says

BY RAYMOND MACDOUGALL

Elite athletes perfect their "A" game with electronic feedback they and their coaches may analyze of swim strokes, golf swings and numerous other motions and behaviors. Dr. Carla Pugh, guest speaker at a recent NIH Director's Wednesday Afternoon Lecture, recognized early in her medical career that, like athletes, physicians could benefit from the data obtained with sensors and motor tracking devices to learn and improve their technique. Pugh is the Susan Behrens professor of surgical education and vice-chair of education and patient safety at the University of Wisconsin.

As a high school athlete in swimming, track and softball, Pugh recalls feedback she received after every match. By contrast, after medical school and a surgical residency, she

SEE **PUGH**, PAGE 4

New Landscape Architect Brings Unique Skills to NIH

BY ERIC BOCK

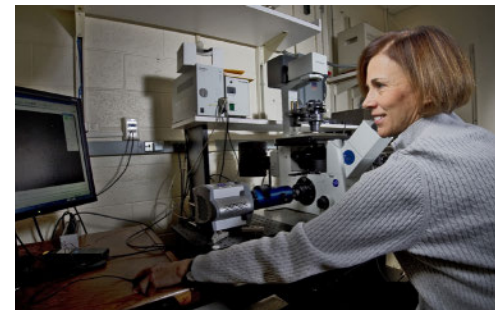
Brandon Hartz envisions a campus teeming with native wildlife. That's why he went to a large meadow near the Bldg. 31 parking lot and planted milkweed seeds on a recent sunny day.

He bought the seeds with his own money and started them in his refrigerator—a process called cold stratification—to simulate a damp winter. If it grows, the milkweed will attract monarch butterflies and other beneficial pollinator insects. Eventually, Hartz hopes the native plants will establish themselves and provide competition to invasive plants and attract birds and other animals.

"It's a big experiment. For me, it's very exciting," said Hartz, the new landscape architect with the Office of Research Facilities.

Such extracurricular ambition augurs

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Salute to accomplished NIH women, p. 12

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Author Al Pittampalli to give DDM seminar

Author Pittampalli To Give DDM Seminar, Apr. 13

The Deputy Director for Management announces the third DDM seminar of the 2017 series "Management and Science: Partnering for Excellence." The event on Thursday, Apr. 13 from 11 a.m. to 12:30 p.m. in Masur Auditorium, Bldg. 10, will feature Al Pittampalli, who will discuss "The Psychology of Great Meetings." In this seminar, author Pittampalli will attempt to change the way we think about meetings so that we consistently conduct meetings that matter.

Videocasting and sign language will be provided. Individuals who need reasonable accommodation to attend should call (301) 496-6211 or the Federal Relay Service at 1-800-877-8339.

For more information about the series, visit www.ddmseries.od.nih.gov or call (301) 496-3271.

NCCIH Talks Deal with Military Populations

NCCIH is sponsoring several events discussing research on mind and body therapies to help active-duty military personnel, veterans and their families with health issues such as chronic pain and anxiety.

On Monday, Apr. 10, at 10 a.m., Dr. Karen Seal will present in Lipsett Amphitheater, Bldg. 10, on "Pain and Opioid Management in Veterans: Evidence, Lessons Learned and Future Directions in the Use of Collaborative and Integrated Care Approaches." Seal has developed a novel, primary care-based, collaborative



Dr. Karen Seal

approach to improve pain, opioid safety and use of nondrug strategies to manage chronic pain in veterans. Its components include shared decision-making, SMART goal planning and a multimodal pain care plan that aligns with a patient's personal values and goals.

Seal is a professor in the departments of medicine and psychiatry at the University of California, San Francisco, and director of the integrated pain team and the integrated care clinic for Iraq and Afghanistan veterans at San Francisco VA Medical Center. Her lecture can be viewed on NCCIH's Facebook page along with a Q&A session at 2 p.m. that day (facebook.com/nih.nccih) or at videocast.nih.gov.

Drs. Eric Schoomaier and Chester "Trip" Buckenmaier, both of the Uniformed Services University of the Health Sciences, will be featured in a Facebook Live Chat on Tuesday, Apr. 25, at 1 p.m. They will discuss mind and body approaches for pain, post-traumatic stress disorder, anxiety and insomnia in military personnel and their families.

Schoomaier, a former U.S. Army lieutenant general, served as surgeon general of the U.S.

Army and commanding general. Currently he is professor and vice-chair for leadership, centers and programs at USUHS, where Buckenmaier is professor, program director and principal investigator at the Defense and Veterans Center for Integrative Pain Management.

Celebrate Minority Health Month

Come celebrate National Minority Health Month by participating in the Minority Health 5K Walk/Run. It will be held Wednesday, Apr. 12 from 11:30 a.m. to 1 p.m. The race will start and finish in front of Bldg. 1. Remember to bring your NIH ID. The event will be shown on Facebook Live! #MinorityHealth5K.

The activity is co-sponsored by the National Institute on Minority Health and Health Disparities, the NIH Office of Research Services and the Recreation and Welfare Association Fitness and Wellbeing Program.

Register at <https://www.nimhd.nih.gov/contact-form/registration-form02.html>.



Roundtable participants included NIAMS director Dr. Stephen Katz (seated, third from l), deputy director Dr. Robert Carter (seated, c), director of the NIAMS Division of Skin and Rheumatic Diseases Dr. Susana Serrate-Sztejn (standing, l), Dr. Robert Colbert, deputy clinical director of the NIAMS Intramural Research Program (standing, third from r) and staff members Drs. James Witter (seated, r) and Ricardo Cibotti (seated, second from l). The meeting was co-chaired by Katz along with NIAMS grantees Drs. Kevin Cooper (seated, l) and Christopher Ritchlin (seated, third from r).

PHOTO: COLLEEN DUNDAS

NIAMS Roundtable Focuses on Psoriatic Arthritis Research

NIH-supported basic, translational and clinical researchers, as well as a patient advocate, recently met with NIAMS leadership and staff to discuss research gaps and emerging opportunities in psoriatic arthritis.

This form of arthritis (joint inflammation) can occur in people who have the skin disease psoriasis. The group addressed topics such as ways to improve understanding of the unique pathophysiology of psoriatic arthritis, especially in the early or subclinical phases; similarities and differences between psoriatic arthritis and diseases such as psoriasis and rheumatoid arthritis; and mechanisms underlying the relationship of metabolic and cardiovascular comorbidities to psoriatic arthritis and psoriasis.

Attendees also discussed approaches to engage new investigators, patients and patient advocacy organizations in this field and opportunities to promote collaborations between rheumatologists and dermatologists.

Once Again, NIH Surpasses CFC Goal

At a Mar. 8 event in Wilson Hall, NIH celebrated an achievement that is now becoming characteristic of the agency—surpassing its goal in the annual Combined Federal Campaign.

The 2016 goal for NIH, which was spearheaded by the National Institute on Drug Abuse, was \$2,340,000. NIH raised \$2,421,889. Talk about demonstrating the campaign theme “Show Some Love.”

The celebration was hosted by NIH director Dr. Francis Collins and NIDA director Dr. Nora Volkow, who were NIH CFC 2016 co-chairs. Joellen Austin, NIDA’s executive officer, served as emcee.

Guest speaker was Dave Smith, CEO of Special Love, Inc., which sponsors the annual Camp Fantastic for kids with cancer and other life-threatening illnesses. He and Collins strapped on guitars and performed a special tune, “Thank you for giving to the CFC.”

Each of NIH’s 27 institutes and centers was presented an award in one of 5 categories: NIH Achievement Award, CFC of the National Capital Area (CFCNCA) Merit, CFCNCA Honor, CFCNCA Chairman’s and CFCNCA President’s.

Earlier in March, HHS and CFCNCA representatives announced awards that NIH received at the CFCNCA awards ceremony at the National Museum of African American



Above, entertaining at the CFC awards ceremony are NIH director Dr. Francis Collins (r) and Dave Smith, CEO of Special Love, Inc. At right, NCI’s Cathy Battistone displays her Hero of the Year award.

PHOTOS: BILL BRANSON

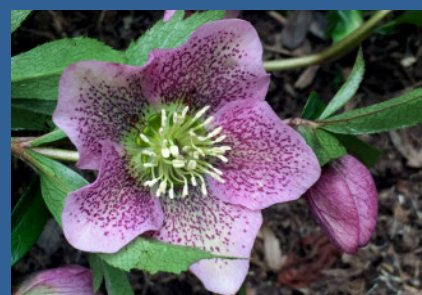


History and Culture.

NIH was presented with three honors: Best Use of Social Media, Best Website and Electronic Communication and Most Innovative Campaign Technique. Also, CIT won Best Poster.

Additionally, NCI’s Cathy Battistone won Hero of the Year for serving as a CFC coordinator for more than 40 years and for her service to the U.S. Coast Guard and other organizations.

At the event’s end, Volkow and Austin passed the CFC banner to NINDS director Dr. Walter Koroshetz and the institute’s executive officer Dr. Maureen Gormley. They will lead the NIH CFC charge in 2017.



ON THE COVER: *Hellebores*, one of several frost-resistant plants that reside in the courtyard of the Clinical Research Center

IMAGE: BRANDON HARTZ

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NINDS director Dr. Walter Koroshetz accepts the mantle for CFC 2017 leadership. Joining him are (from l) Dr. Maureen Gormley, NINDS executive officer, and 2016 CFC leaders Dr. Nora Volkow, director of NIDA, and her EO, Joellen Austin.



Pugh

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found that the concept of feedback got left behind. She returned to the classroom for a Ph.D. in education, including coursework in human-computer interactions, motivated by the question: How can we get the data such that no surgeon in training or in the clinic would ever practice their craft without getting continuous feedback on how they might improve?

In 17 years of research, the past 10 as an NIH grantee, Pugh has designed simulators with sensors and detectors that provide an objective assessment—through data—of medical skills. Clinicians in training and seasoned experts alike have lined up to use her simulators, contributing valuable performance data and gaining elusive feedback.

★ ★ ★

“I began to instrument any simulator I could get my hands on.”

—DR. CARLA PUGH

★ ★ ★

Pugh provided an overview of the evolution of her use of simulators in medical training. Her first, in 2000, was built with medical mannequins outfitted with basic direct-force sensors to record touch and pressure delivered in a simulated gynecologic exam. Medical students performing simulated exams appeared competent, but the sensors and computer interface revealed quite different touch and pressure readings that guided further instruction for each student. “That’s when I knew there was something huge here—something we could potentially do with this data,” Pugh said.

She expanded the simulator study to include 700 expert clinicians in obstetrics and gynecology. By comparison, experts completed the simulated exam in half the time and with less pressure and greater accuracy. That predictable result was accompanied by the surprise effect of experts lining up to participate so they could receive the feedback provided by the simulation.

The laboratory’s lineup of simulators soon included a digital rectal exam, which revealed valuable training information. “It

was quite interesting to see the students looking at the computer while learning the exam and autocorrecting, without needing feedback from a faculty member,” Pugh said. “One of the things that we discovered is that there is a lot lost in translation when the students go from reading what they’re supposed to do in a textbook and actually trying to do it.” Her team received an award for the work in 2008 from the Association for Surgical Education.

“I began to instrument any simulator I could get my hands on,” Pugh said, describing the intubation simulator. The tricky procedure is performed for surgeries as well as to establish an airway for a patient during an emergency. “We put sensors in places where you should be touching and where the instruments should touch, and we put them in places where you shouldn’t.” The data showed that an experienced doctor could place an intubation tube in 12 seconds with fewer wrong moves than a novice committed in 30 seconds.

Breast exam simulation followed. “It’s actually kind of complex; everyone does it differently,” Pugh said. In 2011, Pugh’s breast exam project, supported by the National Institute of Biomedical

Imaging and Bioengineering, earned her a Presidential Early Career Award for Scientists and Engineers.

The breast exam simulator represents a significant advance from Pugh’s early simulators. Sensors in the device can detect directional force; her team videotaped each simulation to be synched with force and directional data. This simulation study showed that 15 percent of physicians who participated with an average of 20 years in practice do not apply enough force to find a lesion in a breast exam. More than half didn’t practice the recommended linear strip palpation that achieves greatest tissue coverage.

Pugh’s ongoing projects extend to operating room procedures, from sutures to laparoscopy. She collaborates with experts to differentiate data signals for various types of touch and with data scientists to extract the many performance variables from her data.

“There is an endless supply of sensor data and new technologies that we can try in the operating room,” Pugh said. “The simulator is my bench, my mouse. I can have different simulators, but it’s the data that is helping move this agenda and the science forward.”



After her WALIS talk, Dr. Carla Pugh (l) meets with NIBIB director Dr. Roderic Pettigrew and Dr. Grace Peng, program director of computational modeling, simulation and analysis at NIBIB.

PHOTO: RAYMOND MACDOUGALL

Cline Offers Insights on Visual Development

New research is revealing how visual activity guides the development of brain circuits that support vision. The findings may help researchers understand the origins of diseases such as amblyopia, when an otherwise normal eye fails to provide normal input to the brain, explained Dr. Hollis Cline, president of the Society for Neuroscience and investigator at the Scripps Research Institute, at a recent Wednesday Afternoon Lecture.

Experiments in developing animals in the 1960s and 1970s by Nobel laureates David Hubel and Torsten Wiesel showed that neurons from different eyes localize in alternating bands of tissue in the brain, where input from one or the other dominates. These so-called ocular dominance columns make the brain look striped when a tracer dye is injected into one eye and taken up by retinal ganglion cells—neurons in the back of the eye that extend their long telephone wire-like axons to visual centers of the brain. Hubel and Wiesel found that input from both eyes was necessary for development of the stripes; when they sealed one eye, the striping pattern disappeared, indicating that neurons from the seeing eye took over.



Dr. Hollis Cline

Although it was clear that sensory input from both eyes was necessary for neurons to form ocular dominance columns in the brain, how or why individual retinal ganglion cells formed the striped pattern remained unknown. To look for answers, Cline imaged developing tadpoles, whose brains are clearly visible through their skin. She found that retinal ganglion axons send out exploratory branches prior to forming synapses with other neurons. During this process, neurons that fire together in response to a common stimulus strengthen their connections and, over time, terminate their branches at the same location. She also found that neurons firing in response to the same stimulus at slightly different times terminated in slightly offset positions in the brain. In short, neurons that fire in sequence wire in sequence. The wiring rule ensures that information about retinal inputs spreads across the entire target area in the brain.

Cline's ongoing work focuses on how incoming information from the retinal ganglion cells is processed by the brain's inhibitory and excitatory neurons. A state of balance between these two kinds of neurons is key for processing visual information.

TALENT SEARCH

Regeneron Finalists Visit NIH

Forty finalists in the Regeneron Science Talent Search Competition—the nation's oldest and most prestigious science and math competition for high school seniors—visited NIH on Mar. 13. A national panel of scientists and engineers selected the finalists based on their original research. The students were in Washington for a week to share their projects and take part in the final competition.

NIH director Dr. Francis Collins regaled the students with stories of his own trajectory into science, from growing up home-schooled on a Virginia farm to leading the Human Genome Project. "The moral here is that if you think you have a linear pathway between where you are today and where you might be 30 years from now, think again," he said. "Don't narrow your sights too early. That's one thing I worry about—really gifted people like you get really good at something and stop paying attention to what is going on in the rest of the landscape."

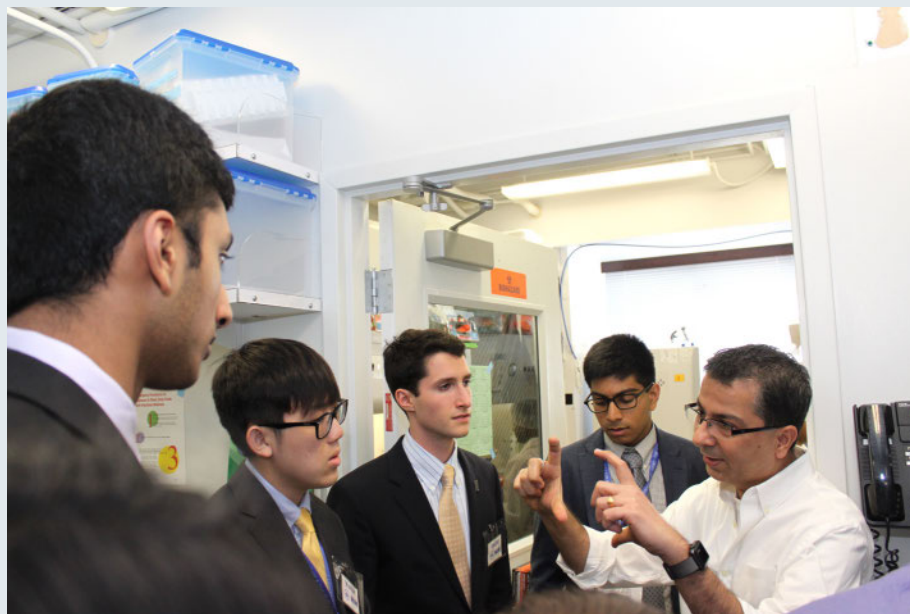
NIH principal deputy director Dr. Lawrence Tabak provided an overview of NIH training opportunities and several NIH investigators gave lab tours, including Dr. Kapil Bharti, Stadtman investigator in NEI's unit on ocular stem cell and translational research; Dr. Ben Busby, genomics outreach coordinator in the National Center for Biotechnology Information, NLM; Dr. Chryssa Kanellopoulou, research fellow in the Laboratory of Immunology, NIAID; and Dr. Donna Novacic, a staff clinician in the Undiagnosed Diseases Program, NHGRI.

The week culminated in the announcement of \$2 million in top awards, including the \$250,000 first-place winner award to Indrani Das, 17, of Oradell, N.J., for her study of a possible approach to treating the death of neurons due to brain injury or neurodegenerative disease.

Second place honors and \$175,000 went to Aaron Yeiser, 18, of Schwenksville, Pa., for his development of a new mathematical method for solving partial differential equations on complicated geometries.

Third place honors and \$150,000 went to Arjun Ramani, 18, of West Lafayette, Ind., for blending the mathematical field of graph theory with computer programming to answer questions about networks.

The Society for Science & the Public has administered the Science Talent Search since its inception in 1942, first in partnership with Westinghouse, then with Intel Corp. 1998-2016, and now in partnership with Regeneron. The society is a nonprofit membership organization dedicated to public engagement in scientific research and education.



Dr. Kapil Bharti (r) shows Regeneron finalists around his lab in NEI's unit on ocular stem cell and translational research.

PHOTO: CHRIS AYERS/SOCIETY FOR SCIENCE & THE PUBLIC



Man vs. Eel? While not powerful enough to kill an average human, the electric eel's energy output can produce a temporary, painful numbing sensation similar to the effect of a Taser. Over the course of about 3 years, Catania documented other fascinating behavior of the animal.

LECTURE PHOTOS: ANDREW PROPP, EEL PHOTO: OPENCAGE.INFO

Electric Eels

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Catania explained, “There’s kind of a theme for a lot of the research we’ve done in my laboratory—that the animals have been so much more interesting than I could possibly have imagined. Each and every one of them has been full of unexpected surprises.”

His NIH talk, “The Shocking Ability of Electric Eels,” focused on such an unexpected observance, which had prompted him to put his hand in an aquarium with a... stunner. But that’s getting ahead of the story.

Not Your Average Eel

First, Catania offered a primer: Despite its name, the electric eel, or *Electrophorus electricus*, actually is not an eel but a fish, close kin to the small South American electric fish, which modified its muscles to produce a weak electric field that became a low-voltage sensory system.

“The electric eel, I like to say, went down the weapons of mass destruction pathway,” Catania joked. Roughly four-fifths, or 80 percent, of the eel’s anatomy is a 600-volt electric organ that generates a powerful energy field—a dipole—in the water around its body. For comparison, a standard household wall socket contains about 120 volts.

While not powerful enough to kill an average human, the eel’s energy output can produce a temporary, painful numbing sensation similar to the effect of a Taser. The eel/fish developed this high-voltage

measured the eel strike, but also recorded the action—sight and sound.

Catania said motor neuron action potentials travel to electrocytes in the eel—those modified muscles that create the high-voltage organ—which then generates an action potential that moves through the water to depolarize the prey’s motor neuron action potentials, causing muscle contraction.

Acrobatic Eels

Over the course of about 3 years, Catania documented other fascinating behavior: Electric eels strategically use their high-voltage power simultaneously for offense, defense and to probe their environment. Those dipole fields they create around their bodies are essentially a motion detector that informs the eels of potential food, enemies and other carbon-conducting objects nearby.

“This is not only active electroreception with high voltage,” Catania said, “but also it’s about the best example of active electroreception I’ve ever seen...It’s one of the most dichotomous traits I can think of—they’re using it as a weapon and as a high-resolution tracking system.”

In addition, the curling/coiling behavior the eels perform serves a purpose: they can double the effect of their energy output—in



“The electric eel, I like to say, went down the weapons of mass destruction pathway.”

-DR. KENNETH CATANIA



“weapon” and also kept its fish-ancestor’s low-voltage sensory system.

Scientists have been studying electric eel energy output for more than two centuries, Catania pointed out, but what has not been understood completely is how, why and to what extent the animals deploy their power.

Analysis of Paralysis

An electric eel can stop all voluntary movement in a prey fish in about 3 milliseconds—without really touching it. Catania was curious: How, exactly, do electric eels paralyze the fish? Turns out, the eel charge acts as a remote control on the neurons of the prey’s muscles, he explained. Catania set up a fish tank experiment that not only

milliseconds—by bending into a loop thereby concentrating the voltage field on a target. Eels can use their strike force to fatigue their prey or a predator, immobilizing larger or otherwise more difficult opponents.

“I think that’s very analogous to the way that neurotoxins work,” Catania said, “so it’s kind of amazing to think that there’s a different way to inactivate muscles.”

Horse vs. Eel: Who Wins?

Around 1800, Italian physicist/chemist Alessandro Volta was inspired by eel anatomy to invent an “artificial electric organ,” or what we now call a battery. However, it was reading about another scientist of the same era—German biogeographer



Catania chats with lecture attendees, including NICHD's Dr. Harry Burgess (l), who invited Catania to give the seminar.

rendering it temporarily defenseless.

Humboldt's report was probably true, Catania determined. The fishermen probably used horses to bait the eels, knowing the eel electricity would peter out battling such huge targets. The anglers then could collect the eels without getting themselves shocked in the process.

"[Electric eels are] really sophisticated animals," Catania concluded. "The list of things that they can do

Alexander Humboldt—that inspired Catania to conduct these experiments.

When Humboldt needed electric eels for his research in 1807, he traveled to South America where he engaged fishermen to collect the animals along the Amazon River. The anglers embarked on the task, telling Humboldt they had to first round up the bait: horses.

That story, famous for decades among scientists who widely disregarded its truth, made Catania wonder: "Why would an electric eel attack a horse? Why not just swim in the other direction?"

An eel wouldn't really go after an animal so much bigger than itself, right?

Don't Try This at Home

In 1838, Catania noted, British electrochemist Michael Faraday reported about putting his hand in water with an electric eel. He described the shock as somewhat mild, felt only in the hand in the water [as opposed to his whole body].

"I trust Faraday," Catania said, showing video of his own hand submerged to the wrist in the electric eel tank. "He was right. It hurts a little bit...but it's not a big deal."


However, the horse thing still nagged at Catania, so he then put a whole arm—not his, a prop—in the tank. The eel immediately attacked the carbon-containing prop, jumping up and out of the tank onto the faux arm.

"When you approach the eel with a large conductor, they do leap out of the water," Catania confirmed, to gasps and chuckles from the audience. "It is a shocking experience, literally."

Truth Stranger Than Fiction

On larger prey, electric eels employ a "repeater strike" motion with their high voltage attack to tire out the opponent. But eventually, the motion will tire out the eel too, depleting its electric energy and

that I never would have imagined gets harder to fit on my summary slide."

See his full lecture at <https://videocast.nih.gov/summary.asp?Live=19864&bhcp=1>. 

APR. 17

'Big Read' Presentation Features Best-Selling Author Mukherjee

Pulitzer Prize-winning author Dr. Siddhartha Mukherjee returns to NIH on Monday, Apr. 17 to discuss his latest book *The Gene: An Intimate History* (2016). His presentation, the featured event of the



Dr. Siddhartha Mukherjee will present The NIH Big Read.

PHOTO: DEBORAH FEINGOLD

inaugural NIH Big Read program, will take place in Masur Auditorium, Bldg. 10 from 2 to 3 p.m. The presentation will be followed by a meet-and-greet with Mukherjee on the FAES Terrace from 3 to 4 p.m. He is the best-selling author of *The Emperor of All Maladies: A Biography of Cancer* (2010).

The NIH Big Read is a collaborative program presented by the NIH Library and the Foundation for Advanced Education in the Sciences. The NIH Big Read 2017 began with a series of book discussions about *The Gene* and concludes with this special presentation by the author.

Mukherjee's presentation will also be available to view online (NIH only) at <http://videocast.nih.gov>. Registration for the event is not required. Sign language interpreters can be provided. Individuals who need reasonable accommodation to participate should contact Jacqueline Roberts, Jacqueline.Roberts@nih.gov, (301) 594-6747 or the Federal Relay, 800-877-8339.

For more information about The NIH Big Read, contact the NIH Library at (301) 496-1080 or email [nihlibrary@nih.gov](mailto:.nihlibrary@nih.gov). Additional information is available at <http://nihlibrary.nihlibrary.com/about-us/news/nih-big-read-2017>.

The NIH Big Read was inspired by the National Endowment for the Arts Big Read program.

Hartz

CONTINUED FROM PAGE 1

well for a man who is succeeding legends—his immediate predecessor, Lynn Mueller, served with distinction for nearly 37 years. Before him, Tom Cook, who retired in 1991, spent 31 years on NIH's grounds staff.

If all goes as planned, the increase in plantings will help reduce the use of herbicides on campus, improve air quality and cleanse parking lot runoff before it eventually flows into the Potomac River, the region's primary drinking water supply. The meadow near the 31 parking lot is just one of six areas around campus, including the Stoney Creek Pond near NLM, where Hartz and a group of volunteers are reintroducing several types of native plants.

As landscape architect, he directs the grounds maintenance contractor's basic maintenance, such as turf renovation and pruning trees, works with ORF's Division of Environmental Protection to address water runoff issues and digitally catalogs just about every tree on campus—roughly 8,500 of them. He also sits on an architectural design review board with other employees from

At NIH, he'll get to know the campus and its seasonal changes, something he's never had the opportunity to do. In his previous jobs, "I'd work at a site and move on."

He takes over as landscape architect from Mueller, who retired at the end of 2015. "Everyone tells me I have big shoes to fill," Hartz noted. "They are right. Lynn cared deeply about the environment and the people here."

Since he began the job last June, Hartz has been reviewing a file cabinet full of Mueller's notes and walking around campus. He knows he can't replace Mueller, but he believes his experience in sustainable design will help him meet the needs of a changing campus and climate.



New NIH landscape architect Brandon Hartz envisions a campus teeming with native wildlife. He's also a photographer; in fact, he captured an image of NIH plant life for this issue's cover.

PHOTO: ERIC BOCK

high-visibility area. He tries to strategically plant trees so they provide shade when staff, patients and visitors walk across campus.

Hartz must also contend with the campus deer herd. The deer eat new plant growth and bucks rub their antlers on trees, stripping away bark on trunks. Some plants such as rhododendrons "are like candy" to deer. Species prone to deer damage are no longer planted.

Additionally, there is no irrigation system on campus, so every plant must be able to withstand a drought. Every time it snows, groundskeepers put down salt on the roads and sidewalks. That salt washes away onto grass and flowerbeds. As a result, plants near roads and sidewalks must tolerate runoff salt.

One of the projects currently occupying Hartz is the green roof that will be built on top of the Northwest Child Care Center. Once finished, the roof will be visible from the Clinical Center's upper floors.

In the future, he wants to increase flora and fauna biodiversity. If there's enough variety, a disease or pest outbreak won't "kill a majority of plants on campus."

Hartz says he wants to make campus as comfortable as possible for those inhabiting it, for it is full of "hidden treasures that people don't get to see." **R**

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"Every decision is in some way guided by whether I am helping to create a safer environment for everyone here at NIH."

-BRANDON HARTZ

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ORF. In late April, he will lead tours of the NIH stream on Take Your Child to Work Day.

Prior to joining NIH, Hartz spent 12 years working for private design and architecture firms after receiving his master's degree in landscape architecture from Harvard University.

He worked on projects for the Department of State, the FBI, U.S. Coast Guard and the National Park Service. He was lead landscape architectural designer for teams that built the third-largest green roof in the United States and restored the National Mall's lawn. He's also helped design sites for several office buildings in Washington, D.C., where "every sustainable strategy had to be considered" before construction started.

Before he designs any project, Hartz thinks about the safety of staff, patients and visitors. He tries to anticipate future problems during the design process. For example, he won't plant trees if he thinks they will encroach on sidewalks or roads. Safety takes priority over aesthetics.

"Every decision is in some way guided by whether I am helping to create a safer environment for everyone here at NIH," he said.

Being a landscape architect at NIH isn't as simple as deciding where to plant trees, grass or shrubs. "There are a lot of constraints here," Hartz noted.

Every time a tree is felled, another tree must be planted in its place. He helps decide the species and where the tree will be located—whether it's in a forested area or a

Scientists Discover Urinary Biomarker That May Help Track ALS

A study in *Neurology* suggests that analyzing levels of the protein p75^{ECD} in urine samples from people with amyotrophic lateral sclerosis (ALS) may help monitor disease progression as well as determine the effectiveness of therapies. The study was supported by NINDS and NCATS.

Dr. Mary-Louise Rogers, senior research fellow at Flinders University in Adelaide, Australia, and Dr. Michael Benatar, professor of neurology at the University of Miami, and their teams discovered that levels of urinary p75^{ECD} increased gradually in patients with ALS as their disease progressed over a 2-year study period.

“It was encouraging to see changes in p75^{ECD} over the course of the study, because it suggests an objective new method for tracking the progression of this aggressive disease,” said Dr. Amelie Gubitza, program director at NINDS. “In addition, it indicates the possibility of assessing whether levels of that protein decrease while patients try future treatments, to tell us whether the therapies are having any beneficial effects.”

Further analysis of the samples from 54 patients revealed that those who began the study with lower levels of urinary p75^{ECD} survived longer than did patients who had higher levels of the protein initially, suggesting that it could be a prognostic marker of the disease and may inform patients about their illness. Benatar and his team noted that this may be useful in selecting participants for clinical trials and in improving study design.

ALS is a fatal neurodegenerative disease in which motor neurons—cells that control muscle activity such as walking, talking and breathing—gradually die off, resulting in paralysis. There is no cure for ALS.

Study Identifies African-Specific Genomic Variant Associated with Obesity

An international team of researchers has conducted the first study of its kind to look at the genomic underpinnings of obesity in continental Africans and African Americans. They discovered that approximately 1 percent of West Africans, African Americans and others of African ancestry carry a genomic variant that increases their risk of obesity, a finding that provides insight into why obesity clusters in families. Researchers at NHGRI and their African collaborators published their findings Mar. 13 in the journal *Obesity*.



People with genomic differences in the semaphorin-4D gene were about 6 pounds heavier than those without the genomic variant, according to the study. Most of the genomic studies conducted on obesity to date have been in people of European ancestry, despite an increased risk of obesity in people of African ancestry.

Obesity is a global health problem, contributing to premature death and morbidity by increasing a person's risk of developing diabetes, hypertension, heart disease and some cancers. While obesity mostly results from lifestyle and cultural factors, including excess calorie intake and inadequate levels of physical activity, it has a strong genomic component.

The burden of obesity is, however, not the same across U.S. ethnic groups, with African Americans having the highest age-adjusted rates of obesity,

said Dr. Charles Rotimi, chief of NHGRI's Metabolic, Cardiovascular and Inflammatory Disease Genomics Branch and director of the Center for Research on Genomics and Global Health at NIH.

“Eventually, we hope to learn how to better prevent or treat obesity,” Rotimi said.

NIH-Funded Study Helps Explain How Zebrafish Recover from Blinding Injuries

Researchers at Vanderbilt University have discovered that in zebrafish, decreased levels of the neurotransmitter gamma-aminobutyric acid (GABA) cue the retina, the light-sensing tissue in the back of the eye, to produce stem cells. The finding sheds light on how the zebrafish regenerates its retina after injury and informs efforts to restore vision in people who are blind. The research was funded by NEI and appeared online Mar. 9 in *Stem Cell Reports*.

“This work opens up new ideas for therapies for blinding diseases and has implications for the broader field of regenerative medicine,” said Dr. Tom Greenwell, NEI program officer for retinal neuroscience.



For years, vision scientists have studied zebrafish to understand their retinal regenerative capacity. Zebrafish easily recover from retinal injuries that would permanently blind a person. Early studies in zebrafish led to the idea that dying retinal cells release signals that trigger support cells in the retina called Muller glia to dedifferentiate—return to a stem-like state—and proliferate.

However, recent studies in the mouse brain and pancreas suggest GABA, a well-characterized neurotransmitter, might also play an important role in regeneration distinct from its role in communicating local signals from one neuron to the next. Scientists studying a part of the brain called the hippocampus found that GABA levels regulate the activity of neural stem cells. When GABA levels are high, the stem cells stay quiet, and if GABA levels decrease, then the stem cells start to divide, explained Dr. James Patton, Stevenson professor of biological sciences at Vanderbilt and senior author of the new study in zebrafish retina. A similar phenomenon was reported in mouse pancreas.

Based on these findings, Patton and his student Mahesh Rao hypothesized that GABA might be involved in the zebrafish retina's regeneration response. To test their idea, Patton and Rao injected GABA inhibitors into undamaged zebrafish eyes and found that the fish developed a regenerative response; that is, Muller glia in the retina dedifferentiated and proliferated. Conversely, increasing GABA levels after inducing retinal damage suppressed proliferation of dedifferentiated Muller glia.

The findings supported the researchers' hypothesis that decreased GABA signaling is a cue for regeneration in the zebrafish retina.

“This is the first report to show a regenerative role for GABA in the zebrafish retina,” said Patton.

Patton and co-authors are conducting ongoing work to determine if the dedifferentiated Muller glia can turn into functional retinal cells, such as the light-activated photoreceptors. They are also exploring whether altering GABA signaling might coax a regenerative response in the retina of other species such as mice.



NIBIB's Pettigrew Honored at Ceremony in India

The fellows of the National Academy of Sciences, India (NASI) acknowledged NIBIB director Dr. Roderic Pettigrew (l) as a foreign fellow at a ceremony on Feb. 10 at the National Institute of Plant Genome Research in New Delhi. The occasion was part of Pettigrew's visit with health care officials in India to explore technology development that may help underserved populations in India and in the United States gain greater access to health care. Shown with Pettigrew are Dr. Anil Kakodkar (c), NASI president; and Dr. Akhilesh Tyagi, NASI past president.

PHOTO: MICHAEL CHEETHAM



Dr. Erica Brown (l) and Stephanie Older recently joined NIGMS.

NIGMS Hires Two New Senior Staffers

NIGMS recently filled two vacancies on its senior staff.

Dr. Erica Brown is deputy director of the Division of Extramural Activities. She helps develop and oversee grant policies and procedures and assists NIGMS officials in formulating institute programs and objectives.

Brown first came to NIH in 2003 as a postdoctoral fellow at NIAID. She then worked as a scientific review officer at NIAID, ran the NIH AREA Program, and, just prior to joining NIGMS, served as director of the *NIH Guide to Grants and Contracts*.

Brown earned her B.S. in biochemistry from Elizabethtown College and her Ph.D. in

microbiology and immunology at Wake Forest University School of Medicine.

Stephanie Older is new chief of the Office of Communications and Public Liaison. She will determine the best ways for the institute to communicate with its audiences, which include the public, the scientific community, students and teachers, the media and policymakers. She oversees the office's content, including online and print resources and social media products; advises NIGMS staff on communications strategies; and fosters relationships with scientific societies, media outlets and other stakeholder groups.

Older comes to NIGMS from NIDA's Office of Science Policy and Communications, where she most recently served as deputy chief of the Public Information and Liaison Branch. She is trained both in communications (she earned a B.A. at the University of Pennsylvania Annenberg School of Communications) and in law (her J.D. is from the University of Baltimore School of Law).

Prior to joining NIH, she worked as a media liaison for the National Breast Cancer Coalition and as an attorney-advisor in the Office of Administrative Law Judges, U.S. Department of Labor.

NINDS's Simpkins Wins Stroke Award

Dr. Alexis Simpkins, a clinical vascular neurology fellow in the Stroke Branch of the NINDS Division of Intramural Research, recently won the first prize Progress and Innovation Award from the journal *Stroke*. The award honors Simpkins as the first author of the manuscript titled "Identification of Reversible Disruption of the Human Blood-Brain Barrier Following Acute Ischemia." She completed this project with Dr. Richard Leigh, an assistant clinical investigator in the NINDS neuro vascular brain imaging unit.

"In the study, we used a novel imaging method on a unique dataset to ask a question that previously could not have been addressed in humans—is blood-brain barrier disruption reversible in humans?" explained Simpkins. "With this knowledge, we may be able to find a way to manipulate



Dr. Alexis Simpkins

the blood-brain barrier and facilitate new approaches to acute stroke treatment." The blood-brain barrier is a network of tightly connected cells that prevents substances from the blood from passing freely into the brain.

According to the *Stroke* web site, the award is "a visible and effective way of encouraging new paths, new methods

and new ways of thinking" and is made possible by funding from the American Heart Association, American Stroke Association and Lippincott Williams and Wilkins. Simpkins received the award at the International Stroke Conference in Houston earlier this year.

Simpkins earned her undergraduate degree in chemistry from Augusta State University, Georgia, in 2001, and her M.D.-Ph.D. degree in medicine and vascular biology at the Medical College of Georgia in 2010. After completing her neurology residency training at Johns Hopkins University in 2014, she joined the NINDS Stroke Branch as a vascular neurology fellow and later served as chief vascular neurology fellow from 2015 to 2016.

Simpkins is also currently working with Dr. John Hallenbeck, chief of the Stroke Branch, and Dr. Larry Latour, a staff scientist in the stroke diagnostics and therapeutics section, on blood transcriptome and magnetic resonance imaging biomarkers of acute ischemic stroke.

Biomarkers are objective ways to measure a disease process. A transcriptome is a collection of gene readouts present in a cell.

Using advanced transcriptome analysis with next-generation RNA sequencing of mRNA and microRNA in patients who have had MRIs prior to and after acute ischemic stroke, the research team hopes to find biomarkers that can identify new therapeutic targets and broaden treatment options for patients.—Shannon E. Garnett

Donahue, Deputy Director of NIDCD Scientific Programs Division, Retires

BY PATRICIA BLESSING

Dr. Amy Donahue considers her 26 years spent at the National Institute on Deafness and Other Communication Disorders as the perfect job and attributes that to her love of research and her collaborators and colleagues at NIH, in the research community, professional organizations and numerous federal agency partnerships.

At the end of March, Donahue retired from her dual roles as deputy director of the institute's Division of Scientific Programs and coordinator of the Hearing and Balance/Vestibular Sciences Program.

Before coming to NIH, Donahue, who received her Ph.D. in speech and hearing sciences from the University of Tennessee, worked as a hearing conservation consultant for 5 years at the U.S. Army Environmental Hygiene Agency. She provided guidance to the Army's preventive medicine program in noise-induced hearing loss and hearing conservation for both active duty military personnel as well as civilians.

Donahue's expertise has been a driving force behind the research portfolio of NIDCD's hearing and balance extramural program. Her leadership facilitated decades of research on noise-induced

2016 Recipients DCD Award of Excellence



Dr. Amy Donahue (c) recently retired from NIDCD. Above, she accepts an award in 2016 from institute director Dr. James Battey and deputy director Dr. Judith Cooper.

and age-related hearing loss, cochlear implants, hearing aids and intervention strategies for infants and children with hearing loss.

Donahue's many career achievements have included her long history of supporting research efforts to improve treatment options for infants and children with hearing loss, as well as adults with mild to moderate hearing loss.

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“[Donahue’s] forward-thinking attitude, creativity, energy, commitment and willingness to take calculated risks to help medical advances reach the patient in a more timely fashion have been invaluable assets.”

-DR. JUDITH COOPER

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In 2016, Donahue was honored with both the NIDCD Award of Excellence and the NIH Director's Award for her many years of outstanding service.

The Hearing Loss Association of America, a patient advocacy organization, recognized her contributions with the James B. Snow, Jr., M.D., Award in 2016 for furthering scientific research in the field of hearing loss, especially in the

promotion of accessible and affordable hearing health care.

Her many contributions to hearing and balance research were also recognized by the American Academy of Audiology, which awarded her the 2017 Career Award in Hearing, and by the Association for Research in Otolaryngology as well as the American Auditory Society, both of which presented her with a certificate of appreciation for her leadership.

“Her forward-thinking attitude, creativity, energy, commitment and willingness to take calculated risks to help medical advances reach the patient in a more timely fashion have been invaluable assets,” said Dr. Judith Cooper, NIDCD deputy director and director of the Division of Scientific Programs. “Moreover, Amy has always provided honest, insightful input and guidance to any and all. She will be greatly missed.”

Dr. Kelly King, an NIDCD research audiologist in the Clinical Center's audiology unit, has assumed on an interim basis many of Donahue's responsibilities.

NICHD Council Welcomes Five

Five new members joined the National Advisory Child Health and Human Development Council.

Dr. Michael Boninger is chair of the department of physical medicine and rehabilitation at the University of Pittsburgh. His work includes regeneration of muscle tissue and using stem cell biology and exercise to spur regenerative processes.

Col. Teresa Brininger is director of the Clinical and Rehabilitative Medicine Research Program at the U.S. Army Medical Research and Materiel Command. She oversees planning, budgeting and execution of Army, Defense Health Program and Congressional Special Interest funds directed toward rehabilitative and regenerative medicine research.

Dr. Catherine Gordon is a pediatric endocrinologist and adolescent health specialist whose research focuses on how nutrition influences bone health, with a particular interest in adolescence and young adulthood. In 2005, she received a Presidential Early Career Award for Scientists and Engineers for her studies examining bone loss in adolescent girls with eating disorders.

Dr. Clifford Tabin is professor and chair of the department of genetics at Harvard Medical School. Throughout his career, he has investigated the genetic regulation of vertebrate development by combining classical methods of experimental embryology with modern molecular and genetic techniques.

Alyce Thomas is a nutrition consultant in the department of obstetrics and gynecology at St. Joseph's Regional Medical Center in Paterson, N.J. Her focus is on working with and caring for high-risk pregnant women, especially those with diabetes.



NICHD welcomes new members to the institute's advisory council. Shown are (front, from l) Dr. Catherine Gordon, NICHD director Dr. Diana Bianchi, Col. Teresa Brininger and Alyce Thomas. At rear are (from l) NICHD associate director for extramural research Dr. Della Hann, Dr. Clifford Tabin, Dr. Michael Boninger, NICHD deputy director Dr. Catherine Spong and NICHD scientific director Dr. Constantine Stratakis.

PHOTO: BILL BRANSON



NLM Deputy Director Betsy Humphreys previously directed the Unified Medical Language System project.



Dr. Elizabeth Neufeld became chief of NIDDK's Genetics and Biochemistry Branch in 1979 and served as deputy director of intramural research, 1981-1983.



Dr. Ruth Kirschstein was the first female NIH institute director, heading NIGMS from 1974 to 1993, and twice served as acting NIH director.



Dr. Maxine Singer, an authority on nucleic acids and former chief of NCI's Laboratory of Biochemistry, also helped break the genetic code.



NIDA director Dr. Nora Volkow has demonstrated that addiction is a disease of the brain and pioneered the use of imaging to show the effects of drugs on the brain.

Accomplished Women: National Academies Honor NIH'ers

Election to the National Academy of Science (NAS), the National Academy of Medicine (NAM) or the National Academy of Engineering (NAE) is considered a prestigious honor for U.S. scientists.

From 1977, with the election of Dr. Elizabeth Neufeld to NAS as the first woman from NIH to be so honored, there has been a growing number of female scientists elected to the academies, some recognized by more than one.

The academies are private, non-profit institutions that provide expert advice to the government on matters of science, engineering and medicine.

Here, we have included the names and some photographs of current members as well as some who came before, as an introduction to a web page to come later this spring that will celebrate these women. Feel free to share any additional information you may have with Lydia Polimeni of OD's Office of

Communications and Public Liaison, lydia.polimeni@nih.gov.

- Susan Amara, NAS (2004); Carolina Barillas-Mury, NAS (2014); Karen Berman, NAM (2016); Diana Bianchi, NAM (2013); Linda S. Birnbaum, NAM (2010); Patricia Flatley Brennan, NAM (2001); Maria Freire, NAM (2008); Naomi Lynn Gerber, NAS (2008); Susan Gottesman, NAS (1998); Patricia Grady, NAM (1999); Florence Haseltine, NAM (1993); Betsy Humphreys, NAM (1999); Elaine Jaffe, NAM (2008); Ruth Kirschstein, NAM (1983); Story Landis, NAM (2009); Jennifer Lippincott-Schwartz, NAS (2008), NAM (2009); Elizabeth Neufeld, NAS (1977); Vivian Pinn, NAM (1995); Judith Rapoport, NAM (1993); Matilda White Riley, NAS (1994); Barbara Rimer, NAM (2008); Maxine Singer, NAS (1979); Thressa C. Stadtman, NAS (1981); Gisela Storz, NAS (2012); Leslie G. Ungerleider, NAS (2000), NAM (2001); Martha Vaughan, NAS (1985); Nora Volkow, NAM (2000); Sue Hengren Wickner, NAS (2004); Wei Yang, NAS (2013); Kathryn Zoon, NAM (2002)



Dr. Vivian Pinn, the first African-American woman to chair an academic pathology department in the U.S., served as first full-time director of the NIH Office of Research on Women's Health.



NLM director Dr. Patricia Flatley Brennan is a pioneer in creating information systems for patients.



Sociologist Dr. Matilda White Riley joined NIA in 1979 and was recognized for developing a multidisciplinary plan for aging research that integrated societal structures and biological sciences.



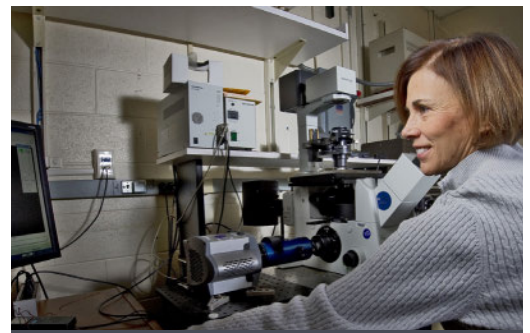
Dr. Linda S. Birnbaum, first woman director of NIEHS, is a toxicologist and microbiologist.



An accomplished prenatal geneticist, Dr. Diana Bianchi is director of NICHD.



Internationally recognized for her research focused on stroke, Dr. Patricia Grady is NINR director.



Dr. Jennifer Lippincott-Schwartz, chief of the section on organelle biology in NICHD's Cell Biology and Metabolism Program, uses live-cell imaging techniques to study molecular interactions in cells.