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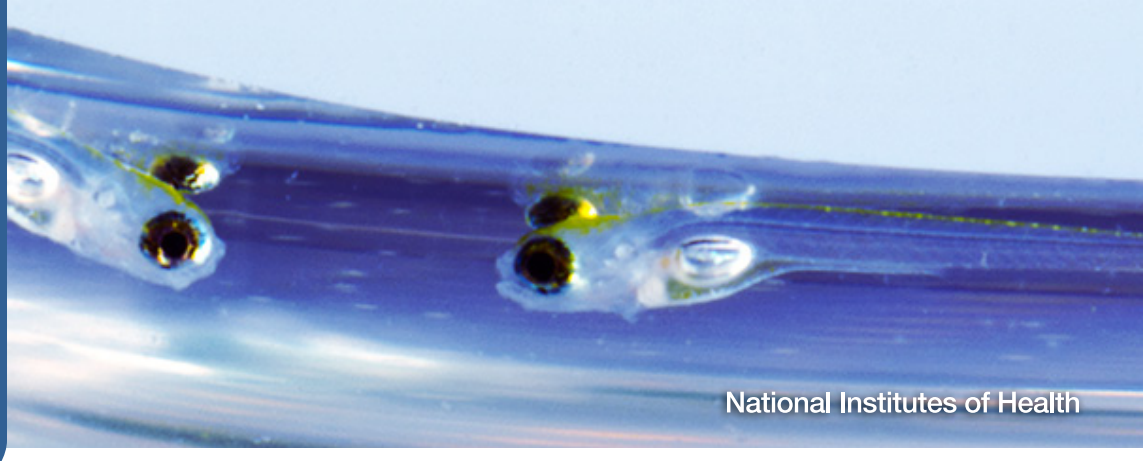


MUSIC AS MEDICINE

Cellist Yo-Yo Ma Talks Music, Science

BY DANA TALESNIK

Something profound happens in the brain when we enjoy music. It draws us in, time and again, rousing our emotions. And it has no boundaries. Music can transport us to different moods, experiences and cultures.

Renowned cellist Yo-Yo Ma explored how music intersects with science and culture during a casual and witty conversation with NIH director Dr. Francis Collins at the recent annual J. Edward Rall Cultural Lecture.

While it undoubtedly takes talent and persistence to master playing a musical instrument, Ma divulged his scientific secret behind becoming a virtuoso who can play all six Bach solo cello suites from memory. "You learn what you need to learn by heart before you're 20," he quipped.

Ma, 61, started playing cello at age 4. After more than a half century of performing, he's grateful to play music as his life's work.

"I assume maybe everybody in this room is doing what they're doing because something got them really excited at some point and they wanted more," Ma told Collins. "Was it an experiment in fourth grade? Was it a teacher that opened up nature to you? Or was it something you solved at a certain point and got so much pleasure out of it that you wanted to do more?"

That desire for more also attracts us to music, especially in the way it brings us to different states of mind. To demonstrate, Ma picked up his 1712 Davidov Stradivarius cello

SEE **MA**, PAGE 6

Cellist Yo-Yo Ma plays music at Rall Lecture.

Durham tour is part of NIEHS anniversary, p. 12.

ALSO THIS ISSUE

Dr. Roger Chou urges avoidance of opioids.

Chou Urges Non-Opioid Therapies for Chronic Pain

BY ELLEN O'DONNELL

Pain is a major public health concern in the United States. More than 25 million of us experience it every day, according to the National Health Interview Survey. But treating it with opioids, a class of pain-relieving drugs, invites problems including misuse,

SEE **CHOU**, PAGE 8

Data Mining Project Helps Search Academic Papers Faster, More Efficiently

BY ERIC BOCK

In 1982, European researchers published an article in the *Annals of Virology*. In it, they warned the African country Liberia to prepare for an Ebola epidemic, explained Dr. Peter Murray-Rust at a recent Frontiers in Data Science Lecture in Bldg. 35.

Dr. Peter Murray-Rust

When the March 2014 outbreak occurred, public health officials in Liberia never saw the warning. The paper was behind a paywall.

"If you do not give knowledge to

SEE **WIKIDATA**, PAGE 4

Town Hall Meeting on OM Relocation

NIH staff are invited to OM on the Move All Hands, a town hall style meeting on Tuesday, Jan. 31 from 2 to 3 p.m. at 6001 Executive Blvd. (Neuroscience Center Bldg.), Rm. C, on the relocation of off-campus staff in the NIH Office of Management (OM) to Rockledge I and II in 2019. The move will co-locate staff from several institutes and centers in a campus style location with reconfigured work spaces for a more open environment.

To attend the meeting in person, send an RSVP to OMontheMove@mail.nih.gov and bring your NIH ID to the event. To participate remotely, go to https://videocast.nih.gov to watch the live videocast. Questions and comments about the move may be sent before, during and after the meeting to OMontheMove@mail.nih.gov. Sign language interpreting services will be provided. For more information about OM on the Move, visit https://omoffice.od.nih.gov/programs/move.

NIH To Host Rare Disease Day Event, Feb. 27

Rare diseases affect an estimated 25 million Americans. On Feb. 27, NIH will host an event to raise awareness about rare diseases, the people they affect and current NIH research collaborations.

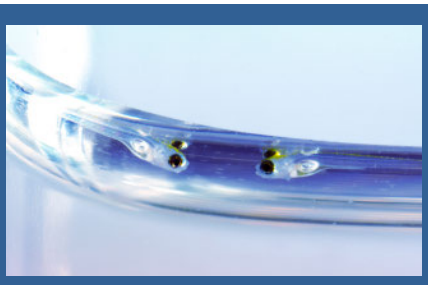
Sponsored by the National Center for Advancing Translational Sciences and the Clinical Center, Rare Disease Day at NIH will take place from 8:30 a.m. to 4 p.m. in Masur Auditorium, Bldg. 10. The event will feature presentations, posters and exhibits, tours of the Clinical Center and an art show. Admission is free and open to the public. In association with Global Genes, participants are encouraged to wear their favorite pair of jeans.

Learn more about Rare Disease Day at NIH at https://ncats.nih.gov/rdd, visit https://events-support.com/events/NIH_Rare_Disease_Day to register and view the agenda and follow the event on social media at #RDDNIH.

Sen. Nelson Visits NIH for ALS Update

Sen. Bill Nelson (D-FL) spent the afternoon of Nov. 28 at NIH, getting an overview of research on amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease) from intramural experts in the field. Above, NIH director Dr. Francis Collins (l) greets Nelson, along with NIA director Dr. Richard Hodes (third from l) and NINDS director Dr. Walter Koroshetz. Below, Dr. Bryan Traynor (l), senior investigator and chief of the neuromuscular diseases research section in the NINDS Laboratory of Neurogenetics, briefs the senator on research progress and techniques. Nelson chairs the Senate's special committee on aging and was a crewmember on the 24th flight of the Space Shuttle Columbia, which took place Jan. 12-18, 1986.

PHOTOS: ERNIE BRANSON



ON THE COVER: *6-day-old zebrafish swim near water's surface. Optically clear, larval zebrafish allow researchers to observe the developing nervous system and monitor neuron activity during behavior.*

IMAGE: J. SWAN & K. TABOR, MCBAIN LAB, NICHD

The NIH Record

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Credit Union Raises Funds for NIH Charities

By donating $25 for every auto loan its members originated with them in October-December 2016, the NIH Federal Credit Union recently provided $8,500 to the NIH Charities.

The donation will be split evenly among the Children's Inn at NIH, Friends of Patients at the NIH and Special Love. Funds will go directly to helping each organization fulfill its goal of supporting patients and families struggling with the life-altering impact of significant illness and treatments.

"The NIHFCU is thrilled to give back to the NIH community which, since 1940, has provided us with the privilege of serving their dedicated workforce," said Steven Levin, NIHFCU's vice president of marketing & business development. "Whether our donation helps to send young cancer patients to summer camp, delivers some financial relief for distressed families at the NIH for long-term stays, or contributes to providing a safe haven for ill children in between their NIH treatments and hospitalization, the NIHFCU is honored to support the incredible missions of these three fine organizations."

"The NIHFCU is an integral part of the NIH community and the NIH Charities cannot thank them enough for their generosity," said Randy Schools, NIH Charities founding board member and trustee. "This gift, along with the other financial and in-kind support the credit union has provided throughout the years, has truly made a difference in the lives of thousands of patients and families who are faced with extreme medical circumstances."

At check presentation are (from l) Randy Schools; Cassandra Hairston, NIHFCU; Heidi Grolig, Friends of Patients at the NIH; Steven Levin, NIHFCU; Jennie Lucca, CEO, Children's Inn at NIH; Roger Bordine, representing Special Love; Rick Wieczorek, NIHFCU president & CEO. Seated is Zilly, inn therapy dog.

NIH Revamps Its Sexual Harassment Policy

BY DANA TALESNIK

Recent headlines remind us of a distressing issue that's been around for decades, and which plenty of professionals still grapple with today. Sexual harassment in the workplace—whether physical, verbal or nonverbal—is demeaning and illegal. NIH is on the cusp of implementing a multi-phase plan to prevent and address harassment and encourages employees to share ideas to help shape the policy.

Debra Chew

"One of the most essential things for a successful harassment prevention program is making sure employees know where to go to get assistance if they observe inappropriate behavior or if they experience it themselves," said Debra Chew, director of NIH's Office of Equity, Diversity and Inclusion (EDI), which is spearheading the initiative.

The updated policies will cover sexual and other forms of harassment such as race, religion, disability, bullying and other forms of discrimination. Victims and observers of workplace harassment will have multiple avenues to seek assistance, including a confidential hotline. Chew said, "If you feel you're being subjected to harassment on any one of the legally protected bases, then this harassment prevention program will protect you."

EDI has drafted an official policy and a handbook, both currently under review by a planning committee consisting of executive officers, NIH scientific directors and representatives from OHR, including its Civil Program, NIMHD and the NIH Office of the Ombudsman.

The anti-harassment plan will feature a new system to alert investigators quickly. When there's a complaint, "We have an obligation to swiftly look into the matter through an administrative inquiry," said Chew. "Then, if we find there's been inappropriate, illegal behavior, we'll be held to the standard of correcting and curing the harassment behavior so it doesn't recur or continue, because each day that someone is being victimized is a horrific day for that individual."

EDI is also planning to launch an online harassment prevention training tool soon. This mandatory training will include video vignettes of simulated situations in labs and offices. As is the case with annual online ethics and IT security training, failure to complete it could result in suspended email accounts.

Any type of harassment can induce anxiety, depression, shame and other debilitating psychological, even physical, effects as well as drain worker morale and productivity. "Workplace harassment, we know, can serve to disengage employees, can create office churn that serves as a distraction; it really takes people off the mission and undermines the success of the organization," said Chew.

★ ★ ★

"We take workplace harassment seriously. One person on this campus who experiences it is too many. We want to have a very strong program in place to give people a sense of comfort and we need everybody's assistance to get this right."

–DEBRA CHEW

★ ★ ★

Once EDI finalizes the policies and cost estimates for contracts, OHR will circulate a workplace harassment survey, coordinated with NIMHD. The survey offers a chance for staff to voice their concerns and ideas so NIH as a community can help fine-tune the prevention program and provide insights into the evolving needs of harassment victims.

Share Your Thoughts

Victims of sexual or other workplace harassment often fear coming forward. They worry about the consequences and the effects on their career and reputation. As NIH hones its anti-harassment policy, EDI wants to hear from harassment victims.

"I want to ask victims: if there was one thing about a program at NIH that would've helped you or made you feel strong to be able to come forward and report an incident of workplace harassment, what would that be?" asked EDI Director Debra Chew.

NIH'ers can share their personal experiences or suggestions related to workplace harassment by contacting EDI via this confidential email: edi.guidance@nih.gov.

"Whenever you communicate about workplace harassment, it brings up really bad memories for people who have been victimized," said Chew. "So we want to make sure we have a supportive system before we start ramping up the dialogue and communication around this survey."

Currently, if an NIH employee files a harassment complaint, OHR provides guidance to supervisors who then address the issue. "The problem with not having a very detailed handbook or policy is that people don't know exactly where to go right now and that's the opportunity we saw to clarify all of that," said Chew.

With the new plan, a review committee will oversee the response efforts and recommend interventions to the IC, including disciplinary actions for the harasser. The IC would be accountable to NIH leadership and would have to justify any failure to implement these recommendations. Chew said, "I do think that's symbolic of [NIH principal deputy director] Dr. [Lawrence] Tabak's and [NIH director] Dr. [Francis] Collins's commitment to this effort."

At the same time, EDI recognizes that large committees with senior officials might seem intimidating to victims and have the unintended consequence of preventing victims or witnesses from coming forward. It's a delicate balance, noted Chew, who has been consulting with employee and labor relations officials. "We need to be thoughtful about the size of the committee, the participants and how to maintain the confidentiality of victims."

Chew knows firsthand how difficult it can be to report harassment. "I've personally experienced sexual harassment in my career," she said. Early in her law career in Atlanta, she experienced daily abuse but was afraid to come forward. In hindsight, she wished she had.

"I know how isolating it can make you feel, as a person, as a professional, how scary it can be, how stressful," Chew said. "I respect victims; I respect that people navigate these situations differently. We want to provide a place for them, that if they do want to come forward, they can."

NIH senior leadership is deeply involved in every aspect of the program and Chew said all components exceed the Equal Employment Opportunity Commission's minimum requirements. Perhaps, she said, NIH's anti-harassment program will serve as a model for other agencies.

NIH'ers need not wait until the full program is finalized to come forward with a complaint or idea. If you believe you've been subject to discrimination or harassment, contact EDI.

"We take workplace harassment seriously. One person on this campus who experiences it is too many," said Chew. "We want to have a very strong program in place to give people a sense of comfort and we need everybody's assistance to get this right."

Wikidata

CONTINUED FROM PAGE 1

people, you will have bad medicine. And bad medicine means people die," said Murray-Rust, reader emeritus in molecular informatics, University of Cambridge, and founder of ContentMine.org.

That's why he founded ContentMine, an open-software data mining project that helps researchers search through academic research papers faster and more efficiently. "We want to liberate a huge number of facts from the literature," he said.

The software can search thousands of papers in just a few minutes. Previously, this task could take multiple high-quality researchers days or even weeks to complete manually.

★ ★ ★

"One of the most important things in a paper is actually the captions. If you look at the captions to the figures—without looking at the paper—you can probably tell what the paper is about because they have known phrases."

-DR. PETER MURRAY-RUST

★ ★ ★

The program finds, or crawls, scholarly articles on the web and then downloads, or scrapes, content from those articles onto a server. Then, the program mines the articles for relevant scientific data, which includes information such as abstracts, methods, conclusions, references and captions. The program can also extract data from diagrams, such as phylogenetic trees or chemical equations.

"One of the most important things in a paper is actually the captions," Murray-Rust said. "If you look at the captions to the figures—without looking at the paper—you can probably tell what the paper is about because they have known phrases."

If a user searches the term "Zika" for example, he or she will receive a list of articles that include that term. In addition, the program will include information from Wikidata—"an incredible source of additional information," he noted. Wikidata contains critical numerical metadata such as someone's age or a country's population.

Murray-Rust has founded ContentMine.org, to search through academic papers rapidly.

In practice, however, crawling, mining and scraping articles isn't so simple, he noted. There are no standards that publishers follow. Each has its own way of doing things. Some, for example, upload papers onto their web sites into formats that are unreadable without special software.

Murray-Rust said one example is a PDF document, which does not contain machine-understandable words. The documents contain characters that cannot be read unless he creates software specifically to convert characters into HTML, a web code that a machine can read. What he does isn't "rocket science," rather "it's just extremely tedious."

Another obstacle is copyright law, which varies from country to country. In the United Kingdom, for example, Murray-Rust has the right to mine for "personal, non-commercial research." However, it can be difficult to figure out what's copyrighted and what isn't.

"We can legally publish facts, although it's not absolutely clear what fact is. But everyone agrees that facts are not copyrightable," he quipped.

All of his software is open, meaning anyone can download and use it. "I'm delighted if people use what I've created," Murray-Rust noted. A 15-year-old student from The Netherlands who is interested in conifers helps him build the software.

"If you write open software and everything is open, people will take it and make new and exciting things," he said. R

NIAID's Metcalfe Receives AAAAI Mentorship Award

Dr. Dean Metcalfe, chief of NIAID's Laboratory of Allergic Diseases (LAD), has been named the 2017 recipient of the American Academy of Allergy, Asthma and Immunology (AAAAI) Mentorship Award. The award "is presented in recognition for a lifetime of...service as an allergy/immunology mentor for students, residents, postdoctoral fellows and faculty." The award will be presented at AAAAI's annual meeting in March.

Metcalfe studied medicine at the University of Tennessee, trained as an internist at the University of Michigan, as an allergist-immunologist at NIH and as a rheumatologist at Robert B. Brigham Hospital. In 1979, he returned to NIH as a senior clinical investigator. Since coming back to NIH, he has trained fellows in the Allergy and Immunology Program and mentored postbaccalaureate and postdoctoral fellows in LAD's mast cell biology section. Metcalfe is an author on more than 560 scientific papers and an editor on 14 books on mast cell biology, systemic mast cell disorders, food allergy and asthma.

Dr. Dean Metcalfe

Metcalfe has previously served as chairman of the American Board of Allergy and Immunology; as president of AAAAI; and as chairman of the ACGME-RRC for Allergy and Immunology. He has been elected to membership in the American Society for Clinical Investigation; the American Association of Physicians; the American Clinical and Climatological Association; and the Collegium Internationale Allergologicum. His numerous awards include the AAAAI Distinguished Scientist Award and the World Allergy Organization Scientific Achievement Award.

NIDA Hosts Teleconference on 2016 Monitoring the Future Results

The National Institute on Drug Abuse hosted a news teleconference Dec. 13 to discuss findings from the 42nd annual Monitoring the Future (MTF) survey.

The 2016 survey of drug use and attitudes among American 8th, 10th and 12th graders indicates a promising decline among most illicit drugs, with marijuana use staying relatively steady. Past year use of any illicit drug was the lowest in the survey's history for 8th graders and stable for those in 10th and 12th grades.

Marijuana use remained relatively stable in the past couple of years, however daily marijuana use among 8th graders dropped significantly in 2016. Additionally, the survey indicates that marijuana, as well as electronic vaporizers (e-cigarettes), are now more popular than regular cigarettes.

MTF, funded by NIDA, is conducted by researchers at the University of Michigan. For more on the 2016 MTF survey, see https://www.drugabuse.gov/related-topics/trends-statistics/monitoring-future.

On hand for a news conference outlining the Monitoring the Future Survey findings are (from l) Dr. Richard Miech, NIDA director Dr. Nora Volkow and Dr. Lloyd Johnston, principal investigator of the Monitoring the Future Survey since its inception in 1975. Miech joined the project in 2013 and will now oversee the survey.

FEBRUARY 1

Staudt To Give Mider Lecture

Dr. Louis Staudt, co-chief of NCI's Lymphoid Malignancies Branch, will give the annual G. Burroughs Mider Lecture as part of the NIH Director's Wednesday Afternoon Lecture Series. His talk, "Therapy of lymphoma inspired by functional and structural genomics," will be held Wednesday, Feb. 1 at 3 p.m. in Masur Auditorium, Bldg. 10.

Staudt received his B.A. from Harvard College in 1976, graduating *cum laude* in biochemistry. He was awarded a Medical Scientist Training Program fellowship at the University of Pennsylvania School of Medicine, where he received his M.D. and Ph.D. degrees in 1982. In addition to his laboratory co-chief role, Staudt also serves as director of the NCI Center for Cancer Genomics, which oversees large-scale NCI programs studying the genomic aberrations in cancer. In 2011, he was given the honorary title of NIH distinguished investigator.

The Staudt laboratory initiated the use of genomic-scale gene expression profiling to define the molecular basis of therapeutic response and survival in lymphoid malignancies. This effort revealed that the most common type of non-Hodgkin's lymphoma, diffuse large B-cell lymphoma, is actually composed of three distinct diseases with different responses to chemotherapy.

To uncover new therapeutic targets, the Staudt laboratory developed RNA interference genetic screens for essential genes in cancer. Using this methodology, in conjunction with high-throughput cancer gene resequencing, the laboratory identified therapeutic targets for the molecular subset of diffuse large B-cell lymphomas that is least curable by current treatments. Staudt and colleagues have conducted clinical trials based on these insights, which have shown a high remission rate using a drug targeting the B-cell receptor signaling pathway in patients with diffuse large B-cell lymphomas that have resisted other therapies.

He has received numerous awards for his research, including the 2009 Dameshek Prize from the American Society of Hematology for outstanding contributions in hematology, the 2015 San Salvatore Prize for the treatment of malignant tumors, the 2016 C. Chester Stock Award Lectureship from Memorial Sloan Kettering Cancer Center and election to the National Academy of Sciences in 2013.

The Mider lecture, established in 1968, recognizes an NIH intramural scientist's outstanding contributions to biomedical research and honors G. Burroughs Mider, the first director of NIH laboratories and clinics.

For lecture information and reasonable accommodation, contact Jacqueline Roberts, (301) 594-6747 or robertsjm@mail.nih.gov.

Sanders Is New CSR Budget Officer

Valerie Sanders has been named budget officer at the Center for Scientific Review. She had previously served as a budget analyst at CSR. During a 14-year NIH career, Sanders has steadily risen. She started out as a secretary at NCI's Laboratory of Cell Regulation and Carcinogenesis and then worked as an administrative officer at NIMH and CSR before becoming a CSR budget analyst in 2014. During this period, she earned an M.S. in accounting from Strayer University and a B.S. in health care management from Southern Illinois University.

Duet or quartet? At left, NIH director Dr. Francis Collins and guitar "Rosalind" join Ma and cello "Sweetie Pie" to explore music's interaction with the brain and culture at a recent lecture in Masur Auditorium. At right, Ma interacts with audience members including NIDDK's Dr. Phillip Gorden.

PHOTOS: ERNIE BRANSON

Ma

CONTINUED FROM PAGE 1

and played part of a prelude to a Bach cello suite.

"The piece doesn't make us feel excited," Ma said. "The patterns, with note changes at irregular intervals, suggest calm and the idea of infinite variety." The audience absorbed this idea of infinity—in the sense that they didn't want his playing to end. Nor did Collins.

"Don't put that away," implored Collins as Ma laid down his cello. Collins asked, after all these years of performing, "Are you ever tempted to tinker with the Bach suites?"

"I think of notes as code," said Ma.

NCATS director Dr. Chris Austin engages Ma for a selfie, following the recent Rall Cultural Lecture.

"Sometimes the code is so good, it works, but then you have to translate it through engineering and into physical space."

Even skilled musicians can learn a new trick. Ma recounted meeting someone in the Boston Symphony Orchestra who suggested that all down bows should be up bows. While playing at a recent festival, he took the suggestion and liked the result.

"It was a simple thing but a massive recalculation that makes one part of your brain go crazy," Ma said. "Some [small] changes make a big difference."

There's a science behind the brain's reaction to music. The auditory cortex and other parts of the brain are wired for music, said Collins. While a person is enjoying music that is particularly moving, brain cells in the ventral striatum release dopamine, a neurotransmitter associated with pleasure, giving us literal chills.

"I've been thinking lately that music in some ways is something that was created as a societal pill," said Ma.

"But sometimes the pill tastes bitter when it's something we're not familiar with," said Collins. "What happens when everyone's idea of what sounds good is not coherent?"

Ma answered with his cello. He played a scale that sounded out of tune to us because it was Persian. He then played a melody based on that scale. He said, "You've taken what was strange and out of tune and slightly ugly into the realm of 'Oh my gosh, that's beautiful.'"

Nearly 20 years ago, Ma founded the Silk Road Ensemble, featuring dozens of musicians who perform music from communities along the ancient Silk Road trade route that connected Europe to East Asia. His interest in uniting musical cultures grew out of his own experience. Born to Chinese parents living in Paris, he moved to the United States with his family when he was a child.

"I'm an immigrant," he said. "It means you arrive from someplace you know to a place you don't know."

Ma said he's long been fascinated with the idea of something foreign evolving into something familiar that eventually becomes part of our psyche. Collins said that also happens a great deal in science.

"The dream of most scientists is to discover something that upends current dogma about some aspect of life science that everyone always accepted," said Collins. "Those big shifts require compelling evidence. People don't necessarily want to stop listening to the music of science that they were familiar with and

• • •

"I think of notes as code. Sometimes the code is so good, it works, but then you have to translate it through engineering and into physical space."

-YO-YO MA

• • •

Sharing his thoughts with an NIH audience, Ma says, "Philosophically, if you go deep enough into any one [musical] code, you can discover the universe."

listen to a new tune."

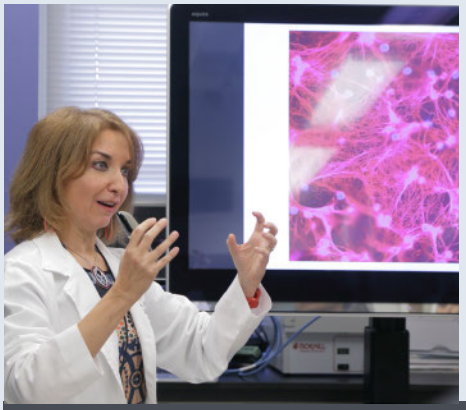
Great improvements, said Ma, can come from collaboration. He said his cello was crafted in Cremona, Italy, at a time when apprenticeships were popular and the quality of instruments peaked, between 1695 and 1735. But then instrument makers around the world began competing for business and keeping secrets.

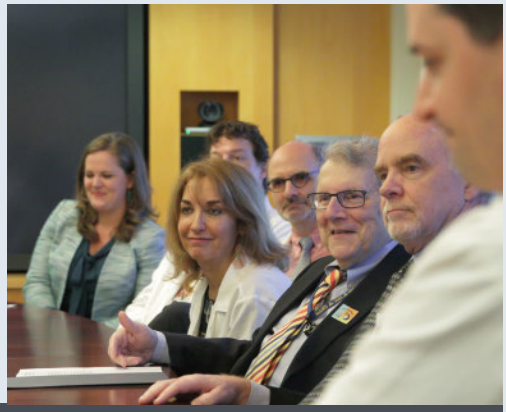
"There's a lesson here about science, I think," interjected Collins.

In the ensuing two centuries, Ma said, the quality of instruments plummeted. In the 1970s, however, apprenticeships resumed around the world; knowledge flowed and the quality of instruments dramatically improved.

At the end of their enlightening dialogue, Collins chose a Civil War-era song for a duet. Its chorus summed up the sentiments of the morning's conversation as Collins sang, "It sounds an echo in my soul; how can I keep from singing?"

As a song or symphony unfolds, it can take us on a musical journey somewhere new or to somewhere familiar and comforting, evoking a range of moods. Said Ma, "Philosophically, if you go deep enough into any one [musical] code, you can discover the universe."





Dr. Mariana Kaplan (l) displays immunofluorescence images depicting neutrophil extracellular traps (NETs), critical mediators of vascular damage in lupus patients. At right, NIAMS director Dr. Stephen Katz (third from r) participates in a question-and-answer segment.

PHOTOS: BILL BRANSON

Congressional Staff Tour NIAMS Labs

NIAMS recently welcomed congressional staff to the Clinical Research Center to learn more about NIH and NIAMS. The biennial event is sponsored by the NIAMS Coalition, an independent consortium of approximately 90 professional and voluntary organizations whose goal is to raise awareness about NIAMS research.

Six congressional staffers took part in the visit, representing members from appropriations and authorizing committees, as well as personal offices. NIAMS Coalition co-chairs Mary Wheatley of the Rheumatology Research Foundation and Robert Riggs of the Scleroderma Foundation also participated in the event.

NIAMS scientific director Dr. John O'Shea introduced participants to the breadth of the work the intramural research program supports, from the basic and cellular level all the way to the clinic.

Dr. Michael Ombrello, head of the translational genetics and genomics unit, led a series of presentations with an overview of how his team is gaining new insights into the mechanisms that underlie inflammatory and autoimmune conditions.

Dr. Robert Colbert, chief of the Pediatric Translational Research Branch, discussed his latest research to understand how genetic susceptibility and changes in the microbiome intersect and may contribute to the development of certain types of arthritis.

Dr. Mariana Kaplan, chief of the Systemic Autoimmunity Branch, described her groundbreaking advances in the understanding of how diseases such as lupus, rheumatoid arthritis and vasculitis develop and how they can cause organ damage.

Dr. Peter Grayson concluded the lab presentations by discussing the importance of collaborative science for investigating rare diseases. He focused on the NIAMS Vasculitis Translational Research Program that he established in 2013 to develop clinical and translational research initiatives across many types of systemic vasculitis.

Following the lab tour, the group reconvened for a discussion led by NIAMS director Dr. Stephen Katz. Topics ranged from engaging and supporting the next generation of scientists and enhancing diversity in the biomedical workforce to reporting outcomes of research to the public.

Katz and deputy director Dr. Robert Carter (standing, 10th and 12th from l) with congressional staff, NIAMS Coalition members and NIAMS staff at the recent NIAMS Tour Day

Chou

CONTINUED FROM PAGE 1

addiction and overdose. Common opioids include hydrocodone, oxycodone, fentanyl and morphine. How can health care providers and their patients with chronic pain, which differs from acute pain, evaluate these drugs and other potential treatments so that care can be as effective and safe as possible?

Dr. Roger Chou, an expert on clinical guidelines and systematic reviews on health topics, provided insights in a recent lecture at NIH. He focused on clinical practice guidelines for primary care providers on opioid treatment of adults with chronic pain. The guidelines coauthored by him were released by the Centers for Disease Control and Prevention last March. Chou is professor of medicine at Oregon Health & Science University, director of the Pacific Northwest Evidence-based Practice Center and a board-certified internist. His talk was part of the Integrative Medicine Research Lecture Series sponsored by NCCIH, whose research portfolio has a major emphasis on pain management.

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"We in the U.S. prescribe more opioids than any other nation, our chronic pain status is not better than [anyone else's] and we have a lot more opioid-related deaths and addiction."

-DR. ROGER CHOU

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Chou took listeners down what might be described as a 4-lane highway, with one lane being opioids, the second non-opioid drugs and the third nondrug therapies ranging from cognitive behavioral therapy (CBT) and exercise to acupuncture and spinal manipulation. The fourth lane was his team's findings supporting a multimodal approach to chronic pain that does not rely exclusively on opioids. Much of the "scenery" included harms being done to individuals and society from the nation's opioid epidemic.

According to statistics from the CDC, from 2000 to 2010 the rates of opioid prescriptions, opioid-related deaths and admissions for opioid use disorder all quadrupled. In addition, since 2008, opioid-related deaths have displaced motor vehicle accidents as the leading cause of accidental death in most states. A SAMHSA survey found that, in 2010, about one in 12 children in junior high or high school used a pain medication not prescribed for them. In a nutshell, Chou said, "We in the U.S. prescribe more opioids than any other nation, our chronic pain status is not better than [anyone else's] and we have a lot more opioid-related deaths and addiction."

In earlier research presented in 2014 at NIH's workshop Pathways to Prevention: The Role of Opioids in Treatment of Chronic Pain and in developing the guidelines, Chou and his colleagues did not find strong support that opioids work for chronic pain. They did, however, find support for treatment options that work about as well (alone or in combination) as opioids and are safer. This is captured in the CDC guidelines' first of 12 recommendations:

"Non-pharmacologic therapy and non-opioid pharmacologic therapy are preferred for chronic pain. Clinicians should consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh risks to the patient. If opioids are used, they should be combined with non-pharmacologic therapy and non-opioid pharmacologic therapy, as appropriate."

"This is one of our most important recommendations," said Chou, "to try to use the non-opioid therapies as much as possible. We know that a lot of them are similar, or only slightly [less effective] compared with opioids, and have fewer serious side effects. Nobody overdoses, for example, from too much CBT or too much massage." Among other options, he said, are acupuncture, tai chi, mindfulness meditation and relaxation techniques, as well as drugs that are not opioids but treat pain (e.g., acetaminophen, NSAIDs and certain antidepressants and anticonvulsants).

Chou chats with NCCIH director Dr. Josephine Briggs.

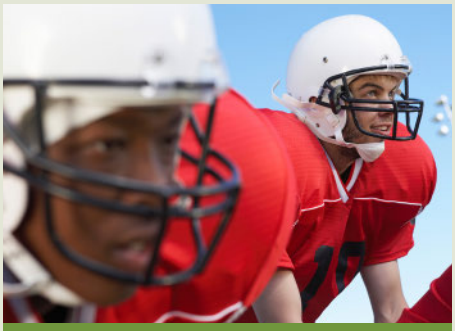
PHOTOS: ERNIE BRANSON

Such therapies can also support clinicians' efforts to decrease dosages of opioids in pain patients who have been taking them long-term and thus inevitably develop tolerance. "I tell my patients on high doses that it is like they are going 150 mph [with opioids]; even if they haven't had an accident yet, they are at risk for one," said Chou. "If, by working together, we can get down to 130 mph or lower, that's progress." Since it can be difficult for patients to access many of these nondrug therapies, Chou added, policy and implementation research are needed to move toward the optimal approach described in the CDC guidelines.

Many complementary therapies have been evaluated in pain studies, Chou said, recapping the evidence. When making decisions, he urged, "Consider which ones have the greatest benefit relative to risks. Benefits may vary based on patients' expectations. We also think it makes sense to prioritize therapies that are more active [for the patient] than passive and that focus on movement and function. Just giving someone a pain medication is not going to address the psychosocial factors that we know are so important in contributing to pain, or the psychological comorbidities extremely important in people with pain."

Chou concluded, "The available evidence suggests that the potential benefits of opioids are, at best, finely balanced with the harms. I think this supports the approach in the CDC guidelines, including use of non-opioid treatment for chronic pain rather than always throwing opioids at these patients."

The full lecture is available at https://videocast.nih.gov/Summary.asp?Live=20079&bhcp=1.



NIH researchers found a blood protein that could help with sports-related concussion.

Biomarker in Blood May Help Predict Recovery Time for Sports Concussions

Researchers at NIH have found that the blood protein tau could be an important new clinical biomarker to better identify athletes who need more recovery time before safely returning to play after a sports-related concussion.

The study, supported by NINR with additional funding from NICHD, was published online in the Jan. 6 issue of *Neurology*, the medical journal of the American Academy of Neurology.

Despite the millions of sports-related concussions that occur annually in the U.S., there is no reliable blood-based test to predict recovery and an athlete's readiness to return to play. The new study shows that measuring tau levels could potentially be an unbiased tool to help prevent athletes from returning to action too soon and risking further neurological injury.

"Keeping athletes safer from long-term consequences of concussions is important to players, coaches, parents and fans," said NINR director Dr. Patricia Grady. "In the future, this research may help to develop a reliable and fast clinical lab test that can identify athletes at higher risk for chronic post-concussion symptoms."

Athletes who return to play before full recovery are at high risk for long-term symptoms such as headaches, dizziness and cognitive deficits with subsequent concussions. About half of college athletes see their post-concussive symptoms resolve within 10 days, but in others, the symptoms become chronic.

Tau is also connected to development of Alzheimer's and Parkinson's diseases and is a marker of neuronal injury following severe traumatic brain injuries.

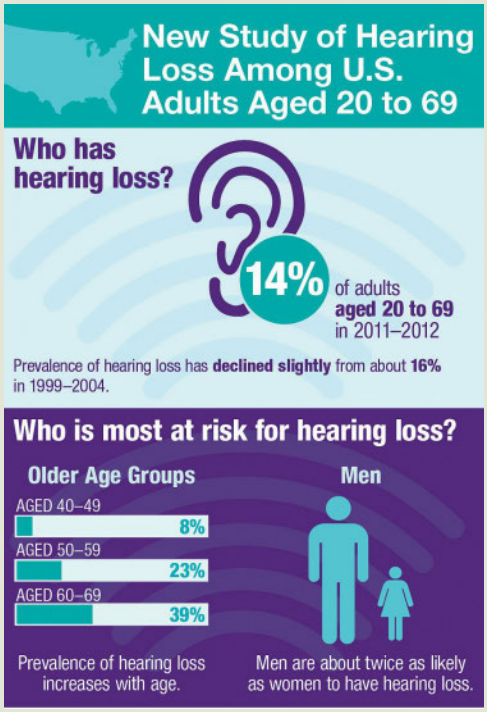
In the study, led by NIH Lasker clinical research scholar Dr. Jessica Gill, chief of the NINR brain injury unit, researchers evaluated changes in tau following a sports-related concussion in male and female collegiate athletes to determine if higher levels of tau relate to longer recovery durations.

"Incorporating objective biomarkers like tau into return-to-play decisions could ultimately reduce the neurological risks related to multiple concussions in athletes," Gill said.

Hearing Loss Prevalence Declining in U.S. Adults Ages 20-69

Hearing loss among U.S. adults ages 20 to 69 has declined over the last decade, even as the number of older Americans continues to grow. These findings, published Dec. 15 in *JAMA Otolaryngology–Head & Neck Surgery*, also confirm that hearing loss is strongly associated with age and other demographic factors such as sex, race/ethnicity and education. Noise exposure, which is potentially preventable, was also significant but less strongly associated after adjustment for other factors. The research was supported by NIDCD and the National Institute for Occupational Safety and Health.

The researchers found that the overall annual prevalence of hearing loss dropped slightly, from 16 percent to 14 percent, or 28 million adults, in the 1999–2004 period versus 27.7 million in the 2011–2012 period. This decline in absolute numbers was observed despite an increase in the population generally and in the relative number of adults ages 50 to 69 in the more recent time period. The new results are consistent with previous findings showing improvements in hearing over time, when researchers compared NHANES data from 1999 to 2004 with data from 1959 to 1962.



"Our findings show a promising trend of better hearing among adults that spans more than half a century," said Howard Hoffman of NIDCD's Epidemiology and Statistics Program. "The decline in hearing loss rates among adults under age 70 suggests that age-related hearing loss may be delayed until later in life. This is good news because for those who do develop hearing loss, they will have experienced more quality years of life with better hearing than earlier generations."

The researchers do not know the reason why hearing loss prevalence is declining but speculate possible factors could include fewer manufacturing jobs, increased use of hearing protectors, less smoking and advances in health including better medical care to manage risk factors associated with hearing loss.

Early-Phase Trial Shows Shrinkage in Pediatric Neural Tumors

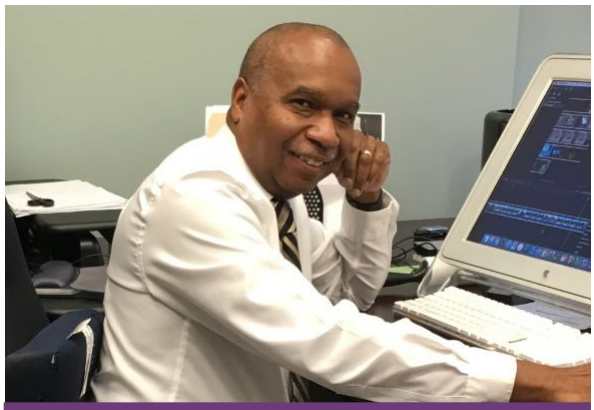
In an early phase clinical trial of a new oral drug, selumetinib, children with the common genetic disorder neurofibromatosis type 1 (NF1) and plexiform neurofibromas, tumors of the peripheral nerves, tolerated selumetinib and, in most cases, responded to it with tumor shrinkage. NF1 affects 1 in 3,000 people. Study results appeared Dec. 29 in the *New England Journal of Medicine*.

The multicenter phase I clinical trial, which included 24 patients, was led by Dr. Brigitte Widemann of NCI's Pediatric Oncology Branch, and was sponsored by NCI's Cancer Therapy Evaluation Program.

The study, conducted at the Clinical Center and three participating sites, took advantage of techniques developed by Widemann's team that enabled precise measurement of the plexiform neurofibromas. Experiments in mice that developed neurofibromas due to genetic modifications were performed at Cincinnati Children's Hospital in the laboratory of Dr. Nancy Ratner.

Plexiform neurofibromas develop in up to 50 percent of people with NF1. The majority of these tumors, which can cause significant pain, disability and disfigurement, are diagnosed in early childhood and grow most rapidly prior to adolescence. Complete surgical removal of the tumors is rarely feasible; incompletely resected tumors tend to grow back.

The primary aim of the clinical trial was to evaluate the toxicity and safety of selumetinib in patients with NF1 and inoperable plexiform neurofibromas, and, encouragingly, most of the selumetinib-related toxic effects were mild.



OCPL's Calvin Jackson bade farewell to NIH last month.

THAT'S A WRAP

Long-Time Comms Leader Jackson Retires

BY DANA TALESNIK

Why is this man smiling? For starters, he retired in December. But throughout his distinguished 35-year NIH communications career, Calvin Jackson often smiled and appeared mysteriously calm, even under tight deadlines. His positive leadership style remained a constant source of inspiration, one of many attributes for which he'll be missed.

Jackson, deputy NIH associate director for public affairs, had previously served as chief of the News Media Branch in the Office of Communications and Public Liaison, OD, for 8 years. Throughout his career, he produced a variety of NIH audiovisual and other media projects.

"Calvin is remarkable for not only what he accomplished here at NIH, but how he worked with others, which was always with grace," said John Burklow, NIH associate director for communications and public liaison. "He is one of the kindest, most thoughtful people at NIH."

"In a place filled with talented and dedicated people, Calvin Jackson stands out," said NIAID director Dr. Anthony Fauci. "I have had the pleasure of working with Calvin since 1982, and I have always been so impressed with his collegiality, his conscientiousness and his love for this great institution. I will miss him greatly and wish him all the best as he embarks on this exciting new chapter."

At a retirement party for Jackson, NIH director Dr. Francis Collins noted, "Have you ever seen Calvin get really rattled by anything? I've tried really hard, shared my hare-brained ideas at the last minute, but he would always just nod and smile."

Jackson reflected on a career that not only connected him to valued colleagues but also had impact on the public. "When I think about NIH, who can argue with our mission?" he said. "It doesn't matter your political affiliation. Everyone wants better health, to live longer and healthier."

Some stories took him in unexpected directions. About 20 years ago, Jackson produced a radio segment on the lack of minorities on organ and marrow donor registries. The story inspired him to get his bone marrow tested. Two years later, he was a match. He then became the first donor to serve as a board member of the National Marrow Donor Program.

One of his proudest achievements, Jackson said, was completing the ReadyCam studio in Bldg. 31. Researchers and institute directors now can do multiple live broadcasts right from NIH.

Building the studio became more of a hands-on project than Jackson expected. When the project manager left halfway through the job, Jackson quickly had to learn about wiring, carpentry and other facets of building a studio from the ground up.

Another proud feat was LabTV, an effort to collect video vignettes intended to inspire a new generation of scientists; Jackson produced almost 1,000 of them with NIH investigators. "LabTV was one of Calvin's major accomplishments in recent years," said Burklow.

Jackson inspired many people through the years with his involvement in NIH's Management Intern Program. "He's long been a champion of career development and strengthening diversity in the workforce," said Burklow.

Dr. Marin Allen, OCPL deputy associate director and long-time colleague, noted, "Calvin has an extraordinary ability to truly listen to what people are saying about their needs and their aspirations, especially young people."

One of Jackson's mentees is audiovisual production specialist Woleola "Wally" Akinso. "Calvin often gave me tasks I didn't think I could handle because he believed in me," he said. "Calvin's respect for you makes you want to go the extra mile."

Upon retirement, Jackson hopes to develop a mentorship program in the Lewes, Del., area where he and his wife now live.

"A lot of kids don't see college as a viable option," Jackson said. "I'd like to make college not the exception but what everyone should be aiming for."

He first came to NIH as a summer intern at the *NIH Record*. He was a physics major at Tougaloo College in Mississippi but, after writing articles and snapping photos, realized communications might be the career for him. He spent his last 2 summers during college as a writer at NIH's neurology institute. He was then hired as an editorial assistant at the National Institute on Aging.

"Calvin's colleagues in the NIH community will remember him as someone who was great—and great fun—to work with," said Marian Emr, NINDS communications director, who was his supervisor at NIA. "But what will long be remembered is his legacy of quality radio, TV and online programming that tell the NIH story to audiences around the country and the world."

While working at NIH, Jackson participated in a 6-month internship program at WTTG-TV to get television experience. The station then hired him as an assistant producer for weekend news.

"For 3 years, I worked 7 days a week: here at NIH during the week and at the TV station on weekends," Jackson recounted. "I loved my time at WTTG but I finally decided I needed a life."

He then migrated to OD, which started producing a radio program on health for local radio station WGMS-FM.

"What changed my career path was getting into the Management Cadre Program at NIH," said Jackson. The program introduced him to several OD offices. "It gave me a broader idea of what happens here."

Colleagues have long been impressed with Jackson's composure, no matter how hectic the workload. "He's never annoyed. He never complains," said Akinso. "I always was impressed by his even-keel leadership style, his humility and his kindness."

"He's always cool, calm and collected," said Burklow. "With Calvin, there's no drama. I really appreciate that in this line of work. He's also completely reliable. We'll miss his positive presence."

Jackson said he plans to decompress for a while but looks forward to doing more oil painting, a longtime hobby, getting involved with his local church, playing tennis and traveling.

Putnam Retires After 42 Years at NIH

BY ERIC BOCK

Israel Putnam, "the Cal Ripken Jr. of radiation safety," retired recently.

The Cal Ripken Jr. of radiation safety has hung up his cleats.

On Jan. 2, Israel Putnam retired as radioactive material supply management officer in ORS's Division of Radiation Safety, Materials Control and Analysis Branch. His wife nicknamed him the Ripken of radiation safety because both men spent their entire careers in one place.

Putnam was in charge of the radioactive material inventory used in biomedical research at NIH. Radioactive materials are used for cancer treatments, biological research and in medical imaging. Most of the radioactive material at NIH is not dangerous if handled properly, he noted.

He kept track of all radioactive materials coming in and out of NIH and how they were used. He also helped ensure that NIH was in compliance with Nuclear Regulatory Commission regulations.

"Israel has been a stalwart employee of DRS and long ago established himself as the subject matter expert on radioactive materials shipping/receiving," said Cathy Ribaudo, director of the Division of Radiation Safety. "Over the past 40 years, he has likely spoken with every single principal investigator who has ordered radioactive material for his or her lab and every purchasing agent who has procured it. He's had an amazing career and I'm deeply appreciative of his many years of service to NIH."

After he graduated from Paint Branch High School in Burtonsville, Md., Putnam began working at NIH as a radioactive waste physical science aid. He worked part-time and took college courses at night. Two years later, he became a full-time employee.

"I got married young, so I had kids young. I had to work," he said.

When he first started, his division handled 35,000 shipments of radioactive material a year. They don't process that many anymore, but Putnam was just as busy as ever. The NRC requires more information about NIH's nuclear materials than before. He didn't enjoy enforcing the rules, but knew that he had to in order to advance NIH's mission.

When a shipment of radioactive material for patients arrived, Putnam and his staff delivered it as fast as possible. Some drugs, for example, have a half-life of 3 hours, which means they become ineffective quickly. Putnam ensured that the packages arrived on time—even if he had to deliver them personally.

Last winter, a snowstorm dumped 2 feet of snow on campus. Although federal offices were closed for 2 days, the Clinical Center stayed open. Researchers still needed their shipments. Putnam dug himself out of his neighborhood in Burtonsville, drove to Bethesda and delivered the goods.

"If I need to be here, I'm going to be here," he said.

Once, he came into work to solve a problem on the same day his daughter was born. When his daughter was getting married, he oversaw the shipment of a 35-ton cyclotron from NIH to a laboratory in Idaho.

In retirement, he plans on fixing up his townhouse in Burtonsville. A year and a half ago, his wife passed away, so he'll spend time with his children, Andrea and Michael, and his two grandchildren. In 2017, he'll spend January in Las Vegas and March in Daytona Beach. And in August, he'll be in Wyoming to watch the total solar eclipse.

"I get to miss most of winter this year," he exclaimed.

Bennett Named Director of CSR Scientific Review Evaluation

Melinda Bennett has been named director of scientific review evaluation activities (SREA) at the Center for Scientific Review. This group manages costs, contracts, payments and non-federal travel associated with NIH peer review meetings for CSR and 23 other NIH institutes and centers. Bennett previously served as deputy director in SREA. She has had a 10-year tenure at CSR. She started her career at NIH in 1995 as animal resource program coordinator for the intramural research program at the National Eye Institute.

NIAID's Belkaid Receives Sanofi–Institut Pasteur Award

Dr. Yasmine Belkaid, chief of the mucosal immunology section in NIAID's Laboratory of Parasitic Diseases, has been awarded one of four Sanofi–Institut Pasteur 2016 International Awards. Belkaid received the International Mid-Career Award for her contributions to the field of immunology. Each year, these awards honor four scientists "whose outstanding research in the life sciences is contributing to progress in global public health." The award was presented on Dec. 13 in Paris, France.

Belkaid, shown at right with Dr. Staffan Normark of the award jury, obtained her Ph.D. in 1996 from the Pasteur Institute in France on innate responses to Leishmania infection. Following a postdoctoral fellowship at NIAID on immune regulation to infection, she joined the Children's Hospital Research Foundation in Cincinnati as an assistant professor in 2002. In 2005, she joined the Laboratory of Parasitic Diseases as a tenure-track investigator and became a tenured investigator in 2008. Since 2007, she has worked as an adjunct professor at the University of Pennsylvania. Her work explores the role of the microbiota and nutrition in the control of immunity to infection.

PHOTO: F. GARDY, INSTITUT PASTEUR

Malaria Study Seeks Adults

Researchers at the Clinical Center are recruiting healthy adults, ages 18-50, to undergo an initial assessment to determine if they will qualify for future malaria studies. These studies may involve evaluation of experimental medications, vaccines and vaccine strategies to prevent malaria. Compensation is provided for participation. For more information, call 1-866-444-2214 (TTY 1-866-411-1010). Refer to study 16-I-0039.

Study Needs Teen Girls

NICHD seeks adolescent girls above average weight, 12 to 17 years old, to join a study testing whether an attention training program on a smartphone will influence teens' eating habits. Compensation will be provided. Parents/guardians must give permission for children to participate. For more information, call 1-866-444-2214 (TTY 1-866-411-1010) and refer to study 17-CH-0014.

Healthy Children Sought

NICHD seeks healthy children 8 to 17 years old to join a research study of growth and health behaviors. Compensation will be provided. Parents/guardians must give permission for children to participate. For more information, call 1-866-444-2214 (TTY 1-866-411-1010) and refer to study 15-CH-0096.

NIAID Seeks Healthy Volunteers

NIAID study seeks healthy adult volunteers, 18-64 years old. Researchers want to better understand the effects of glucocorticoids on the body. These medications are commonly used to treat conditions that cause inflammation on the skin and in the body like lupus, asthma and eczema. This research may help us find better treatments for people with conditions that cause inflammation. Participants will receive one intravenous dose of a glucocorticoid and a glucocorticoid cream will be applied to a small area of the skin. Blood and skin samples will be collected. Two outpatient visits at the Clinical Center are required. Compensation is provided. For more information, contact the Office of Patient Recruitment, 1-866-444-2214 (TTY 1-866-411-1010). Refer to study 16-I-0126.

NIEHS Celebrates 50-Year Anniversary

BY JOHN YEWELL

Recently, dignitaries, invited guests, retirees, former directors, staff and others gathered to celebrate the National Institute of Environmental Health Sciences' golden anniversary. The event highlighted the positive impact NIEHS has had on the world over the past 50 years.

NIEHS and National Toxicology Program director Dr. Linda Birnbaum kicked off the ceremony. "I see this as an opportunity to highlight the public health improvements that are the direct result of environmental health science and our research," she said. "We want our work to make a difference in people's lives."

"I've been with NIH for about 10 years," said Dr. Molly Puente of the Division of Extramural Research and Training. "This gives me much more perspective on where this institute has been and where we're going."

Former North Carolina Gov. Jim Hunt recounted the role played by his predecessor Terry Sanford in bringing NIEHS to North Carolina. Hunt offered praise for the institute's work. "It is vital to the future of mankind," he said. "You've had a great 50 years and we've got to work on making the next 50 even better."

Ira Flatow, executive producer and host of *Science Friday*, a public radio program that brings discussion on science, technology, health, space and the environment to people worldwide, gave a presentation on how science reaches the public.

He encouraged scientists to be eager to tell their stories. "You have to get past the myth that people don't love science," Flatow said. "They will inhale as much science as you can give them—if you know how."

The centerpiece of the celebration was the presentation of 12 Champion of Environmental Science Research awards by Dr. Carol Folt, chancellor of the University of North Carolina at Chapel Hill.

"Your groundbreaking work has quite literally made the world a safer place," she said. "No one has met this challenge more than the 12 people we are honoring today." To learn more about the award recipients, visit www.niehs.nih.gov/news/newsletter/2016/12/.

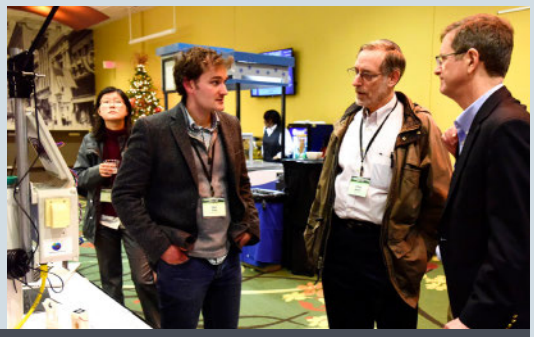
Following the awards presentation, Joe Graedon and Dr. Terry Graedon, the husband and wife team behind *The People's Pharmacy*, drove home the importance of mainstreaming science. "What you do here really affects people's lives," said Joe. "People care about the environment and how it affects their health," Terry added.

ABOVE: "Only about 5 percent of Americans get their science in school," said guest speaker Ira Flatow. "They're getting it informally in science museums, on the Internet, on vacation." RIGHT: NIEHS/NTP director Dr. Linda Birnbaum saluted the champion awardees for their remarkable history of accomplishment.

PHOTOS: STEVE MCCAW

Emphasizing the theme of public outreach, Rep. David Price, who represents North Carolina's fourth district, which includes NIEHS, said that scientific research forms the bedrock of U.S. leadership in world affairs. "Our greatest strength for many decades has been our public/private research enterprise," he said. "I couldn't be prouder to represent this institution and the people who work here."

Following a video salute from actress Jessica Alba and Christopher Gavigan, founders of The Honest Co. and supporters of the event, Birnbaum expressed her appreciation to everyone who had helped make the day—and the past 50 years—so special. "Everyone here in this room, all my NIEHS family, have made such a difference for the world," she said. "And I want to thank you all."



At left, history buff John Schelp, from the NIEHS Office of Science Education and Diversity, leads walking tours of downtown Durham, starting off at the historic Carolina Theater, next door to the convention center. Right, at the sensors and technologies fair, Dr. Eben Cross (l), senior scientist at Aerodyne Research, Inc., describes the ARISense system, which measures gas phase pollutants, particulate matter and weather data.

PHOTO AT RIGHT: STEVE MCCAW

First Environmental Health Science FEST a Success

More than 1,200 people from across the nation joined in the first-ever Environmental Health Science FEST held recently in Durham, N.C. The NIEHS Division of Extramural Research and Training planned the event in recognition of the NIEHS 50th anniversary.

The event included more than 250 posters, a sensors and technologies fair, a film festival, walking tours of downtown Durham and an evening 3-minute science talk competition.

Participants included representatives from federal agencies including the Environmental Protection Agency, CDC and the Agency for Toxic Substances Disease Registry.

Discussions of how NIEHS-funded research fits within the larger biomedical research enterprise shaped one session, featuring representatives from NIH and six scientific societies.

Dr. Matt Gillman, director of the NIH Environmental influences on Child Health Outcomes (ECHO) program, participated via video. He spoke of the developmental origins of health and disease, saying that ECHO will work to understand the risks and to whom they apply, take action through clinical trials and practices and help fill unmet scientific needs.

Representatives of scientific societies also weighed in, including the International Society of Environmental Epidemiology, International Society of Exposure Science (ISES), American Public Health Association, Society of Toxicology, American Thoracic Society and Environmental Mutagenesis and Genomics Society (EMGS).

Both ISES and EMGS will hold their 2017 annual meetings in nearby Raleigh, offering a chance for members to strengthen connections made at EHS FEST.—**Kelly Lenox**