



## ‘ILL-CONCEIVED, WELL-DRAWN’ ‘Graphic Medicine’ Exhibition Opens at NLM

BY CARLA GARNETT

In an era when digital info rules and high-tech is titan, an emerging approach in health communication is leading us literally back to the drawing board. “Graphic medicine”—a field using comics to convey messages about wellness and illness—has burgeoned over the last decade and a new installation at the National Library of Medicine is giving it a close-up.

“In this day and age when we are so focused at NIH on data-driven discovery, to realize a whole new genre as data is out there waiting for us is extremely exciting,” said

NLM director Dr. Patricia Flatley Brennan, opening a special public program recently in conjunction with the exhibition, “Graphic Medicine: Ill-Conceived & Well-Drawn.”

The term graphic medicine isn’t exactly new. Welsh physician-artist-writer Ian Williams coined the phrase in 2007 to describe the comics—images sequentially paired with words to tell a story—that he and others were creating to depict their experiences in health care. A website he developed using the term caught the attention of like-minded artists, writers, care providers and educators whose professional and personal lives had also led them to communicate medical topics through comics. They held the first conference on comics and medicine in 2010. That launched the graphic medicine movement.

NLM invited several of the field’s pioneers to an event in Lister Hill Auditorium to talk

SEE GRAPHIC, PAGE 6



Artist and author Ellen Forney served as guest curator of the NLM graphic medicine exhibition.

### IN THE MOOD

## Neuroscientist Takes a Gamble on Happiness

BY DANA TALESNIK



Dr. Robb Rutledge

Are you happy now? That probably depends on many things including recent events, your choices and expectations. As circumstances change over time, so might your mood. Given certain

variables, can we predict how emotions might fluctuate?

Neuroscientist Dr. Robb Rutledge is studying what determines our emotional

SEE RUTLEDGE, PAGE 4

## Weiss Describes Alternatives To Bariatric Surgery

BY ERIC BOCK

Minimally invasive trans-arterial instruments guided by imaging technology may provide a way to block the flow of blood to parts of the stomach that produce the hormone that signals the brain to feel hunger. That, in turn, can help patients lose weight, said Dr. Clifford Weiss at a recent Clinical Center Grand Rounds in Lipsett Amphitheater.

Ten years ago, interventional radiology and treatment of obesity were two concepts “that wouldn’t seem to have gone well together—or



Dr. Clifford Weiss



NIH Pavilion smells success at festival; see p. 12.

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## Asian American Heritage Month Celebrations Set, May 9 and 23

The NIH chapter of the Federal Asian Pacific American Council invites NIH'ers to a 2018 HHS Asian American Pacific Islander Heritage Month observance on Wednesday, May 9 from 9 a.m. to 1 p.m. in Wilson Hall, Bldg. 1.

Featured speakers include Holly Ham, executive director, White House Initiative on Asian Americans and Pacific Islanders, and Dr. Matthew Y.C. Lin, HHS deputy assistant secretary for minority health. There will be a networking session from noon to 1 p.m.

Register online through the Learning Management System. Registration is not required to view via <https://videocast.nih.gov/>.

This year's Asian Heritage Celebration at NIH, on Wednesday, May 23 from 11:30 a.m. to 1:30 p.m. on the Bldg. 31 patio, will feature a fashion show. Attendees will see colorful clothing and costumes from several traditions including Chinese, Vietnamese, Filipino and Indian, as modeled by volunteer NIH staff.

The NIH Asian and Pacific Islander American Organization has sponsored annual observances of Asian American history and heritage at NIH for many years. Enjoy traditional Indian dance and a Chinese music ensemble. You can learn about Chinese calligraphy and Japanese origami and participate in a tai chi group exercise. Asian foods, as well as jewelry and accessories, will be available for sale. Several NIH organizations, institutes and centers will also have information tables.

## NIH Holds 11th Annual Career Symposium

The NIH Office of Intramural Training & Education invites all NIH graduate students and postdoctoral trainees, both basic scientists and clinicians, to participate in the 11th annual NIH Career Symposium on Friday, May 18 at Natcher Conference Center from 8:30 a.m. to 5 p.m. The symposium provides an opportunity for fellows and graduate students to learn about scientific career options and explore factors that lead to career success. The all-day program will include more than 20 breakout sessions highlighting career opportunities available to biomedical scientists.

Panel sessions cover academic, government, industry and non-profit career paths. More than 80 speakers will provide insights into their careers. For more information and registration visit <https://www.training.nih.gov/>.

## Public Service Recognition Week Offers Outlets for Pride

May 6-12

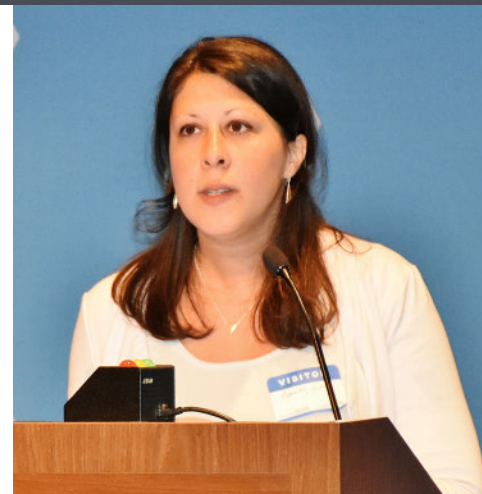
Every year since 1985, a week in early May has been set aside as Public Service Recognition Week, a time to thank dedicated public servants from federal, state and local governments across the country.



## Trading Lab Life for Careers in Science Writing, Policy

The NIAMS Intramural Research Program Career Development and Outreach Branch recently hosted a forum on career paths to science policy and science writing. Intramural trainees heard from the American Association for the Advancement of Science's Office of International and Security Affairs deputy director Dr. Mahlet Mesfin (bottom, l), American Geophysical Union public information specialist/writer Lauren Lipuma (bottom, r) and NIAMS science policy analyst Dr. Stephanie Burrows (above, l) about hanging up their lab coats to pursue careers in science policy, diplomacy and communications. In addition to introducing skills and competencies needed for a successful transition, the presenters discussed ways to find and secure policy and writing jobs and the importance of networking with leaders in the field. Following featured talks, participants had the opportunity to engage directly with speakers, shown above.

PHOTOS: COLLEEN DUNDAS



During this special week, you have an opportunity to share your pride in your public service. One way you can do that is by participating in NIH's photo campaign for Public Service Recognition Week. Here's how it works:

- Take a photo with your completed "I Heart Public Service" template at <https://hr.nih.gov/about/events/psrw/PSRW>.
- Post your photo on Facebook, Twitter or Instagram using the following hashtags: #NIH, #HHS, #PSRW and #Proud2ServeUSA. The #NIH hashtag allows NIH to find its employees.

• You can also email your photo to [NIHPSRW@nih.gov](mailto:NIHPSRW@nih.gov). Images will be posted on NIH social media outlets.

Another way to participate is by thanking others for their service with the Public Service Star Awards to recognize your coworkers for their outstanding public service. The Star Awards can be found at the same link as I Heart Public Service.

If you have questions or would like more information, contact Anait Freeman at [anait.freeman@nih.gov](mailto:anait.freeman@nih.gov). Visit <http://publicservicerecognitionweek.org/> events for a list of local observances. **R**

## Melchers Lecture To Mark Exhibit Opening, May 14

Dr. Fritz Melchers, a professor of immunology at the University of Basel, Switzerland, will deliver a lecture on Wednesday, May 14 honoring the scientific accomplishments of Dr. Michael Potter, the Lasker award-winning NIH scientist who helped establish the field of monoclonal antibodies, largely seen as one of the greatest advances in medical research of the 20th century.

Melchers' lecture, from 9:30 to 10:30 a.m. in Lipsett Amphitheater, Bldg. 10, will mark the official opening of twin historical exhibits in Bldg. 10 celebrating the lives of Potter and Nobel laureate Dr. Christian Anfinsen. (This will be the first of two celebratory lectures; the second, honoring Anfinsen, will be held in the fall.)

Melchers is a leading expert in the field of immunology and, in particular, B cell immunology. From 1980 to 2001, he was director of the Basel Institute for Immunology, an organization with more than 300 scientific investigators. During this time, he and Potter held a series of workshops alternating between Bethesda and Basel concerning mechanisms of B-cell neoplasia, a precursor to abnormal tissue growth.

Potter, who died in 2013, was an ingenious and generous researcher whose 50-year career at the National Cancer Institute was distinguished by significant discoveries and superb mentoring. His work focused

## NIMH's Murray To Speak on May 17

Dr. Elisabeth Murray, chief of NIMH's section on the neurobiology of learning and memory and chief, Laboratory of Neuropsychology, will give the 2018 lecture in the Anita B. Roberts Lecture Series: Distinguished Women Scientists at NIH, sponsored by the NIH women scientist advisors committee. Her talk, "Specializations for Decision-Making in Primate Prefrontal Cortex," will be held Thursday, May 17 at 11 a.m. in Lipsett Amphitheater, Bldg. 10. All are welcome.

Murray's research focuses on the neural basis of learning, memory, emotion and decision-making. This work makes use of multiple techniques to examine the dissociable functions of different prefrontal cortex regions and their interactions with various medial temporal lobe structures, especially the amygdala.



Dr. Elisabeth Murray



Dr. Fritz Melchers (l) with NCI's Dr. Michael Potter in 2004 at event marking Potter's 50th year at NIH.

PHOTO: BEVERLY MOCK

primarily on plasma cells, a form of white blood cells that produce antibodies. His 1984 Albert Lasker Award for Basic Medical Research was for his "elegant studies of plasma cell tumors, leading to the development of monoclonal antibodies and enlarging our knowledge of carcinogenesis and the immune system."

The twin exhibits—titled "Curiosity & Collaboration: The Work of Michael Potter" and "Christian Boehmer Anfinsen: Protein Folding and the Nobel Prize"—are positioned in the long, first-floor corridor, just north of the FAES bookstore and are expected to be fully installed by May 14.

Following Melchers' talk, there will be a ceremony to officially open the exhibits for both Potter and Anfinsen.

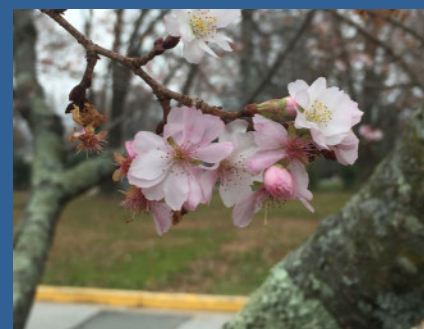
Murray is a fellow of the Association for Psychological Science, Society of Experimental Psychologists, American Psychological Association and American Association for the Advancement of Science. She has served as mentor to numerous trainees, been invited to present lectures worldwide and authored more than 160 peer-reviewed publications.

The seminar series is dedicated to the memory of Dr. Anita B. Roberts, chief of NCI's Laboratory of Cell Regulation and Carcinogenesis from 1995 to 2006. Prior to her death in May 2006, she spent 30 years at NIH as a research leader.

Individuals who need reasonable accommodation to participate should contact Margaret McBurney at (301) 496-1921 and/or Federal Relay, 1-800-877-8339, 5 days before the lecture.

Like Potter, Anfinsen had a long and distinguished career at NIH, first at what was then called the National Heart Institute and later as chief of the Laboratory of Chemical Biology in what is now the National Institute of Diabetes and Digestive and Kidney Diseases. Anfinsen's book, *The Molecular Basis of Evolution*, published in 1959, demonstrated the scientific and disciplinary affinities between molecular genetics and protein chemistry. Anfinsen shared half of the 1972 Nobel Prize in chemistry for "work on ribonuclease, especially concerning the connection between the amino acid sequence and the biologically active conformation."

The exhibits were built by the Office of NIH History and Stetten Museum with funding from NIDDK, NHLBI and NCI. **R**



ON THE COVER: Autumn cherry tree blooms in December.

IMAGE: BRANDON HARTZ, NIH/ORF

## The NIH Record

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## Rutledge

CONTINUED FROM PAGE 1

state, specifically whether we can predict mood changes over time. This research may provide insights into the emotional states and decisions of people with depression, bipolar disorder and other mental health conditions.

Rutledge, principal research associate at University College London's Max Planck Centre for Computational Psychiatry and Ageing Research, built a mathematical model to sum up happiness in terms of rewards and expectations (see below). Think of it as a roll of the dice. The building excitement of whether you'll win a bet and the resultant gain or loss can mimic the oscillating moods inherent in certain mental disorders.

"I think these computational approaches are very powerful for understanding subjective states that are relevant to psychiatry," said Rutledge at a recent NIMH Director's Innovation Speaker Series lecture at the Neuroscience Center. "These tools may help us bridge the gap between neurobiology...and subjective symptoms assessed by clinicians."

Rutledge wanted to test his hypotheses on a large data set. For his purposes, clinical trials had limited reach; it's expensive to collect data from thousands of patients. So Rutledge helped develop a free smartphone app called the Great Brain Experiment ([www.thegreatbrainexperiment.com](http://www.thegreatbrainexperiment.com)), which features cognitive and emotional tasks in the form of games, to augment the research of smaller clinical trials and laboratory studies.

"One thing we can do with smartphones is cheaply collect data among large populations that can help us to answer questions that are important for psychology and psychiatry,"



Rutledge's games can be played on smartphones.

Rutledge said. To date, more than 120,000 people have used the app.

In one game, for example, the player can choose the safe option or spin a wheel to win points, then rates his or her happiness based on the outcomes. The player makes 30 choices and 12 happiness ratings in a 4-minute game.

"We're finding that happiness depends not on how well people are doing in the task, but whether they're doing better than expected," Rutledge said.

His team has replicated this finding in tens of thousands of subjects based on data from the app, which also confirmed results from their smaller lab studies that used brain imaging to show that neural activity in dopamine-related brain areas predicted changes in happiness. This surprised Rutledge because, he said, people playing the app games are anonymous, unpaid and might not answer honestly about their happiness.

"We can think about these tasks that we're running as probes of the neural circuits that underlie psychiatric symptoms," Rutledge said. "One advantage of putting patients in tasks [on their phones] is we can measure how they behave and feel in environments that a clinician wouldn't be able to assess, such as a situation in which they face multiple negative events in a row. We can control their environment because we set up [the game] that way."

A key component in Rutledge's happiness equation is the reward prediction error, the difference between what people expect and what they receive. In our brains, dopamine neurons signal reward prediction errors. Getting an unexpected positive reward boosts dopamine activity, whereas getting a predicted reward doesn't make us quite as happy and keeps dopamine at baseline.

Data from 1,800 players of the Great Brain Experiment, which included more than 400 people diagnosed with depression, showed that reward prediction errors had similar effects on fluctuations in mood in depressed and non-depressed subjects.

"These results suggest that the dopamine

system that produces reward prediction errors is probably functioning normally in depression and that the reward-related symptoms of depression have a different cause," said Rutledge.

You win some, you lose some, but what happens to your mood when your friend wins or loses? In another experiment, Rutledge said, participants were less happy if they won and another player lost. The player's happiness really took a dive if he or she lost and the other player won. "Both forms of inequality—getting more or less than another person—are happiness-reducing," said Rutledge.

Mood changes might also lead to a potentially dangerous feedback cycle. Low expectations make positive surprises larger, which lead to inflated expectations that set the stage for negative surprises and lower mood—a cycle of alternating periods of positive and negative emotion common to those with bipolar disorder. Rutledge's lab is building a computational model to understand the interaction between emotional states and resultant decisions, including risky decisions typical in bipolar patients.

As Rutledge was collecting data from his app, he realized that many players only used it on the day they downloaded it, which didn't provide the longitudinal data he sought for clinical questions. This spring, his lab will launch a follow-up app with new cognitive science games that will provide data over time by asking people to play the games every couple of weeks and fill out brief questionnaires about their current mood.


The four games focus on risk, effort, learning and other behaviors relevant to depression. In one game, you're a fisherman who earns different amounts of points per fish and the values change over time. In another game, you're digging for treasure and know that you will have winning and losing streaks down the line.

"We're interested in how information about future prospects affects your current emotional state and the decisions you make," said Rutledge.

$$\text{Happiness}(t) = w_0 + w_1 \sum_{j=1}^t \gamma^{t-j} CR_j + w_2 \sum_{j=1}^t \gamma^{t-j} EV_j + w_3 \sum_{j=1}^t \gamma^{t-j} RPE_j$$

Rutledge's "formula" for happiness

The smartphone games provide hundreds of data points reflecting the player's emotions and behaviors. The computational models then reduce these data to a much smaller number of parameters that can be used as inputs to machine-learning algorithms that can make predictions about symptoms.

"To the extent they actually capture important aspects of those neural circuits," said Rutledge, "we expect they would be useful for making clinical predictions, for predicting whether symptoms will get better or worse." 

### NIDA's Volkow Meets with First Responders

First responders met with NIDA director Dr. Nora Volkow recently at the NIDA Clinical Trials Network 2018 annual steering and scientific meeting to discuss policies, strategies and future research on substance use disorder treatment in the midst of the opioid crisis.

The gathering provided a forum for the exchange of research findings on treatment and prevention and exploration of how these findings can inform clinical practice, health care policy and future research directions.

Topics at the meeting included safe and effective medications for opioid use disorder (OUD) treatment; better treatment through use of big data; improved screening in routine medical care; improvement of clinical practice through electronic health record data; alternative outcome measures of effective OUD treatment; treatment models in primary care; women-specific treatment issues; and OUD prevention and treatment for youth.



NIDA director Dr. Nora Volkow met with opioid quick response team chief Will Mueller (l) of Colerain Township, Ohio, and Fire Chief Daniel Goonan of Manchester, N.H., at the recent scientific meeting.

MAY 9

## Mucke To Give Mahoney Lecture

Dr. Lennart Mucke, whose research examines processes that result in memory loss and other neurological deficits, will discuss "From Genetics to Therapeutics in Alzheimer's: Accelerating Translation, Increasing Success" May 9 at 3 p.m. in Masur Auditorium, Bldg. 10. Mucke, professor of neurology and neuroscience, University of California, San Francisco, and founding director of the Gladstone Institute of Neurological Disease, the J. David Gladstone Institutes, is this year's honoree delivering the annual Florence S. Mahoney Lecture on Aging. The lecture is sponsored by NIA and is part of the NIH Director's Wednesday Afternoon Lecture Series.



Mucke's research uses transgenic mouse models and neural cultures to dissect the pathogenic pathways that lead from genetic and environmental risk factors to neurological abnormalities at the molecular, cellular, network and behavioral levels. Experimental mouse models are also used to develop and evaluate novel treatment strategies.

In Alzheimer-related transgenic models, Mucke's lab discovered that amyloid-beta peptides (Ab) can damage synapses and disrupt neural memory circuits independent of their deposition into the visible amyloid plaques that form in Alzheimer brains. The plaque-independent toxicity of these peptides was inhibited by apolipoprotein E3, but not E4, and by genetically deleting tau, which may relate to the differential effects of these molecules on Alzheimer risk and age of onset. Pathogenic interactions between Ab and alpha-synuclein worsened cognitive and motor deficits in doubly transgenic mice, a finding of potential relevance to the frequent overlap between AD and Parkinson's disease.

Ongoing studies expand on these findings and address clinically relevant questions, aiming to unravel and block the pathogenic cascades and neural network dysfunction these pathogenic proteins trigger.

Mucke is a graduate of the Free University Berlin School of Medicine, Georg-August University, School of Medicine and the Max Planck Institute for Biophysical Chemistry (Neurobiology) in Göttingen, Germany. He trained in internal medicine at the Cleveland Clinic, in neurology at Massachusetts General Hospital and Harvard Medical School and in neuroimmunology and neurovirology at the Scripps Research Institute.

He has received numerous awards, including the Potamkin Prize from the American Academy of Neurology, MetLife Foundation Award for Medical Research and a MERIT Award from NIH. He chairs the Senate of the German Center for Neurodegenerative Diseases and served on the National Advisory Council on Aging. He is also a grant recipient of multiple NIH institutes.

The annual Mahoney Lecture is named in honor of Florence Stephenson Mahoney (1899-2002). She devoted the last half of her life to successfully advocating for the creation of NIA and increased support for NIH.

There will be a reception and an opportunity to talk with the speaker in the NIH Library immediately following the lecture.

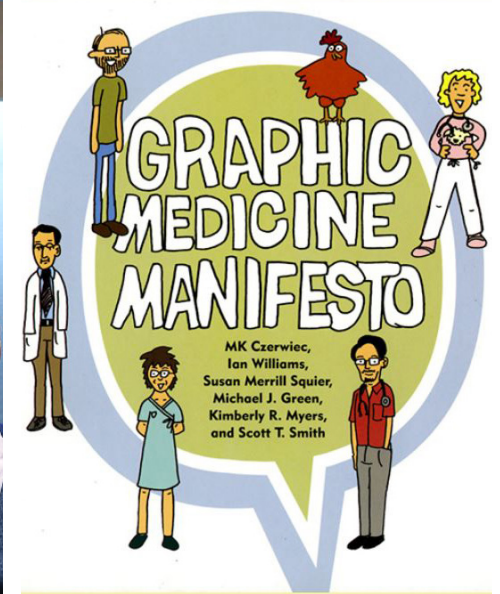
### FEVS 2018 Survey Opens

The 2018 Federal Employee Viewpoint Survey (FEVS) is scheduled to open the week of May 7 and will remain open until the week of June 18. This is your opportunity to provide input on a variety of topics within your organization, including: work experience, leadership, diversity and inclusion.

Eligible NIH employees (full- and part-time permanent, non-seasonal employees, on-board on or before Oct. 28, 2017) should receive an email invitation from the Office of Personnel Management containing a unique link to participate in the survey. The survey takes 20-25 minutes to complete and responses will be confidential.

In 2017, the NIH response rate increased by 5.6 percent to 57.1 percent. This year, NIH director Dr. Francis Collins set a goal of 60 percent employee participation.

For questions about the FEVS, visit <https://hr.nih.gov/working-nih/fevs> or contact the Office of Human Resources at [NIHFEVS@mail.nih.gov](mailto:NIHFEVS@mail.nih.gov).



NLM director Dr. Patricia Flatley Brennan (second from l) talks about the graphic medicine movement with pioneers of the field, including (from l) physician-educator-researcher Dr. Michael Green, artist and author Forney and nurse and artist MK Czerwiec. At right, a recently published guide on the field.

PHOTOS: CHIA-CHI CHARLIE CHANG

## Graphic

CONTINUED FROM PAGE 1

about the new discipline, its origins and impact and future directions.

“Comics and graphic novels and medical exhibitions are not medicine,” Brennan emphasized, beginning the discussion. “They are the way we display the artifacts of medicine and engender dialogue and conversation about this...Today’s conversation and the preparation for it, for me, have been a mini-seminar on looking at new ways to interact. I’m drawn to this deeply by my experience as a nurse, but I’m coming to you today as a library director. I want you to understand [that] the systematic collection of a representation of the way health is experienced in the 21st century is the fundamental commitment [NLM] has to society. The way we understand, express and communicate about health—and preserve that communication and representation—is why the library exists.”

## When Words Overwhelm

MK Czerwiec was a Chicago nurse caring for people with HIV/AIDS in the 1990s during some of the darkest days of the deadly pandemic. Watching her patients suffer—and many of them die—began to take a personal toll on her; initially she took to journaling to express her grief. Soon, though, writing alone was no longer sufficient.

“There was a point where words were overwhelming,” she explained,

introducing herself at the chat session, “and I couldn’t tell the whole story again. It was intense. It was like reliving it.”

She began to paint images of the friends she lost, to preserve their memory. One day she drew a picture of herself and added a dialogue box. Eventually the cartoons became her way to cope.

“I’m a nurse who uses comics to help me contemplate the complexities of illness and caregiving,” she summarized. “I make [comics], but I also read them and teach with them. I use them as a living, breathing way to bear witness to the experience of what it’s like....Creating comics, I’m just really focused. When I start drawing, it just tunes everything else out—it’s the closest thing I know to what meditation can be like.”

Now artist-in-residence at Northwestern Feinberg School of Medicine, she’s been creating as “Comic Nurse” since 2000. She met Williams at the first GM conference in London in 2010 and

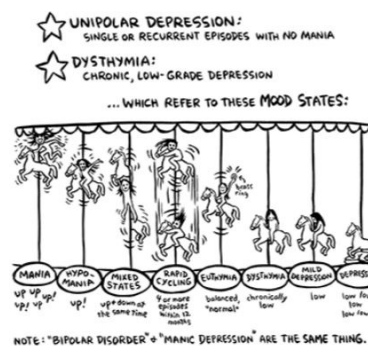
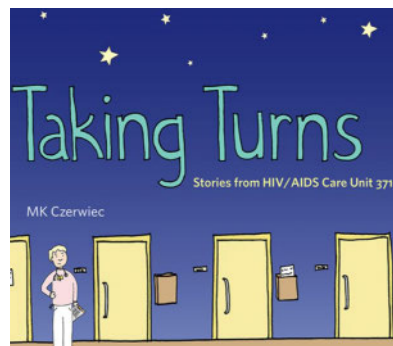
joined with him in 2012 to relaunch and co-edit [graphicmedicine.org](http://graphicmedicine.org).

## Thinking in Comics

Artist and author Ellen Forney, who is also a comics instructor in Seattle, served as guest curator of the NLM exhibition. She said she wrote her first graphic memoir, *Marbles: Mania, Depression, Michelangelo and Me*, about her diagnosis of bipolar disorder shortly before age 30 and the 4 years afterwards when “I was struggling to figure out how to be stable.”

Describing the role graphic medicine plays in her life, she recalled that as a child she wanted to be one of three things when she grew up—writer, illustrator or actor.

“Now I get to be all three,” she said. “This is how I think, in comics. I’ve always been a believer in comics and the power of comics, the power of art and the power of words and the way they combine in such a dynamic way and can get so much information across in an



One of Czerwiec’s books (l) talks about experiences on an HIV/AIDS care unit. Forney discusses her graphic memoir about bipolar disorder. The book includes graphic definitions of mood states.



After the hour-long conversation, attendees chat with graphic medicine pioneers.

engaging format...This is a way to get across something that's very important to me."

Forney talked about how she represented the whole gamut of her illness—both the depressed and manic periods as well as the reflective times when she's between episodes.

"Text is very specific," she related, "but it doesn't have that more abstract resonance that art does."

• • •

*"I make [comics], but I also read them and teach with them. I use them as a living, breathing way to bear witness to the experience of what it's like."*

-MK CZERWIEC

• • •

### Physicians, Draw Thy Selves?

Physician-educator-researcher Dr. Michael Green is professor and interim chair of the department of humanities at Penn State Health's Milton S. Hershey Medical Center. Nine years ago, he developed the first medical school course on comics and medicine. In addition to having students read medically themed, book-length comics about health and illness, he requires his 4th-year med students to create an original comic about their own experiences during medical school.

"I've long been interested in helping students better understand the experience of illness from a patient's perspective," Green said. "We do a great job of teaching about the clinical aspects of disease that you can learn in textbooks. But it's much more difficult to have students understand what it's like to

be a patient with a particular illness going through that experience."

He discovered that comics can help because the medium lends itself to experiential learning and is particularly effective for communicating emotional aspects of experience.

An equally important component of the training, Green said, is that these incipient physicians can use comics "to express themselves and tell their own stories. Comics give a creative outlet to students' experiences."

In 2015, he and Czerwicz teamed up with Williams and several other creative academics to produce *Graphic Medicine Manifesto*, a paperback book of essays and visual narratives that lays out principles of the field. The book is part of the NLM display.

### Drawing Conclusions


In the 45-minute chat, Brennan primed the wide-ranging conversation with questions covering the guests' perspectives on the creative process, comics as a window into uncommon experiences, balancing self-ex-

pression with therapeutics and whether it's necessary to nail down firm parameters of a graphic medicine field still in its early formation.

The audience, too, entered the discussion during a Q&A session that followed. Later, at the FAES bookstore in the Clinical Center, Brennan and guests gathered for a reception.

The conversation is archived at <https://videocast.nih.gov/summary.asp?Live=26989&bhcp=1>.

"Ill-Conceived and Well-Drawn" the exhibition is open through Jan. 3, 2019, in the reading room of NLM's History of Medicine Division on the first floor of Bldg. 38.

The traveling banner version is visiting several sites across the U.S. and Canada; see the schedule or experience the exhibition online at <https://www.nlm.nih.gov/exhibition/graphicmedicine/index.html>. 



### De Waal To Give Inaugural Gadlin Lecture

Dr. Frans B.M. de Waal will be the inaugural guest speaker of the Gadlin Lecture Series, an annual cultural event. He will address "Animal Emotions and Empathy" on Thursday, May 10 at 2 p.m. in Lipsett Amphitheater, Bldg. 10.

De Waal, a Dutch/American biologist and primatologist known for his work on behavior and social intelligence of primates, will discuss early ideas about animal emotions and draw upon research on empathy and the perception of emotions in primates to make the point that the study of animal emotions is a necessary complement to the study of human behavior.

His first book, *Chimpanzee Politics* (1982) compared the schmoozing and scheming of chimpanzees involved in power struggles with that of human politicians. His scientific work has been published in hundreds of technical articles in journals such as *Science*, *Nature* and *Scientific American*. His popular books—translated into 20 languages—have made him one of the world's most visible primatologists. His latest book is *Are We Smart Enough to Know How Smart Animals Are?* (Norton, 2016).

De Waal is the C.H. Candler professor in the psychology department of Emory University and director of the Living Links Center at Yerkes National Primate Center, Atlanta. He has been elected to the National Academy of Sciences and the Royal Netherlands Academy of Arts and Sciences. In 2007, he was selected by *Time* magazine as one of the World's 100 Most Influential People Today.

The Gadlin Lecture Series was created in honor of the many contributions made to the NIH community by Dr. Howard Gadlin, former director of the NIH Office of the Ombudsman, Center for Cooperative Resolution. He retired in December 2015, after 17 years as director of the center. Gadlin is well known for his proactive, big-picture approach to ombudsman work. He encouraged all at NIH to become more aware of the value of negotiation for resolving a wide array of individual and systemic conflicts that threaten scientific discovery. Gadlin Lecture speakers and topics will embody his ongoing commitment to scholarship, intellectual curiosity, creative problem-solving and values of fairness and respect.

Sign language interpreters will be provided. Individuals who need reasonable accommodation to participate should call the NIH Office of the Ombudsman at (301) 594-7231 at least 7 business days before the event.



Weiss predicts bold new ways to treat obesity.

PHOTOS: ANDREW PROPP

## Weiss

CONTINUED FROM PAGE 1

at least we wouldn't have thought that," said Weiss, associate professor of radiology and radiological science and director of interventional radiology research at Johns Hopkins University School of Medicine. Interventional radiology refers to minimally invasive, image-guided procedures to diagnose and treat disease.

The obesity epidemic is a rapidly growing health care crisis, he said. More than 60 percent of Americans are overweight or obese. Each year, the health care industry spends \$210 billion on obesity and obesity-related illnesses. There are more than 100,000 obesity-related deaths each year.

Current treatments for obesity include diet, exercise, medication and, in extreme cases, bariatric surgery, Weiss noted. One type is gastric bypass surgery. It involves reconnecting parts of the stomach and intestines so that food bypasses most of the stomach and the first part of the small intestine.

"There can be serious complications from gastric bypass surgery," he said. "These are some of the patients you'd least like to operate on. Fat tissue does not heal well."

One of the effects of bariatric surgery is to alter the production of hormones that signal the brain to feel hungry or full, he explained. Normally, an empty stomach produces ghrelin, a powerful hunger-stimulating hormone. After a person eats, the production of ghrelin decreases and the intestines produce hormones such as GLP-1 and PYY that signal satiety. This combination eases the sensation of hunger, producing an "I'm full" hormonal profile.

Patients who've undergone gastric bypass surgery are less hungry than they were before the procedure, partially because their stomachs stop producing as much ghrelin. About 10 years ago, Weiss's friend and mentor Dr. Aravind Arepally thought he could mimic the effects of the surgery by stopping the blood flow to the fundus, a part of the stomach that produces ghrelin.

The image-guided procedure, known as bariatric arterial embolization, involves the injection of tiny beads through a catheter that's inserted into the wrist or leg, he said. The beads decrease blood flow in the arteries that feed the fundus.

In the first studies of juvenile pigs, their lab found "the data demonstrates that we can decrease ghrelin and increase GLP-1 with this bariatric procedure."


Weiss and Arepally then designed the first FDA-approved pilot clinical study—Bariatric Embolization of Arteries for the Treatment of Obesity, or BEAT Obesity (a collaborative study between Johns Hopkins Hospital and Mt. Sinai Hospital in New York). Before the procedure, 20 morbidly obese patients who weighed less than 400 pounds and had BMIs over 40 received weight management counseling.

Weiss said almost everyone lost a significant amount of weight over the first 60-90 days after the procedure. They averaged a 7 percent total weight loss. By 180 days, the effects of the embolization seemed to have dropped off. There were no major adverse events. Eight of the 20 patients had minor superficial ulcers on the lining of their stomachs. These ulcers healed after 3 months.

"We think this is a well-tolerated procedure," he said. "It appears to be effective in the short and intermediate term."

Weiss hopes that with continued research, the procedure will be approved by the Food and Drug Administration in the near future.

Another potential treatment for obesity might be cryotherapy, pioneered by Dr. David Prologo at Emory University. Weiss said the approach uses extreme cold to freeze the vagus nerve, which send signals from the stomach to the brain. In cryotherapy, a probe is inserted near a nerve. Once the probe is near the nerve, it creates an ice ball, which acts to damage the nerve. Interrupting the nerve's signals might reduce the sensation of hunger.

Weiss predicted doctors will one day treat obesity "the same way we treat patients with cancer or other complex diseases, which is a multifactorial approach. Maybe it's surgery followed by bariatric arterial embolization, maybe it's cryotherapy followed by diet and exercise followed by something we haven't even thought of yet." 

## NIH 'Big Read' To Feature Author Yong

The NIH Library and the Foundation for Advanced Education in the Sciences announce the NIH Big Read 2018 featuring *I Contain Multitudes: The Microbes Within Us and a Grand View of Life* by Ed Yong. Published in 2016, the book examines the world of microbes that exist within and around



Author Ed Yong

PHOTO: URSZULA SOLTYS

us in a tour that takes us through their history and illuminates the impact they have on our daily lives.

The event culminates Tuesday, June 5 in Masur Auditorium, Bldg. 10 from 1-2 p.m., when author and science journalist Yong will discuss his book with NIH director Dr. Francis Collins in an informal

conversation. Afterward, there will be a meet-and-greet and book signing on the FAES Terrace from 2-3 p.m. followed by a reception for the author in the NIH Library from 3-4 p.m.

Before the final event in June, there will be a series of book discussions hosted by the NIH Library in May. Get started reading now through the NIH Library's OverDrive platform (<https://nihlibrary.overdrive.com/>). Unlimited online access to both the eBook and the audiobook is available through July 2 for all NIH staff. Learn more on the NIH Big Read information page (<https://www.nihlibrary.nih.gov/nih-big-read>), where you will find information on book discussions in May.

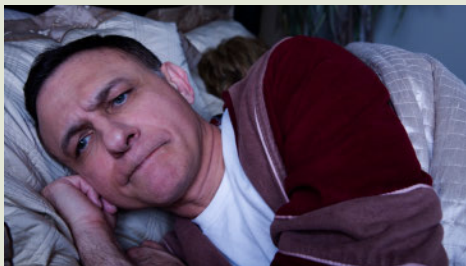
Individuals who need sign language interpreters and/or reasonable accommodation to participate should contact the NIH Library information desk at (301) 496-1080 5 business days in advance and/or the Federal Relay, 1-800-877-8339.

## VOLUNTEERS

### HIV Vaccine Study Needs Subjects

Vaccine Research Center researchers seek persons 18-60 years old who are living with HIV for a research study. The study evaluates an investigational product targeting the HIV virus to determine if it is safe and can generate an immune response. Compensation is provided. For more information, call 1-866-444-1132 (TTY 1-866-411-1010) or email [vaccines@nih.gov](mailto:vaccines@nih.gov). Se habla español.





The study is among the first to demonstrate that sleep may play an important role in human beta-amyloid clearance.

IMAGE: DIANE39/ISTOCK

## Lack of Sleep May Be Linked to Risk for Alzheimer's Disease

Losing just one night of sleep led to an immediate increase in beta-amyloid, a protein in the brain associated with Alzheimer's disease, according to a small, new study by researchers at NIH. In Alzheimer's disease, beta-amyloid proteins clump together to form amyloid plaques, a hallmark of the disease.

While acute sleep deprivation is known to elevate brain beta-amyloid levels in mice, less is known about the impact of sleep deprivation on beta-amyloid accumulation in the human brain. The study is among the first to demonstrate that sleep may play an important role in human beta-amyloid clearance.

"This research provides new insight about the potentially harmful effects of a lack of sleep on the brain and has implications for better characterizing the pathology of Alzheimer's disease," said Dr. George Koob, director of NIAAAA, which funded the study. The work was reported Mar. 29 in the *Proceedings of the National Academy of Sciences*.

Beta-amyloid is a metabolic waste product present in the fluid between brain cells. In Alzheimer's disease, beta-amyloid clumps together to form amyloid plaques, negatively impacting communication between neurons.

In Alzheimer's disease, beta-amyloid is estimated to increase about 43 percent in affected individuals relative to healthy older adults. It is unknown whether the increase in beta-amyloid in the study participants would subside after a night of rest.

The researchers also found that study participants with larger increases in beta-amyloid reported worse mood after sleep deprivation.

## Genetically Altered Broadly Neutralizing Antibodies Protect Monkeys from HIV-like Virus

Two genetically modified broadly neutralizing antibodies (bNAbs) protected rhesus macaques from an HIV-like virus, report scientists at

NIAID. After introducing genetic mutations into two potent HIV bNAbs, researchers prepared intravenous infusions of two bNAbs known as 3BNC117-LS and 10-1074-LS. Single infusions of each modified bNAb protected 2 groups of 6 monkeys each against weekly exposures to simian-human immunodeficiency virus (SHIV) for up to 37 weeks, compared with a median of 3 weeks in 12 monkeys receiving no antibody. SHIV is a manmade virus commonly used in HIV nonhuman primate studies.

The study, reported in *Nature Medicine* and led by Dr. Malcolm Martin, chief of NIAID's Laboratory of Molecular Microbiology, also assessed the efficacy of injecting a combination of both modified bNAbs into 6 monkeys subcutaneously—a route of administration considered more feasible in resource-limited clinical settings. This bNAb mixture, administered at a three-fold lower concentration than the individual antibodies infused intravenously, protected this group of monkeys for a median of 20 weeks.

Martin's team demonstrated that the genetic mutations introduced into the original bNAbs increased their durability following injection and led to the extended period of protection. The mutations did not affect the way the bNAbs bound to the virus but extended their activity following injection. This extended activity in the body could theoretically allow for longer periods between clinical visits to receive the prevention modality, if proven safe and effective in humans.

This approach joins other candidate drugs and biomedical technologies that aim to provide long-term protection against HIV in the absence of an HIV vaccine. Among ongoing studies are two large phase 3 trials in Africa and the Americas known as the AMP Studies, for antibody-mediated prevention.

Given the success of the modified bNAbs in non-human primates, researchers will next test their safety and efficacy in people. A phase 1 clinical trial to evaluate 3BNC117-LS already has begun.

## Epstein-Barr Virus Protein Can 'Switch on' Risk Genes for Autoimmune Diseases

Infection with Epstein-Barr virus (EBV), the cause of infectious mononucleosis, has been associated with subsequent development of systemic lupus erythematosus and other chronic autoimmune illnesses, but the mechanisms behind this association have been unclear. Now, a novel computational method shows that a viral protein found in EBV-infected human cells may activate genes associated with increased risk for autoimmunity. Scientists supported by NIAID reported their findings Apr. 16 in *Nature Genetics*.

"Many cases of autoimmune illness are difficult to treat and can result in debilitating symptoms.

Studies like this are allowing us to untangle environmental and genetic factors that may cause the body's immune system to attack its own tissues," said NIAID director Dr. Anthony Fauci. "A better understanding of the complex causes of autoimmunity promises to lead to better treatment and prevention options."

EBV infection is nearly ubiquitous in the human population worldwide. Most people acquire EBV in early childhood, experience no symptoms or only a brief, mild cold-like illness, and remain infected throughout their lives while remaining asymptomatic. When infection first occurs in adolescence or young adulthood, EBV can lead to a syndrome



When infection first occurs in adolescence or young adulthood, EBV can lead to a syndrome of infectious mononucleosis.

IMAGE: DIGITAL VISION/THINKSTOCK

of infectious mononucleosis characterized by prolonged fever, sore throat, swollen lymph nodes and fatigue. This syndrome, also known as "mono" or the "kissing disease," generally resolves with rest and only rarely causes serious complications.

When EBV infects human immune cells, a protein produced by the virus—EBNA2—recruits human proteins called transcription factors to bind to regions of both the EBV genome and the cell's own genome. Together, EBNA2 and the human transcription factors change the expression of neighboring viral genes.

In the current study, the researchers found that EBNA2 and its related transcription factors activate some of the human genes associated with the risk for lupus and several other autoimmune diseases, including multiple sclerosis, rheumatoid arthritis, inflammatory bowel disease, type 1 diabetes, juvenile idiopathic arthritis and celiac disease.

"Because EBV is most often encountered in early childhood, avoiding infection is practically impossible," said Dr. Daniel Rotrosen, director of NIAID's Division of Allergy, Immunology and Transplantation. "However, now that we understand how EBV infection may contribute to autoimmune diseases in some people, researchers may be able to develop therapies that interrupt or reverse this process."

## Grady Addresses Future Nursing Leaders

“Why do we care about health policy?” This is the question NINR director Dr. Patricia Grady posed to an audience of baccalaureate and graduate nursing students at the recent American Association of Colleges of Nursing Student Policy Summit.

Speaking to these future leaders, Grady helped connect how work as nurses and nurse scientists can influence health policy and offer solutions for a broad range of health care issues. These solutions can improve quality of life for individuals, families and communities. According to Grady, “Nursing science plays a critical role in the health research enterprise, bridging the gaps between the bench, the research clinic, communities and translating the findings to clinical care.”

Grady offered several examples of how nursing science can change clinical practice and health policy. In one example, she shared information about the Chicago Parent Program (CPP), a NINR-supported program to promote healthy behaviors and reduce risky behaviors in children and their families. Because of promising research results during tests of this program, the Chicago department of children and youth services asked the CPP team to adapt and disseminate CPP to Chicago Head Start sites. The CPP intervention has been used in agencies serving families and young children in 19 states and the District of Columbia. CPP is also being used in children’s



NINR director Dr. Patricia Grady

mental health clinics and is being reimbursed as a mental health treatment through Medicaid.

“At NINR, and throughout nursing research, we seek to identify evidence-based solutions that best address our most pressing health challenges,” said Grady.

She also spoke about how students could prepare for future careers as nurse scientists. “The nurse scientist of the future must be well-versed in data science, emerging health technology and the latest methodologies in clinical trials such as pragmatic trials,” she said.

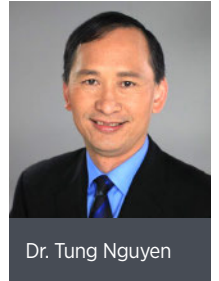
She shared the intramural research training opportunities available at NINR such as the Summer Genetics Institute, the Symptom Methodologies Boot Camps and the NINR Graduate Partnerships Program.

“NINR is always seeking new and more effective ways to foster and support researchers-in-training and new investigators as well as established scientists,” Grady concluded. **R**

She shared the intramural research training opportunities available at NINR such as the Summer Genetics Institute, the Symptom Methodologies Boot Camps and the NINR Graduate Partnerships Program.

## Asian-American Cancer Health Disparities To Be Focus of Next NIMHD Director’s Talk

Dr. Tung Nguyen, the Stephen J. McPhee, M.D. endowed chair in general internal medicine and professor of medicine at the University of California, San Francisco, will deliver the next NIMHD Director’s Seminar Series lecture on Wednesday, May 16 at 9 a.m. in Lipsett Amphitheater, Bldg. 10. He will speak on “Asian American Cancer Health Disparities: Updates and Innovations.”



Dr. Tung Nguyen

Nguyen conducts community-based participatory research, which involves minority communities as integral partners to reduce health disparities. His work has helped improve cancer prevention, particularly in Vietnamese- and Chinese-American populations.

Nguyen is director of the Asian-American Research Center on Health and served as a member of President Obama’s Advisory Commission on Asian Americans and Pacific Islanders. He earned his medical degree from Stanford University and completed his primary care medicine residency at UCSF before joining the UCSF faculty in 1997.

Sign language interpreters will be provided. Individuals with disabilities who need reasonable accommodation should call Edgar Dews at (301) 402-1366 or the Federal Relay at 1-800-877-8339.

## NIDA Meeting on Oral Health, Opioids

NIDA’s medical & health professionals initiative recently brought together leaders of the American Dental Association to meet with NIDA director Dr. Nora Volkow, NIH principal deputy director Dr. Lawrence Tabak and NIDCR director Dr. Martha Somerman to discuss ways the oral health profession is addressing the opioid crisis.

The meeting was timely as the ADA has just announced a new policy on opioid prescribing—requiring its membership to take continuing education courses in prescribing opioids and other controlled substances, including statutory limits on opioid dosage with duration of no more than 7 days for the treatment of acute pain.



NIH and ADA staff discuss ways the oral health profession is addressing the opioid crisis.

These steps are consistent with the new Centers for Disease Control and Prevention evidence-based guidelines. The ADA also recommends that dentists use and register with Prescription Drug Monitoring Programs to promote the appropriate use of opioids and deter misuse and abuse. The initiative builds on ADA policy adopted in 2016, which recommended that dentists should consider nonsteroidal anti-inflammatory analgesics as the first-line therapy for acute pain management.

Volkow, Somerman and Tabak also discussed with ADA leadership possible research projects that could further identify best practices to deter opioid misuse in oral health management.

## Larson To Lecture in NCCIH Series

On Monday, June 4 at 11 a.m., Dr. Mary Jo Larson will lecture on “Caring for Our Military: Considering Nondrug Therapies for Pain,” in Lipsett Amphitheater, Bldg. 10. Larson is a senior scientist at the Heller School for Social

Policy and Management, Brandeis University. Her recent research focus is improving health care systems that care for military members and their families who are affected by behavioral health conditions or chronic pain. The talk is part of NCCIH’s Integrative Medicine Research Lecture Series.

Larson will introduce the U.S. military health care system and its treatment of pain, including recent innovations. Trends include moving toward a culture of pain awareness, expanding the use of nondrug treatments and offering a full continuum of best-practice pain services. She will also discuss her NCCIH-funded study on U.S. Army soldiers who have returned home from deployments—their characteristics, clinical needs, treatments received and associated outcomes.

Larson’s lecture will also be available at videocast. nih.gov, with more information at <https://nccih.nih.gov/news/events/IMlectures>.

## PHS Officers Celebrate Social Work Month

Capt. Jeasmine Aizvera, Lcdr. Nicole Pascua, Lt. Jamillah Bynum and Lt. Heather Light are Public Health Service social worker officers at NIH. Together, they have worked 58 years in the profession—celebrated each March—and 16 years as PHS officers.

Bynum provides addiction-related psychosocial support, resource development and discharge planning. She comes from a family of service members and worked for many years with veterans. Recently, she joined with officers to provide supplies and services to homeless veterans at the D.C. Veterans Affairs Medical Center.

Light helps chronically ill patients find solutions and advocate for their complex needs here and in their communities and serves as an instructor for graduate social work students. She also provides homeless shelter meals and pantry food supplies and works on outreach projects with her church.

Pascua leads the Clinical Center's Office of Hospitality and Volunteer Services and the Edmond J. Safra Family Lodge. She oversees the CC hospitality team, patient library, messenger and patient escort service and hospital volunteer program.

She "finds it rewarding to meet individuals from the community who want to volunteer at NIH because they believe in the mission and value towards medical science."

Aizvera oversees quality measures and performance improvement as manager in the social work department. She supervises a team of clinical social workers and has a clinical assignment of her own in pediatric behavioral health.

The officers are sometimes asked to step beyond Bldg. 10 and deploy to emergencies. Aizvera has deployed 6 times, including after 3 hurricanes, and to Native American reservations during behavioral health crises. The four officers are part of the 680,000 social workers nationally who celebrated their profession in March. **R**



Celebrating their profession recently are (from l) Lt. Heather Light, Lcdr. Nicole Pascua, Lt. Jamillah Bynum and Capt. Jeasmine Aizvera.

PHOTO: JARRYD MUSHATT-VALRIE

## U.S., Japan Cancer Programs Collaborate on Biomarkers

The Japan Agency for Medical Research and Development (AMED) and the National Cancer Institute recently hosted a scientific workshop in Japan aimed at facilitating the research and development of early cancer detection. The focus was on biomarker discovery.

Dr. Sudhir Srivastava, head of NCI's Early Detection Research Network, co-organized the meeting with Dr. Tetsuo Noda, executive director and cancer institute director of the Japanese Foundation for Cancer Research.

"A deeper understanding of the transition from premalignant to malignant state as a function of time will allow the development of more precise risk stratification methods and effective early intervention strategies," Srivastava said.



Dr. Sudhir Srivastava

### EARLY DETECTION TARGETED

"A major hindrance to prevention, early detection and treatment of cancer is the lack of comprehensive knowledge of the molecular, cellular and tissue alterations that drive tumor development and progression from its earliest stages," he added.

"These meetings significantly have stimulated research activities and facilitated collaborative crosstalk between the two countries," Noda said. "Since 2016, [AMED] has supported the workshops to provide cancer researchers with an invaluable opportunity to mutually exchange information regarding their cutting-edge research findings and novel technologies."

AMED president Dr. Makoto Suematsu added, "To conquer cancer and achieve the vision of a cancer-free society, we need to accelerate the research of early detection through collaboration among international researchers. This U.S.-Japan workshop has been [since its inception in 2012], and will continue to be, a great opportunity to maximize the value of collaboration between Japan and the U.S." **R**

## MILESTONES



Roger Mack, with what were then new respirators used in the CC, and more recently

## Former CC Admin Officer Mack Is Mourned

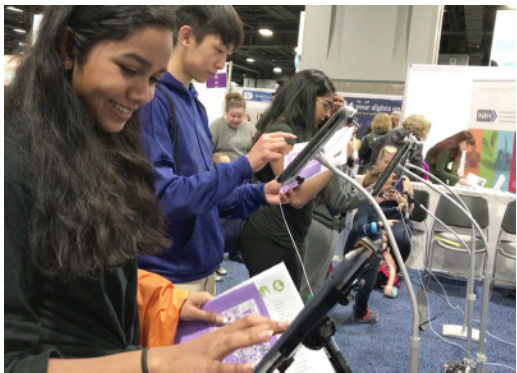
Roger B. Mack, former hospital administrative officer, passed away on Apr. 13 from complications of multiple system atrophy. He was 76 years old.

He worked in the Clinical Center for 34 years, first in the inhalation therapy section of the anesthesiology department and later as chief of what is now called respiratory therapy.

In the early 1980s, Mack left clinical care for administration. He retired in April 2000 as a hospital administrative officer.

Mack was on the cardiac arrest team, where he assisted in saving the life of Fred Loveless, a statistical clerk in the Safety and Fire Prevention Branch in 1972. Mack also was a member of the PHS Disaster Medical Assistance Team and was a principal designer of the first mock disaster evacuation drill held at the Clinical Center on Aug. 28, 1981.

Mack is survived by his wife Gay Mack and two daughters, Sylvia Mack and Jessica Mack, who works at NINDS.



At left, visitors to the NIBIB booth play an iPad game “Want to be a bioengineer?” Center: A student at the NHGRI booth admires large strands of extracted strawberry DNA. Participants at right at the NIDCD booth learn how sight and smell, in addition to taste, affect flavor in foods.

## NIH Pavilion Draws Crowd at Festival

BY CYNTHIA SCHOONOVER

NIH hosted a 6,550-square-foot anchor exhibit Apr. 6-8 at the 5th USA Science & Engineering Festival (USASEF), the nation’s largest biennial celebration of science, technology, engineering and math (STEM). Attracting a record-breaking crowd of more than 370,000 people, the event at the Washington, D.C. Convention Center was filled each day with enthusiasts of all ages exploring the mysteries of STEM.

“Strengthening the STEM educational foundation of our nation is vital to our future economy and the health, safety and well-being of America’s families,” said the late USASEF co-founder Larry Bock.

Saturday and Sunday at USASEF brought in roughly 150,000 people each day. Visitors filled the NIH Pavilion, where they could engage in

more than 30 hands-on activities focusing on health, biomedical and behavioral science topics. They could learn about seasonal and pandemic influenza—and how researchers are working to combat the virus—or take a virtual reality tour of “the surgery of the future” operating room.

Check out the video montage of the NIH Pavilion (<https://dpcpsi.nih.gov/SciFest/2018Festival>) to get an overview of all the NIH activities at the 2018 festival and learn about NIH staff represented among the USASEF Nifty Fifty program.

“As I walked around the NIH Pavilion, I saw the faces of children and adults light up as ideas were shared and connections made,” said John Burklow, NIH associate director for communications and public liaison, who stopped by during the event. “It’s the dedication of NIH employees as they share their passion for science that inspires the next generation.”

Attendees could also interact with NIH scientists at the hour-long “Meet the Scientist & Engineer”

networking event. The one-on-one meetings offered students a chance to learn about the variety of individual education and career paths that are represented by IC employees.

The NIH Pavilion was staffed with representatives from 18 of NIH’s ICs during the event. Among them was NIGMS director Dr. Jon Lorsch, who volunteered at the NIGMS booth most of Saturday.

“This is one of my favorite days of the year,” he said. “What an incredible chance to inspire future scientists and to show thousands of kids—and adults—how exciting biomedical research is!”

NIH Pavilion coordinator Jennifer Gorman Wright estimates that more than 900 combined NIH volunteer hours contributed to the effort. “The NIH participation at USASEF would not be possible without all of those who volunteered their time,” she said. “I want to extend a sincere thank you to all NIH staff who made the NIH Pavilion a success.”



At the NIMH booth, a student learns about phantom limbs and how her brain can fool her into thinking that a rubber hand is part of her own body.



NIH volunteers at the Career Pavilion spent an hour speaking with USASEF visitors about their careers. More than 370,000 people attended the festival, which is the nation’s largest biennial celebration of science, technology, engineering and math.