

nih record



ABOVE • The (photo) jury is in. See winning images from the annual In Focus workplace safety competition, p. 12.

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A Host of Connections

President's Advisor Jarrett Speaks at NIH Town Hall

By Rich McManus

It turns out that not only is President Obama keenly interested in NIH research—especially the recently announced Precision Medicine Initiative (PMI)—but also one of his closest advisors, Valerie Jarrett, has a wealth of connections that bind her to the NIH mission.

During an Apr. 14 visit to campus, Jarrett, who is senior advisor to the President, was interviewed informally on the Masur Auditorium stage by NIH director Dr. Francis Collins. The event was part of NIH's observance of National Minority Health Month.



NIH director Dr. Francis Collins chats with Valerie Jarrett on Apr. 14 in Masur Auditorium.

Originally billed as “a fireside chat,” the event became “an armchair conversation” when Collins noted that “we looked into [having a fireplace], but the fire marshal would have none of it.” Nonetheless, the chat gained warmth when Collins disclosed that he consulted Jarrett's father, Dr. James Bowman, during the early days of the Human Genome Project.

SEE JARRETT, PAGE 6

Medicine and Media

Gupta Uses Surgeon, Journalist Roles to Educate, Inspire

By Dana Talesnik

Scientists and science journalists have a lot in common. Both do huge amounts of research and tackle complicated subjects, accuracy and credibility are paramount and the end result has the potential to improve, even save, countless lives.



Dr. Sanjay Gupta gives the 2015 Rall Cultural Lecture.

Each of these professions is time-consuming and challenging on its own, but somehow Dr. Sanjay Gupta manages to balance his dual career as a practicing neurosurgeon—he is associate chief of neurosurgery at

SEE GUPTA, PAGE 4

Pi Day

'Doing the Math' Adds Up to Big Genomic Discoveries

By Dana Talesnik

Never underestimate the power of math. It turns out that much of what we know and are learning about the human genome relies on computational mathematics. Equations and algorithms are helping researchers decode evidence across the huge genomes of many species and have even debunked data from earlier scientific experiments. But much more data—from ever-larger population samples—will be needed to truly drive biomedical progress, said



Dr. Eric Lander speaks at Pi Day 2015 at NIH.

SEE LANDER, PAGE 8



The NIH Record is published biweekly at Bethesda, MD by the Editorial Operations Branch, Office of Communications and Public Liaison, for the information of employees of the National Institutes of Health, Department of Health and Human Services. The content is reprintable without permission. Pictures may be available upon request. Use of funds for printing this periodical has been approved by the director of the Office of Management and Budget through September 30, 2015.

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NIH...Turning Discovery Into Health



OIR Launches New Web Site

The Office of Intramural Research has launched a new web site (<https://oir.nih.gov/>), part of an ongoing effort aimed at providing clear and concise information about the office and its policies.

One of the site's architects, OIR assistant director for computational biology Dr. Andy Baxevanis, said the goal of the project was to make "a user-friendly source of information" about the office's oversight and coordination of research, training and technology transfer activities in NIH labs. The site is responsive and can be viewed on smartphones and tablets.

As part of the site's development, OIR updated the "Sourcebook" (<https://oir.nih.gov/sourcebook>), a policy manual for intramural researchers. Baxevanis said the updated edition is organized so that users can quickly scan through the text and find what they need.

The web page for the Wednesday Afternoon Lecture Series (<https://oir.nih.gov/wals>) was also updated. Baxevanis said the site now features speaker biographies, summaries and videocasts of past lectures in addition to the upcoming schedule.

For more information about the new site, visit <http://irp.nih.gov/blog/oir-website>.

NIH Career Symposium Set, May 15

The NIH Office of Intramural Training & Education invites all NIH graduate students and post-doctoral trainees to participate in the 8th NIH Career Symposium on Friday, May 15 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 to explore factors that lead to career success. Program includes a keynote speaker and breakout sessions highlighting opportunities available to biomedical scientists. For more information and registration visit www.training.nih.gov.

Two NIH'ers Named to American Academy

Two NIH scientists were recently elected to membership in the American Academy of Arts and Sciences.

Dr. Michael J. Lenardo is senior investigator and chief, molecular development of the immune system section, Laboratory of Immunology, National Institute of Allergy and Infectious Diseases. Dr. Wei Yang is senior investigator,

Laboratory of Molecular Biology, National Institute of Diabetes and Digestive and Kidney Diseases.

Members contribute to academy publications and studies of science and technology policy, global security and international affairs, social policy and American institutions and the humanities, arts and education.

Also joining the 2015 class are singer-songwriter Judy Collins, actor Christopher Plummer and pianist-conductor Murray Perahia. The new class will be inducted at a ceremony on Oct. 10 in Cambridge, Mass.

Since its founding in 1780, the academy has included such members as George Washington, Benjamin Franklin, Ralph Waldo Emerson and Martin Luther King, Jr. Current membership includes more than 250 Nobel laureates and more than 60 Pulitzer Prize winners.



Dr. Michael J. Lenardo



Dr. Wei Yang



Alzheimer's Association Honors Hodes

NIA director Dr. Richard Hodes (r) receives the Ronald and Nancy Reagan Award from Alzheimer's Association President and CEO Harry Johns. The award, presented at the association's annual Advocacy Forum on Mar. 24, recognizes an individual who has made significant advances in Alzheimer's disease research.

NEI Scientist Emeritus's Debut Novel Probes Jellyfish Eyes

By Kathryn DeMott

NEI scientist emeritus Dr. Joram Piatigorsky remembers the moment he became captivated by jellyfish eyes. He was reading a book about invertebrate vision and there it was—an image of a very familiar-looking eye looking back at him from the most ancient multi-organ animal. The eyes of jellyfish became a focus of his more than four-decade long career at NIH.

Although he retired from NEI in 2009, he's now published a book that may help inspire today's young scientists. He describes it as a "somewhat autobiographical" novel. The main character, Ricardo Szein, and Piatigorsky share a fascination with the Caribbean box jellyfish living amid the mangrove swamps in La Parguera, Puerto Rico.

On Earth for 600 million to 700 million years, jellyfish are some three times older than the earliest dinosaurs. And yet the eyes of certain species are complex. This means they can see shapes and colors and they include corneas, lenses for transmitting light, and retinas with photoreceptors cloaked under black pigment. Biologists noted the existence of jellyfish eyes in the mid-19th century. More than 100 years later, Piatigorsky found that much about them remained a mystery. He was hooked.

Many of Piatigorsky's studies focused on crystallins, which are proteins that contribute to the transparent and refractive qualities of the eye's lens. He compared crystallins in the eyes of invertebrates and vertebrates in terms of their genetic building blocks. Out of this work grew the concept of "gene sharing," a term Piatigorsky coined referring to the fact that a single gene can produce a protein that serves unique functions in different tissues of the body. Crystallins, for example, are found in the eye's structures, but also serve metabolic functions in the lens and other tissues.

For Piatigorsky's protagonist Szein, his adventures in jellyfish research are fraught with struggle. Set some 35 years into the future, Szein uses NASA technology to record from their visual system and is able to see what jellyfish see. His remarkable finding: The jellyfish sense evolution. Szein writes:

"Tonight with the help of advanced computer technology I entered the jellyfish mind, so to speak, and I discovered that jellyfish use their nerve ring to integrate electronic signals from their eyes to perceive the surroundings, suggesting that the nerve ring is a kind of brain. And, even more remarkable, this 'brain' seems to perceive images, albeit somewhat abstract, of species comprising the evolutionary history of any marine organism that the jellyfish eye sees, even a species that evolved after the



Dr. Joram Piatigorsky, circa 1985, searches for jellyfish in a mangrove swamp in La Parguera, Puerto Rico.

a new crop of deadly diseases can be the perfect storm that threatens to extinguish basic science altogether. The fact that Szein's basic research isn't relevant to human disease runs afoul of society's expectations.

"As a scientist, my research has never been directed to curing disease. Instead it has been directed by my interest to learn about the natural world," said Piatigorsky. Yet over the course of his career, he has witnessed colleagues feel pressure to abandon basic science and pursue disease-oriented research. He considers his book a warning of what could happen if funding is limited to supporting medical research only. "Of course, there's nothing wrong with working on disease-based research," he said. "But it is limiting. Basic science is the best way to push beyond the science that we know today."

Although he rallies behind basic science, Piatigorsky said that he strove to write a novel that steered clear of "good guy" versus "bad guy" dynamics. "There have been a lot of books written featuring the bad, suppressive government. What hadn't been written before was a book about how a really good, well-intentioned government could turn out to be suppressive," he said. "The government [in the novel] is one that simply wants taxpayer money to be spent to help people with medical problems while under unprecedented pressure to control expenditures."

Although the novel is written from the point of view of the protagonist Szein, Piatigorsky said he tried to present both sides of this hypothetical. "I believe that an author's role is to expose problems rather than to preach their solution. I presume that some people who read my book will be for Szein's cause and others for the government. That's why this issue is so complex and important." 🗣️

jellyfish evolved. These images change from one to another in a way that is consistent with the evolutionary pathway of the species that the jellyfish is looking at, suggesting that jellyfish see videos of evolution! How those visual memories are recorded remains an unwritten chapter in this extraordinary story."

But his research is cut short. Piatigorsky's story shows how a tattered economy coupled with

Bike to Work Day, May 15

BTWD takes place on Friday, May 15 with morning pit stops in front of Bldg. 1, Rock Springs Business Park and Rockville-Falls Grove. Registration is open at www.biketoworkmetrodc.org. Registrants should select NIH as their employer regardless of the pit stop they attend. This enables NIH to get credit so we can continue being the employer with the most registrants in the D.C. area. NIH director Dr. Francis Collins will speak at 8 a.m. on campus. Following his remarks, the NIH Bicycle Commuter Club will present this year's recipient of the Carl Henn Bicycling Advocacy Award. This year, there is a prize for the individual with the longest round-trip commute. Hudson Trail Outfitters will provide bike maintenance and the NIH Police will conduct bicycle registration. Attendees will be able to enjoy food courtesy of the Takoma Park Silver Spring Co-op and local Giant food stores, as well as Crest Hill Bakery. Sponsors also include The Bicycle Place and Proteus bike shops.



GUPTA

CONTINUED FROM PAGE 1

Above, l:
NIH director Dr. Francis Collins sits on stage with Gupta during the interview portion of the Rall lecture.

Above, r:
During his NIH visit, Gupta meets with NIAAA director Dr. George Koob (r) and NIAAA investigator Dr. Lorenzo Leggio, who is looking for medications to treat addiction.

PHOTOS: ERNIE BRANSON

Grady Memorial Hospital and regularly performs surgery at Emory and Grady hospitals in Atlanta—and chief medical correspondent for CNN.

“For nearly 14 years now, I’ve been living at this intersection of medicine and media,” said Gupta, who delivered the annual J. Edward Rall Cultural Lecture on Mar. 25 to an overflow crowd in Masur Auditorium. “Medicine and media, to me, very much fall along the same spectrum. I think about them both as opportunities to educate people, whether I’m educating people in the office about a particular problem they may have, in the hospital or doing it via TV or through articles.”

Gupta, a multiple Emmy Award-winning journalist, has reported on stories that sometimes take him to war zones and other dangerous places. In 2003, he traveled with the U.S. Navy’s “Devil Docs” medical unit in Iraq, where he alternated between wartime correspondent and front-line surgeon. He has covered natural disasters from hurricanes to tsunamis, traveled to more than 100 countries, been shot at and negotiated his way out of danger, learned new languages and embraced new cultures.

Just weeks after starting at CNN, the 9/11 attacks occurred and the network relied on Gupta’s expertise as a practicing doctor. “If you present facts, if you present science—it can help calm the fears of a very worried nation,” he said.

Gupta presents the facts in an engaging way that he hopes will inform and inspire. To test whether a topic will make sense to a general audience, he often considers how he’d explain it to his curious 9-year-old daughter. He also intends for each story to foster discussion. “It’s not designed to end at the 2-minute mark when a story ends,” he said. “It’s designed to stay in your mind for a while, make you think about it, make you share what you’ve just learned with other people.”

Science Journalism

After his candid, at times humorous talk, Gupta sat down for a Q&A session moderated by NIH director Dr. Francis Collins, who happens to have been Gupta’s genetics professor at the Uni-

versity of Michigan Medical School in 1989. The two chatted about how Gupta picks and prioritizes stories.

Gupta chooses stories that affect a sizeable population or profoundly affect a smaller group and he considers how best to interest viewers. When reporting on Parkinson’s, for example, he explained how the disease affects a small part of the brain that doesn’t produce enough dopamine and the possibility of repopulating that part of the brain with dopamine-producing cells. “All of a sudden you start to create this narrative and the brain itself becomes a character,” he said.

“People listen and they expect [the facts],” said Gupta. “They want to know I’ve done my homework and when they hear from me, they can count on it to be accurate.”

It’s also important to take advantage of the public’s sudden interest in a topic. Current events can provide ideal teachable moments. When President Bill Clinton had heart problems, for example, the network used the public’s heightened interest to report on cardiovascular disease, cholesterol and proper diet.

Sometimes, ongoing health concerns such as Ebola and antibiotic resistance get overshadowed by other big news stories, said Gupta, but the media continues to gather information and report on developments at the opportune time.

“Just because you’re not seeing it on the front page of the web site or it’s not the lead story for the hour, doesn’t mean we’re not covering it still,” said Gupta. “We have to provide a really full, accurate picture of what’s happening at a time when people’s attention spans are focused on it.”

Hot Topics: From Vaccinations to Medical Marijuana

Collins and Gupta also probed some impassioned topics including public reluctance over vaccinations and the controversy over medical marijuana.

Gupta said he’s been surprised that some science journalists have equivocated on the need to immunize children. It’s not necessary to present both sides of an issue if one side is undeniably wrong, he said. After having kids, Gupta said his own research reinforced the importance of vaccinating children. “In the end, I got my children vaccinated fully and on schedule and, when I said that part of the story and explained it, I think it maybe hit the mark a little bit more than before.”



Gupta says that being both a journalist and a physician “makes me love each one of these professions more than I think I could love them by themselves.”

One topic that requires an open mind, said Gupta, is medical marijuana. After conferring with patients and scientists, Gupta said he believes marijuana, in its non-psychoactive form, might help patients, particularly when all other options have failed. “So much of the studies and hypotheses were looking at the potential harm of medicinal marijuana and not so much at the benefit,” he said. “People should not be denied a treatment that could potentially benefit them.”

A question likely on everyone’s minds was how Gupta manages to juggle his two demanding jobs. “Having a split life like this makes me love each one of these professions more than I think I could love them by themselves,” he said. “Each has made me better at the other job.”

When covering a story for CNN, hearing from hospital colleagues and patients helps inform his reporting. And, he no longer thinks of a patient as simply a chart number. “Being a journalist, when I approach my patients now, I’m much more curious about their [personal] stories...I enjoy medicine more as a result of that.”

Gupta said one regret is that his intense schedule prevents him from spending more time with his wife and three children, though he said his family remains understanding and supportive of his twin careers and busy travel schedule. “I don’t do these things because I’m an adventurer, thump-on-your-chest thrill-seeker,” he said. “You do these things because you hope they make a difference.”

The Rall lecture honors Dr. Joseph “Ed” Rall, 1920-2008, a scientist who devoted 40 years of his life to intramural research at NIH. Rall, who came to NIH in 1955, founded NIH’s Clinical Endocrinology Branch and also served as NIH deputy director for intramural research.

The webcast of Gupta’s lecture can be seen at <http://videocast.nih.gov/summary.asp?Live=15937&bhcp=1>. 

Fifth Annual Nirenberg Lecture Features Page, May 20

Dr. David C. Page will deliver the fifth annual Marshall W. Nirenberg Lecture as part of the 2014-2015 Wednesday Afternoon Lecture Series. Page’s lecture, “Lost in Translation: Do Males and Females Read Their Genomes Differently?,” will be held on May 20 at 3 p.m. in Masur Auditorium, Bldg. 10.

Page is director of the Whitehead Institute, professor of biology at the Massachusetts Institute of Technology and an investigator with the Howard Hughes Medical Institute. His laboratory seeks to understand fundamental differences between males and females in health and disease, both within and beyond the reproductive tract.



Dr. David C. Page

Most recently, the Page lab discovered that XY and XX sex chromosomes account for subtle differences in the molecular biology of male and female cells and tissues throughout the body. These findings emerged from the lab’s comparative genomic and evolutionary studies of the sex chromosomes of humans, other mammals and birds.

In earlier studies, the Page lab reconstructed the evolution of today’s X and Y chromosomes from an ancestral pair of chromosomes that existed 300 million years ago. They also discovered and characterized the most common genetic cause of spermatogenic failure in humans—deletion of the AZFc region of the Y chromosome. All of these insights were based on technological innovations pioneered by the Page lab to map and sequence Y and X (and Z and W) chromosomes with unprecedented precision and accuracy.

Page’s honors include a MacArthur Prize fellowship, *Science* magazine’s Top Ten Scientific Advances of the Year (in 1992 and again in 2003) and the 2011 March of Dimes Prize in Developmental Biology. He is a member of the National Academy of Sciences, the Institute of Medicine and the American Academy of Arts and Sciences.

The lecture, established in 2011, recognizes Nirenberg for his work to decipher the genetic code, which resulted in his receiving the 1968 Nobel Prize in physiology or medicine. Nirenberg’s research career at NIH spanned more than 50 years; his work also focused on neuroscience, neural development and homeobox genes. The lecture, which recognizes outstanding contributions to genetics and molecular biology, is the second of a “triplet” of events in 2015 recognizing the 50th anniversary of Nirenberg’s work on deciphering the genetic code.

For lecture information and reasonable accommodation, contact Jacqueline Roberts, (301) 594-6747.



JARRETT

CONTINUED FROM PAGE 1

Above:
Collins interviewed Jarrett for about an hour, touching on topics such as health disparities, minority health and life in the White House.

PHOTOS: BILL BRANSON

Bowman, an internationally renowned pathologist and geneticist who ran an NIH-supported center for the study of sickle cell disease at the University of Chicago Medical School, advised Collins about the need to make ethical, legal and social issues a priority in HGP planning.

After thanking the NIH audience for their service to the country, Jarrett explained that her great-grandfather on her mother's side, Robert Robinson Taylor, was the first African-American graduate of the Massachusetts Institute of Technology.

"After he graduated from MIT, Booker T. Washington [founder, 100 years ago, of the observance that has become National Minority Health Month] recruited him to the Tuskegee Institute to design campus buildings," Jarrett recounted. "His students actually made the bricks that built the campus." A U.S. postage stamp was recently issued in his honor, "and you can buy it now," said Jarrett, who proved to be a gracious combination of entrepreneurial pluck and deep devotion to public service. She several times humorously jostled Collins about how much progress NIH has made so far in PMI.

Using questions submitted by employees and staff, Collins interviewed Jarrett for about an hour; he first wanted to know how Bowman influenced his daughter. Jarrett said she traveled the world with her dad, "the first African American tenured in the division of biological sciences at the University of Chicago," and was born in Iran. "I used to walk to my father's lab. I was fascinated by what he did."

Jarrett said she started out pre-med as an undergrad, "but it was organic chemistry or

anatomy lab that did me in," she noted with a laugh. But she learned the rudiments of health care institutions by taking a job as a clinic coordinator at the University of Chicago Medical Center.

She explained that her father was an opponent not just of genetic discrimination, but of any kind of discrimination, including that based on pre-existing medical conditions. Jarrett said her father had plenty of exposure to health disparities, given that the UC hospital is located on Chicago's south side.

Asked about the importance of role models to underrepresented groups and ways to attract them to scientific careers, Jarrett said, "My view is that diversity is a strength. We make better decisions when we are inclusive." She said corporations have been shown to be more profitable when their boards are diverse.

"We've got to start earlier, with pre-school," she emphasized. "My mother taught me that all important things happen between zero and 4."

Jarrett noted that Ursula Burns, chairman and CEO of Xerox, grew up poor in New York, but got an internship during high school. "Somebody opened the door," she said.

Jarrett said the White House Council on Women and Girls, which she chairs, puts an emphasis on family-friendly workplace policies, since 60 percent of families with children have both parents employed. She decried a continuing wage gap [78 cents vs. \$1 per hour] between female and male employees, called for tax credits to support child-care costs and urged that employers adopt paid sick leave. "Forty-three million Americans don't have a single day of paid sick time," she reported.

She said that college affordability, mentorship and programs to keep kids in school are major White House goals. Of the male-female pay gap, she observed, "I have found that men who have daughters in the workforce are sensitive to this issue." She welcomed suggestions "other than knocking people over the head" about closing the gap, perhaps by creating incentives for managers to do so.

Collins commented, "You can't herd cats, but you can move their food."

"I like that!" Jarrett responded.

Collins recounted an Oct. 3, 2014, meeting in the Oval Office about PMI, when the President held forth on its importance. Said Jarrett, "The President is just passionate about it and thinks we need to take full advantage of new technology. He's intellectually curious and especially

likes talking to scientists. He says, 'I love talking to people who are logical.'

Jarrett traces Obama's passion for medical research to the loss of his mother. "He's totally committed [due to] losing his mother when she was younger than I am. That made it personal. So, Francis, how are we doin'?" she prodded jokingly.

Collins said that many NIH'ers have already canceled summer vacations to make progress on PMI and mentioned four workshops that, by August, will help guide the project. Jarrett said that one of her Silicon Valley acquaintances was already in touch with her about accepting NIH's invitation to serve as an advisor, but warned that he has a reputation as a disruptor. "You're going to have at least one disruptor on your group," she predicted.

Asked about life in the White House, and whether it resembled the television drama *House of Cards*, Jarrett responded, "It's more like *The West Wing*, which was my favorite show for 4 years." She said the show captured the sense of collegiality, mission, purpose and good intentions of public servants. But she also admitted to peeking in, guiltily, on *House of Cards* as well.

"There is just no greater privilege than serving your country, at any level," she told the audience. "You all don't get enough recognition."

Jarrett said no two days are the same at the White House. "That's part of what I enjoy." She gets up early, works out, then faces a broad menu of challenges that excite her.

She said she was especially grateful for accepting a dinner invitation one night years ago. She had met Michelle Robinson in 1991, while working for Chicago Mayor Richard Daley. Robinson invited Jarrett to meet her fiancé, Barack Obama. "That was a really important dinner in my life," she said.

Collins concluded the discussion by asking Jarrett about the White House's most important priorities for what he termed "the fourth quarter, when many exciting things happen." Jarrett's response belied the range of issues she confronts: getting a budget passed through Congress; immigration and criminal justice reform, including "strengthening relations between police and the communities they serve"; gun control legislation; using Executive Orders, such as the recent decision to restore relations with Cuba, and to craft trade agreements with 11 Asian nations ("China will move in if we don't," she said); the My Brother's Keeper initiative to improve the lives of boys and young men ("Just by the grace of God, President Obama could be any one of these children," she said); increasing the minimum wage and extending both same-sex marriage and leave benefits.

The President is also passionate about the problem of sexual assault on American campuses, Jarrett added. "One in five women experience assault while on campus," she said, calling for a change of culture. She decried the extremes of drinking and drug use that characterize campuses. "A generation that prides itself on working hard and playing harder is not a good generation to be," she warned, especially for employers of the future. "All kinds of terrible behavior" will be entering the workforce, she said.

Collins said that two NIH institutes, NIDA and NIAAA, are seeking ways to interfere with destructive behavior.

"We just have to be creative," Jarrett noted. "Certainly don't give up."

Lastly, the doctor's daughter urged NIH'ers to "get out of the bubble. Travel around the country and see lives improved by what you do." Although she acknowledged that "NIH has far too few resources," she urged the agency to tell its stories, which will be compelling.

Jarrett's talk can be viewed at <http://videocast.nih.gov/summary.asp?Live=16122&bhcp=1>.

NIH Honored for Historic Preservation

The Maryland Historical Trust recently presented NIH's Office of Research Facilities with an award for Outstanding Stewardship by a Government Agency at its 2015 Historic Preservation Awards ceremony in Annapolis. Now in its 40th year, the Maryland Preservation Awards recognize outstanding efforts in architecture, archaeology, museum work, cultural conservation, education and related fields.



Phillip Neuberg (c) accepts an award on behalf of NIH from David Craig (l), Maryland secretary of planning, and Elizabeth Hughes, acting state historic preservation officer.

Phillip Neuberg, NIH federal preservation officer and chief of the Facilities Programming and Planning Branch in ORF's Division of Facilities Planning, accepted the award on behalf of NIH.

The trust recognized that: "Through its ongoing long-term planning, active capital renewal program and ongoing, sensitive stewardship, the NIH has demonstrated the federal government's ability to balance the research needs of the institution with the communal and public benefits of historic preservation." NIH has successfully "taken best practices and made historic preservation an integral part of ongoing campus planning and capital renewal programs. More importantly, perhaps, these efforts point to how the NIH has united historic preservation with the mission of 'Turning Discovery into Health.'"

The ORF Historic Preservation Program covers a variety of buildings and three historic districts on the Bethesda campus. These include Bldgs. 1, 2, 3, 4, 5, 6, 7, 8 and the "Quarters" (Bldgs. 15B, C, D, E, F, G, H, I, K), Bldgs. 16 and 16A, Bldgs. 29, 29A and 30 and Bldgs. 38, 38A and Bldg. 60, which was once a convent. These historic properties are highlighted in the NIH Bethesda Master Plan, which is updated about every 5 years. The location, site and character of these historic properties inform the future of campus development.

Neuberg also received, on behalf of NIH, a certificate of special recognition from Sen. Ben Cardin's office at the event.—Susan Permut



LANDER

CONTINUED FROM PAGE 1

Above, from 1:
The day-long celebration included a poster session in the Porter Bldg. atrium.

Dr. DJ Patil, chief data scientist of the U.S., shows off his Pi wear.

Below:
Collins and Lander pose with high school students, who formed a large part of the audience at NIH's observance of Pi Day.

PHOTOS: BILL BRANSON

Dr. Eric Lander, founding director of the Broad Institute of MIT and Harvard and one of the early architects of the Human Genome Project.

A question that underlies genomic research is: “What’s the math under the hood?” said Lander, who delivered the inaugural NIH Data Science Lecture on Pi Day eve, Mar. 13, in the Porter Neuroscience Center.

When researchers began decoding the genetics of disease 35 years ago, said Lander, “The idea was that somewhere in this massive human genome of 3 billion bases, there would be 1 base that would be wrong and that would explain the problem.” But how would they find that 1 base?

Having all of these data was one thing; deciphering it was another—and that’s where the math came in. “All the nucleotides in the world and all the polymerases...wouldn’t have made a difference but for a lot of the math under the hood,” said Lander. For example, in assembling a genome, “I have zillions of little fragments of DNA and I’ve got to figure out which ones overlap.”

So the biology community turned to math experts who devised all sorts of algorithms and

extensive graphing to trace the overlaps. They developed algorithms to find overlaps between DNA fragments and to recognize regions of evolutionary conservation.

Lander discussed such concepts as Hilbert sets, Orenstein-Uhlenbeck diffusion and the Chen-Stein method of Poisson approximation. Such terms were undoubtedly unfamiliar to some members of an audience that included many high school students—the room was packed with teenagers sitting on the floor and standing along the walls.

When researchers started tracing chromosomes of families and inherited patterns of disease, Lander explained, they had to deal with incom-

“All the nucleotides in the world and all the polymerases... wouldn’t have made a difference but for a lot of the math under the hood.”

plete data. Members of the team exploited a mathematical trick called the E-M algorithm. They started with a possible solution, estimated the missing data and repeatedly solved the problem until it all added up. “This was essential to genetic linkage analysis,” said Lander. “That’s what’s under the hood.”

In 2003, scientists completed the 13-year project of sequencing 99 percent of the human genome based on the data and technology available at that time. Soon after, the math showed that some long-held beliefs about the human genome were wrong. For example, researchers discovered that there are thousands fewer protein-coding genes than previously thought, said Lander, and most functional information actually lies in noncoding DNA.

New techniques allow us to follow millions of the three-dimensional positions of points in the genome simultaneously. Ultra high-resolution mapping has illuminated how the human genome—which is 6 meters long—folds into a single cell. Said Lander, “It turns out one can work out the whole folding of the genome by math!”

Genetics: Driving Medical Progress

Recent genomic studies are helping us pinpoint which regions of chromosomes correlate to disease—from heart disease to diabetes to inflammatory bowel syndrome. Thousands of loci are associated with hundreds of different diseases and traits, said Lander.





What would Pi Day be without actual pie? These guests at NIH's observance found more than mere intellectual nourishment at the celebration.

A study of schizophrenia examined 6,000 patients and found no common genetic markers. When the sample expanded to 20,000 people, 5 loci were found. With 50,000 patients, they found 62 genes and, thanks to an international consortium, a sample size of 110,000 schizophrenic patients yielded 108 genome-wide results. "The math was what gave them the faith to keep going," said Lander.

Studies of type 2 diabetes identified 64 related genes. Today, researchers are identifying dozens of cancer genes by analyzing thousands of malignant tumors. "In each case, we believe the math," said Lander. "It tells us there's more over the horizon."

Big Data to Knowledge

"We have only scratched the surface," said Lander. "For common genetic disease, for almost all important phenotypes and all important diseases, we still are far from having a complete picture. We're going to need huge collections to be able to do that."

The recent Precision Medicine Initiative announced by President Obama seeks to enroll 1 million volunteers to contribute their genetic information to improve diagnosis and treatment of disease. While this is an important start, Lander said society needs an even larger, global patient-driven movement to study every major disease in each ethnic group. He noted, "One big aspect of the future of quantitative biomedicine is going to be these large populations from which we're going to have to learn. We must turn our health care system into a learning system."

Another exciting field is single-cell genomics. Math is driving innovation in this area as well; the goal is a complete cell atlas. New technology is making it possible to sequence RNA in individual cells and read it out by massive parallel sequencing.

Currently, cells are classified by structure and function. "What we really want is some utterly unbiased way to know every cell type in the human body," said Lander. "We want to know every cell state the cell type can be in, how they differ according to location and environment, what every cell transition is about and the lineage history of the cell."

Learning from populations of cells and from larger populations of people will help unlock the genetic basis of diseases and will ultimately lead to new technologies and therapies. "We're learning more and more from every sample," said Lander. "Extracting all of this amazing data from human health care will be an incredibly powerful driving force for medical progress."

The complete Pi Day program, including Lander's talk, can be viewed at <http://videocast.nih.gov/summary.asp?Live=15906&bhcp=1>. 📺

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VOL. LXVII, NO. 10	
 volunteers	

People with Anxiety Needed

NIMH is studying people with anxiety and how they respond to stressful events. Researchers are seeking those with general anxiety, panic and/or social anxiety disorder. Study requires one to two outpatient visits to the Clinical Center. Compensation will be provided. For more information, call 1-866-444-2214 (TTY 1-866-411-1010) and refer to study 03-M-0093.

Study Needs Overweight Adults

NICHD seeks adults who are overweight, have high blood pressure and/or pre-diabetes to participate in a study. Researchers are examining the effects of the medication colchicine on the complications of obesity. Compensation is provided. For more information call 1-866-444-2214 (TTY 1-866-411-1010). Hablamos español. Refer to study 14-CH-0119.

Overweight Children Sought

NICHD seeks healthy, overweight children 7 to 11 years old to join in a research study. Researchers want to learn if breaking up sitting with short periods of activity improves children's metabolism and attention. 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 13-CH-0169.

What Does a Depressed Person's Brain Look Like?

The purpose of this brain imaging study is to see if depressed individuals, ages 18 and older with major depressive disorder, have increased inflammation in their brain. Study involves four outpatient visits or a brief inpatient stay at the Clinical Center. Procedures include blood tests, medical evaluations and two brain scans (PET and MRI). There is no cost to participate. For more information, visit www.nimh.nih.gov/JoinAStudy, call 1-877-646-3644 (TTY 1-866-411-1010) or email moodresearch@mail.nih.gov. Refer to study 13-M-0100.

Improve Depressive Symptoms Faster?

Studies are enrolling eligible participants ages 18-65 with unipolar or bipolar depression symptoms for a 2-3 month inpatient stay. The study compares ketamine, an experimental medication, to placebo and evaluates rapid reduction of depressive symptoms (within hours). For more information and eligibility criteria go to www.nimh.nih.gov/JoinAStudy, call 1-877-646-3644 (TTY 1-866-411-1010) or email moodresearch@mail.nih.gov. See protocol 04-M-0222.

milestones

NLM Director Lindberg Retires

By Shana Potash

National Library of Medicine director Dr. Donald A.B. Lindberg retired in March, after 31 years leading the world's largest medical library. He was one of the longest-serving leaders at NIH.



NLM and NIH supporter Congressman Claude Pepper (l), who sponsored legislation to establish NCBI, talks with Lindberg and Dr. David Lipman (c) at a Capitol Hill event in 1988.

The NIH and NLM communities gathered in the Natcher Center for a tribute to Lindberg on Mar. 30, just before his last day on the job. The program began with video highlights of his swearing-in ceremony speech, perhaps even more remarkable today than it was in 1984.

Lindberg predicted a time when “the book or journal on the shelf will become increasingly too remote for immediate patient-care decisions,” and computers will become increasingly useful; when “medical informatics will emerge as a formal research field and academic discipline”; and when progress in “cancer research and molecular biology will be to the average citizen not an idle curiosity or newspaper headline, but a matter of immediate personal concern.”

“I hope you saw how true and prescient his observations were,” noted NIH director Dr. Francis Collins. “Don created programs that transformed our approach to information.”

“Your influence has been profound,” NIAID director Dr. Anthony Fauci told Lindberg. “The kind of capabilities you put at our fingertips made what we do possible.” Drs. Vivian Pinn, Harold Varmus, John Gallin and Roger Glass were the other NIH leaders who spoke of their collaborations with Lindberg.

Lindberg came to NLM from the University of Missouri. Trained as a pathologist, he went on to become a pioneer in the use of computers and medicine and founding president of the American Medical Informatics Association.

During his years at NLM, the public, health providers and scientists gained new or improved access to medical literature via PubMed and PubMed Central; to clinical trials and their results via ClinicalTrials.gov; and to consumer health information via MedlinePlus. And, his crowning achievement was establishment of the National Center for Biotechnology Information to provide access to biomedical and genomic information.



NLM director Dr. Donald A.B. Lindberg has the last word at the Mar. 30 celebration.

PHOTO: BILL BRANSON

NCBI began with a conversation between Lindberg and Florida Congressman Claude Pepper. Peter Reinecke, who worked for Pepper, recalled the day Lindberg came to Capitol Hill to convince Pepper to sponsor NCBI legislation. “Dr. Lindberg immediately captivated Congressman Pepper with his explanation of why the center was so important, why it needed to be at the National Library of Medicine and the impact it could have,” Reinecke said. “Congressman Pepper immediately got it.”

NCBI director Dr. David Lipman said Lindberg “was willing to take risks because he really understood the benefits. I feel lucky to have reported to Don for over 25 years.”

Martha Fishel, chief of the library's Public Services Division, called Lindberg a “creative thinker” who had the courage to stand up and fight for his ideas and the ideas of others so they had the best chance of getting done.

NLM Deputy Director Betsy L. Humphreys, who is serving as acting director, said she's “had the great pleasure and privilege of working for, and being mentored by, Don Lindberg.” She praised him for recognizing the need for deep engagement with people outside NLM who rely on the library's services. Librarians, informatics researchers and health care providers came from across the country for the tribute.

Lindberg had the last word. “It's been a great pleasure for me personally, and a benefit to me professionally, to have come to NLM at the time I came,” he said, noting that he knew more about the library than about NIH when he arrived. “It was therefore a wonderful pleasure to discover there's strength and depth all over the NIH.”

digest

benefit down the road,” said Dr. Paul Tesar of Case Western Reserve School of Medicine, senior author of the study. “We asked if we could find a faster and less invasive approach by using drugs to activate native nervous system stem cells and direct them to form new myelin. Our ultimate goal was to enhance the body’s ability to repair itself.”

“The ability to activate white matter cells in the brain, as shown in this study, opens up an exciting new avenue of therapy development for myelin disorders such as multiple sclerosis,” said Dr. Ursula Utz, program director at NINDS.

NIH Study Finds Genetic Link for Rare Intestinal Cancer

Heredity accounts for up to 35 percent of small intestinal carcinoid, a rare digestive cancer, according to findings from a team at NIH. The researchers examined families with a history of the disease. Because the disease has long been considered randomly occurring rather than inherited, people with a family history are not typically screened. Results were published recently in *Gastroenterology*.

“Small intestinal carcinoid tumors usually grow slowly without symptoms. It is often too late to reverse the condition once people seek medical attention,” said lead author Dr. Stephen Wank, senior investigator at NIDDK, which supported the trial. “Our findings suggest that people with a family history of the disease should be screened for it. We hope this research empowers thousands of at-risk people with a way to prevent these tumors from becoming a devastating disease.”

Conducted at the Clinical Center, the study screened 181 people from 33 families, each with at least two cases of small intestinal carcinoid. The researchers discovered the disease in 23 people who had not yet developed symptoms and successfully removed all tumors in 21 of those people.

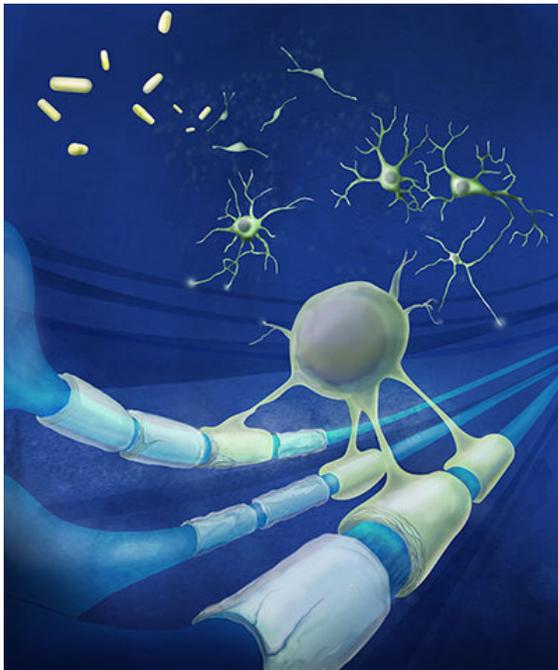
Global Pandemic of Fake Medicines Poses Urgent Risk, Scientists Say

Poor quality medicines are a real and urgent threat that could undermine decades of successful efforts to combat HIV/AIDS, malaria and tuberculosis, according to the editors of a collection of journal articles published Apr. 20.

Scientists report that up to 41 percent of specimens failed to meet quality standards in global studies of about 17,000 drug samples. Among the collection is an article describing the discovery of falsified and substandard malaria drugs that caused an estimated 122,350 deaths in African children in 2013. Other studies identified poor quality antibiotics, which may harm health and increase antimicrobial resistance. However, new methodologies are being developed to detect problem drugs at the point of purchase and show some promise, scientists say.

Seventeen articles in all, detailing various aspects of the issue and proposing possible solutions, were included in a special journal supplement “The Global Pandemic of Falsified Medicines: Laboratory and Field Innovations and Policy Perspectives,” published online ahead of print by the *American Journal of Tropical Medicine and Hygiene*. Several articles suggest policy interventions, including an international framework and the adoption of stricter national laws against drug counterfeiting.

“This problem continues to spread globally, creating an even greater challenge to cooperation among stakeholders, many with limited resources,” noted the supplement’s co-editor Dr. Joel Breman, senior scientist emeritus at the Fogarty International Center. “The need is urgent for collaboration among those with expertise in policy, science, technology, surveillance, epidemiology and logistics, in order to secure global supply chains.”



An artist’s representation of a study in which scientists found that certain drugs were able to promote remyelination in mouse models of multiple sclerosis
IMAGE COURTESY CASE WESTERN; ILLUSTRATOR: MEGAN KERN

Drugs That Activate Brain Stem Cells May Reverse Multiple Sclerosis

Two drugs already on the market—an anti-fungal and a steroid—may potentially take on new roles as treatments for multiple sclerosis. According to a study published in *Nature* Apr. 20, researchers discovered that these drugs may activate stem cells in the brain to stimulate myelin-producing cells and repair white matter, which is damaged in multiple sclerosis. The study was partially funded by NINDS.

Specialized cells called oligodendrocytes lay down multiple layers of a fatty white substance known as myelin around axons, the long “wires” that connect brain cells. Myelin acts as an insulator and enables fast communication between brain cells. In multiple sclerosis there is breakdown of myelin and this deterioration leads to muscle weakness, numbness and problems with vision, coordination and balance.

“To replace damaged cells, the scientific field has focused on direct transplantation of stem cell-derived tissues for regenerative medicine, and that approach is likely to provide enormous



Photo Contest Focuses on Workplace Safety

The In Focus! Safe Workplaces for All contest, now in its fourth year, recently announced the top three finishers. The Division of Occupational Health and Safety, ORS, challenged anyone with a passion for photography to capture an image of workplace safety and health and share it with the NIH community.

The top two photos were submitted by Diane Poole and Dr. Amanda Vandever.

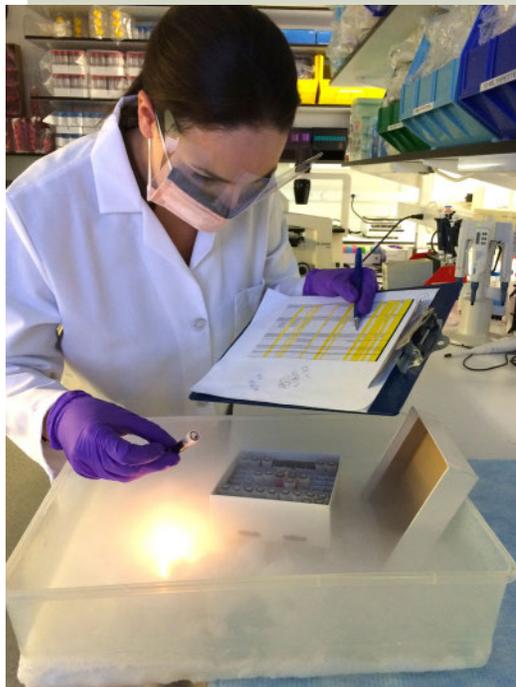
Poole recently retired from the National Cancer Institute's Laboratory of Tumor Immunology and Biology, where she had worked for 37 years. She was a biological laboratory technician and worked with cancer vaccines used in clinical trials.

She was recently featured as artist of the month in a shop at Glen Echo and is excited about the new possibilities offered by retirement. She enjoys playing soccer, yoga, running and intends to learn to play golf. She also looks forward to having the time to enjoy her daughter and 4 grandchildren.

Vandever is in her third year as a CRTA postdoctoral fellow in the same lab as Poole and is featured in both photographs.

Taking third place was Dr. Dale Lewis, a staff scientist at NCI who is interested in understanding the molecular mechanisms of transcriptional regulatory systems.

He has had award-winning photographs every year since the workplace safety photo contest began in 2011. Lewis recently joined the NIH Camera Club, where he continues to pursue his interest in photography.—Nancy McLean-Cooper



Clockwise, from 1:

The first-place winner was “Biospecimen Inventory.”

Taking second place was “Hardhat Safety.”

The third-place finisher was “NIH Firefighter.”

Below:

The prize winners are (from l) Dr. Amanda Vandever, Dr. Dale Lewis and Diane Poole, who recently retired from NCI. The workplace safety photo contest began in 2011.

