

WAS THIS REVOLUTION TELEVISED? History of TV Tech in Medicine Mined for 21st Century Lessons

BY CARLA GARNETT

When medicine met television in the mid-20th century, the subsequent wedding was one of necessity. Medicine at the time needed TV's technology to reach remote, underserved areas and, potentially, disenfranchised patients. It was thought to be, perhaps, the dawn of a new era in medical care.

Dr. Jeremy Greene, a history of medicine professor at Johns Hopkins University, recollected that hope recently with two vignettes he told a Natcher Conference Center audience. What we can learn from

the 60-year "telemedicine" marriage, he suggested, may help us navigate the early stages of today's med-tech relationships—medicine via mobile device ("mHealth") or vital sign monitors ("wearables"), for example.

"There is much in the story of medical images communicated by television in the 1960s and '70s that is of relevance to contemporary understandings of new media in medicine and health today in the 21st century," said Greene in his lecture, "The Analog Patient: Imagining Medicine at a Distance in the Television Era."

His talk was the keynote of the National Library of Medicine's 2-day "Images and Texts in Medical History: Workshop in Methods, Tools & Data from the Digital Humanities."

Nothing New Under the Sun

"Claims for the ability of new media to inform the way we live in our bodies in health and disease are all around us," Greene



Dr. Jeremy Greene says we can learn a lot from telemedicine's early days.

said. However, the promise also comes with "deep wells of anxiety."

Hospital servers get hacked. Facebook, Twitter and email accounts get spoofed. Identity theft and privacy concerns get top billing these days. That's today's reality. But,

SEE **TELEMEDICINE**, PAGE 8



'Adventure in Science' is looking for you. See p. 2.

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In a CC operating room, 7-year-old Elena, daughter of NLM's David Hurwitz, successfully intubates a mock patient.

TYCTWD Captivates Throngs Of Eager Kids

BY DANA TALESNIK

Hundreds of smiling kids descended on NIH on Apr. 28, excited to learn more about the place where their parents/guardians work. The 21st Take Your Child to Work/Earth Day featured dozens of activities both on and off campus that got kids thinking about ways to protect their health and the environment.

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BEER, BREAD...PAINKILLERS Smolke Describes Use of Yeast to Make Medicine

BY ELLEN O'DONNELL

Yeasts are simple, 1-celled fungi that people have used for fermentation and baking throughout history. Archaeologists combing through Egyptian ruins, for example, have found early grinding stones and baking chambers for yeasted bread, along with drawings of 4,000-year-old bakeries and breweries. In the 19th century, chemists and biologists such as Louis Pasteur began to study yeast and fermentation scientifically.

Today, Dr. Christina Smolke, an NCCIH grantee, has discovered a new use for humble yeast—reprogramming its biology so it can serve as a platform for producing medicines from natural products, including opioids for pain management and palliative care, which are in short supply in much of the world and pose many production challenges.

SEE **SMOLKE**, PAGE 4

Author Pink To Present at DDM Seminar, June 16

The Deputy Director for Management (DDM) announces the fourth and final DDM seminar of the 2016 series "Management and Science: Partnering for Excellence" featuring Daniel Pink, a *New York Times* bestselling author of *A Whole New Mind*, *Drive*, and *To Sell is Human*. He will discuss "The Puzzle of Motivation," which overturns the conventional wisdom about human motivation and offers a more effective path to high performance. Come hear the surprising truth about what motivates us and others on Thursday, June 16 from 11 a.m. to 12:30 p.m. in Masur Auditorium, Bldg. 10.

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

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

Still Time to Fill Out Employee Survey

NIH employees still have time to participate in the 2016 Federal Employee Viewpoint Survey (FEVS) if they have not done so already. It only takes 20-25 minutes to share your confidential feedback.

In 2015, NIH's scores improved over 2014 and were higher than government and HHS-wide scores in every performance category. NIH ranked 81st in the Partnership for Public Service's 2015 Best Places to Work rankings and third among public health agencies though, so we still have opportunities for improvement. Help make NIH an even more engaging and fulfilling place to work by sharing your perspective before FEVS closes on Thursday, June 16.

Eligible NIH employees (full- and part-time permanent, non-seasonal employees, hired by Oct. 31, 2015) should have received an email invitation from the Office of Personnel Management containing a link to participate in the survey. Search your email for a message with a subject line of "2016 Federal Employee Viewpoint Survey - Empowering Employees. Inspiring Change!" sent from the "Federal Employee Viewpoint Survey-HE." You may want to check your "junk email" folder as well.

If you have any questions or problems accessing the survey, call (toll-free) 1-855-OPM-FEVS (1-855-676-3387) or email NIHFEVS@mail.nih.gov.

NIH Library Bioinformatics Symposium, June 20

Attend the NIH Library Bioinformatics Symposium, Monday, June 20, 9:30 a.m.-3 p.m. in Lipsett Amphitheater, Bldg. 10, to learn how scientists are using software licensed by the NIH Library Bioinformatics Support Program to analyze, integrate and annotate data from multiple genomics technologies, including next generation sequencing. Discover the latest applications of these data analysis tools to problems in molecular biology.



At left, Deyaan and Mahilan Guha listen to a sound generator they have created with electronic parts from a kit. At right, volunteer teacher Gareth Prosser performs an experiment on water as students Thomas Dorsey, Saatchi Barochia and Ria Aswathi await the result along with co-teacher Marlene Espinoza.

'Adventure in Science' Seeks Faculty, Students

Adventure in Science (AIS), a non-profit science education program for children, is planning its 24th year at NIH. The program, which meets on Saturday mornings October through March in Bldg. 10, is designed to show 8- to 11-year-olds the fun of science using hands-on activities—from building and launching model rockets to dissecting frogs, visualizing the activity of enzymes, measuring their lung volumes and more.

AIS teachers are mostly volunteers from the NIH community, from postdocs to institute directors. This is a great opportunity to exercise your teaching skills with an enthusiastic audience. You can volunteer to teach for only one Saturday, or for several. If you are interested in AIS, read the "About Us" section at www.adventureinscience.org. If you want to volunteer, think about possible topics you might teach and send your contact information to Vathani Arudchandran (Arulvathani.Arudchandran@fda.hhs.gov) and Ed Max (edward.max@fda.hhs.gov).

Enrollment for children will be open for a brief period in June, as announced at www.adventureinscience.org/ais-registration.

For more information about enrollment, send an email with "AIS Enrollment" in the subject heading to Max.

Find out how state-of-the-art knowledge bases and pathway analysis applications are transforming downstream functional analysis of high-throughput experiment data. The symposium is free and open to the public. For more information, including a complete schedule of presenters and to register, visit <http://nihlibrary.nih.gov/biosymposium2016>.

'Week of Making' Symposium To Feature Fox, June 20

The National Week of Making, June 17-23, celebrates the ingenuity and creativity of the diverse community of inventors in the Maker Movement. Celebrate the National Week of Making at a symposium, "Making Health: Inspiring Innovative Solutions for Research and Clinical Care," with a special presentation from Susannah Fox, HHS chief technology officer. The symposium will take place Monday, June 20 from noon to 1:30 p.m. in Masur Auditorium, Bldg. 10. The event is free and open to the public. No registration is required. If you have any questions about the symposium, email 3Dprint@nih.gov. For more information on this and other events throughout the week, visit <http://nihlibrary.nih.gov/weekofmaking>.

The NIH Library will also host several events and training classes highlighting a variety of 3-D printing and modeling software and 3-D printers available for use at the NIH Library. These activities are free and open to NIH and HHS staff and will

be held in the library training room, Bldg. 10. Registration is required; visit the web site listed previously. If you have questions about the library's events, contact Verma Walker by emailing verma.walker@nih.gov.



Biophysicist Krepiy Joins NIGMS

Dr. Dmitriy Krepiy recently joined NIGMS as a program director in the Division of Biomedical Technology, Bioinformatics, and Computational Biology. He will oversee technology development

grants in spectroscopy, structural biology and computational biology. Before coming to NIGMS, Krepiy was a staff scientist in the molecular physiology and biophysics section at NINDS. He earned an M.S. in molecular biology from Novosibirsk State University in Russia and a Ph.D. in chemistry from the University of Wisconsin-Milwaukee. He conducted postdoctoral research at the Medical College of Wisconsin and NIAAA.

Brennan Appointed New NLM Director

Dr. Patricia Flatley Brennan has been named the next director of the National Library of Medicine. She will be the first female and first nurse to serve as head of the library in its 180-year history.

“Dr. Brennan brings her incredible experience of having cared for patients as a practicing nurse, improved the lives of home-bound patients by developing innovative information systems and services designed to increase their independence, and pursued cutting-edge research in data visualization and virtual reality,” said NIH director Dr. Francis Collins, who announced the appointment on May 11.

Brennan is currently at the University of Wisconsin, where she is the Lillian L. Moehlman Bascom professor, School of Nursing and College of Engineering. She also leads the Living Environments Laboratory at the Wisconsin Institute for Discovery that develops new ways for effective visualization of high-dimensional data.

Brennan has been active in many medical associations. She is a past president of the American Medical Informatics Association, a member of the National Academy of Medicine and a fellow of the American College of Medical Informatics, the American Academy of Nursing and the New York Academy of Medicine.



Dr. Patricia F. Brennan

PHOTO: BRYCE RICHTER/UW

Collins highlighted her accomplishments in the field. “Patti developed ComputerLink, an electronic network designed to reduce isolation and improve self-care among home care patients,”

he said. “She directed HeartCare, a web-based information and communication service that helps home-dwelling cardiac patients recover faster and with fewer symptoms. She also directed Project HealthDesign, an initiative designed to stimulate the next generation of personal health records.”

Brennan received a bachelor of science in nursing from the University of Delaware, a master of science in nursing from the University of Pennsylvania and a Ph.D. in industrial engineering from the University of Wisconsin. Following 7 years of clinical practice in critical care and psychiatric nursing, she held several academic positions at Marquette University, Case Western Reserve University and the University of Wisconsin.

In addition, she spent a year at NLM in 2002-2003 as a visiting senior scientist at the Lister Hill National Center for Biomedical Communications.

Rice To Give Khoury Lecture, June 8

Dr. Charles M. Rice of the Rockefeller University will give the annual George Khoury Lecture on Wednesday, June 8, 3-4 p.m. in Masur Auditorium, Bldg. 10. The lecture is titled “Hepatitis C and beyond: Never a dull moment.”

Rice is head of the Laboratory for Virology and Infectious Disease at the Rockefeller University. He is a prominent figure in research on members of the *Flaviviridae* including hepatitis C virus. Rice’s lab works to understand virus replication and innate immune responses that limit infection. His group is also developing new *in vitro* culture and animal models to facilitate this work.

This annual lecture, part of the Wednesday Afternoon Lecture Series, honors the memory of virologist Dr. George Khoury, who was highly regarded as a superb scientist and caring mentor of the postdoctoral fellows in his laboratory.

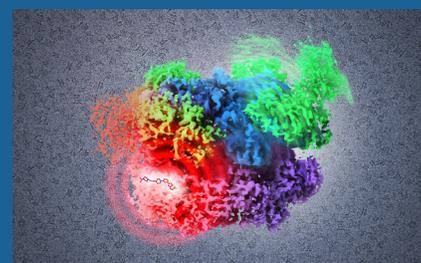
For more information and reasonable accommodation, contact Jacqueline Roberts, (301) 594-6747 or robertsjm@od.nih.gov.



Collins said, “Dr. Brennan is ideally suited to lead the NLM in the era of precision medicine, as the library becomes the epicenter for biomedical data science, not just at NIH, but across the biomedical research enterprise.”

Acting NLM Director Betsy Humphreys said, “In my view, Dr. Brennan’s expertise and experience—and her focus on developing health information systems that support patients, caregivers and the general public—are a great fit for NLM at this point in the library’s history. She will also bring a valuable perspective to NIH as it launches the Precision Medicine Initiative cohort program.”

Brennan is expected to begin as NLM director in August. **R**



ON THE COVER: Illustration of the structure of p97, a target for cancer therapy. Structure is a composite of multiple states derived by cryo-EM analysis.

IMAGE: VERONICA FALCONIERI & SRIRAM SUBRAMANIAM OF NCI

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Editor: Rich McManus
Rich.McManus@nih.gov

Associate Editor: Carla Garnett
Carla.Garnett@nih.gov

Staff Writers:
Eric Bock • Eric.Bock@nih.gov
Dana Talesnik • Dana.Talesnik@nih.gov

Subscribe via email: listserv@list.nih.gov Follow: <http://nihrecord.nih.gov/>



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NIH National Institutes of Health
Turning Discovery Into Health

Smolke

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Her discoveries have brought her many accolades, including an NIH Director's Pioneer Award, being named one of "Nature's 10" (the 10 scientists who *Nature* determined mattered most in 2015) and her research being a runner-up for "Breakthrough of the Year" in *Science*.

Recently, Smolke lectured in Masur Auditorium as part of NCCIH's Integrative Medicine Lecture Series, on "New Bio-based Supply Chains for Medicines." She is associate professor, associate chair of education and W.M. Keck Foundation faculty scholar in the department of bioengineering at Stanford University and co-founder of Antheia, a biotechnology start-up company.

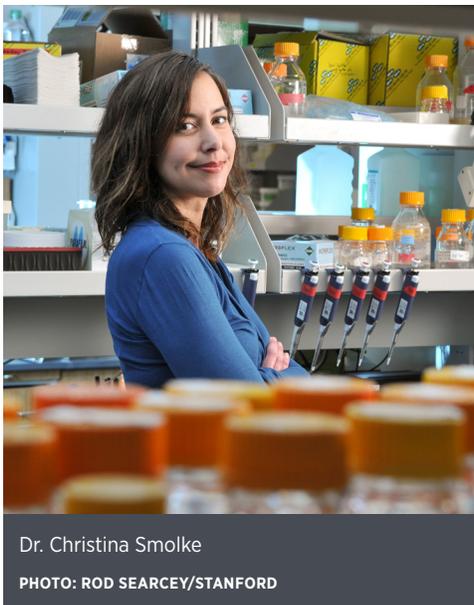
Currently, opioid drugs come from only one source, Smolke said—opium poppies. Among the production challenges: the medicinal part of the plant is very tiny, it can take a year to grow the plants and produce medicine, the land use is substantial and production is affected by many factors such as climate and variable crop yields. This, in turn, can drive up prices and decrease availability, especially for patients in developing countries.

Smolke and her colleagues demonstrated, in a proof-of-concept study published in *Science* in 2015, that they could genetically modify yeast to produce opioid compounds in just a few days. In efforts over about a decade, they eventually found the diverse building blocks they needed in freely available genomics resources, took more than 20 genes from 5 different organisms, engineered them and inserted them into the genome of baker's yeast. In doing so, they created two different microbial assembly lines, each of which convert sugar into a medicinal compound: either thebaine (an opiate alkaloid) or hydrocodone (an opioid).

In her lecture, Smolke detailed some challenges the team faced and creative approaches they took to solve them.

"When we started 10 years ago, we thought this class of alkaloids was very interesting in terms of complex structure and the medicinal properties they can have; there had been very little work done on plant-alkaloid reconstruction in microbial systems. We thought a lot could be done there," she said.

"People told me, 'This is going to be



Dr. Christina Smolke

PHOTO: ROD SEARCEY/STANFORD

impossible to do.' But when people say that, it gets me thinking, 'Okay, why is it impossible? What do we need to have happen to make it possible? If we want to do this kind of complex biosynthesis and make this level of molecules—what are the tools that need to be in place to be able to do this in a very efficient manner, so people can't say it's impossible and we just do it?'"

The Smolke team is now considered the first to produce synthetic hydrocodone using synthetic biology (which can be described as the re-design of existing natural biological systems for useful purposes). It's a technique that holds many exciting possibilities as a platform, she said. It could eventually offer a more economically efficient route to drug production, reduce manufacturing time, improve access to medicines in impoverished nations and inform creation of scaffolds for developing other natural products, including treatments for disease.

A relatively "green" sustainable approach, it could also lessen the generation and use of hazardous substances associated with synthetic chemistry. Such bioengineering could also tweak medicines from natural sources to reduce undesirable side effects and, importantly for medicines like opioids, addiction potential.

Dr. John Williamson, chief of NCCIH's extramural Basic and Mechanistic Research Branch, said, "Dr. Smolke's research is, at this point in time, proof-of-concept and early stage work that illustrates the power of expression of complex plant materials in

general. With further refinement, her team's innovative process may ensure a stable supply of a critically important category of drugs and impact the development of bio-engineering techniques to more efficiently produce other medicines crucial to public health, and at a more economical level. We at NCCIH are proud to have supported Dr. Smolke's work and look forward to more innovations from her lab."

Smolke's lecture can be viewed at <https://videocast.nih.gov/summary.asp?Live=18770&bhcp=1>. **R**



Archer To Speak in NLM Series, June 15 in Lister Hill

Dr. Kellie J. Archer will give the next presentation in the National Library of Medicine Informatics Lecture Series. She will discuss "Predicting an Ordinal Response Using Features from High-Throughput Genomic Assays" on Wednesday, June 15 from 2 to 3 p.m. in Lister Hill Auditorium, Bldg. 38A.

Ordinal scales are commonly used to measure health status and disease-related outcomes. Notable examples in medicine include stage of cancer, grading the severity of an adverse event and response of target lesions to chemotherapy.

Archer is a professor in the department of biostatistics and director of the Massey Cancer Center Biostatistics Shared Resource at Virginia Commonwealth University. She works primarily in developing innovative statistical methods and software for the analysis of high-dimensional datasets such as those arising from high-throughput genomic platforms.

The talk will be broadcast live and archived at <http://videocast.nih.gov/>.

Sign language interpreters will be provided. Those who need reasonable accommodation to participate should contact Ebony Hughes, (301) 451-8038, Ebony.Hughes@nih.gov or the Federal Relay (1-800-877-8339).

Newest NAS Members Speak, June 8

Drs. Ronald Germain and Eugene Koonin will deliver lectures at a mini-symposium that will be held to celebrate their recent election to the National Academy of Sciences. This event will be held on Wednesday, June 8 from 10 a.m. to noon in Masur Auditorium, Bldg. 10. All are welcome to attend to hear about the exciting research going on in their labs. The two join the more than 40 active NIH scientists in the academy.



Germain (left) is an NIH distinguished investigator in NIAID's lymphocyte biology section. He

studies the basic aspects of innate and adaptive immune function, with an emphasis on the biochemical mechanisms involved in the discrimination between self and foreign peptide-associated major histocompatibility complex molecules by T-cells as well as on T-cell antigen-presenting cell interactions and the subsequent delivery of effector function. Germain's talk is titled "Developing a deep understanding of the immune system, with an emphasis on 'system.'"

Koonin is a senior investigator in the evolutionary genomics research group, National Library of Medicine/ National Center for Biotechnology Information. He performs research in many areas of evolutionary genomics and takes advantage of the advances in comparative genomics and systems biology to address fundamental problems in evolutionary biology. He hypothesized in 2005 that "spacer DNA" in the clustered regularly interspaced short palindromic repeats (CRISPR) loci of bacteria and Archaea, which matched sequences of bacteriophages, could be a key part of a sort of adaptive immune system. Koonin's talk is titled "Adventures in evolutionary genomics: from comparison of the first bacterial genomes to a new generation of genome engineering tools."



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

JUNE 20

TRIBUTE TO MATILDA WHITE RILEY

OBSSR Conference Honors Excellence In Research

"People don't grow up and grow old in laboratories. They grow up and grow old in changing societies," was a mantra of sorts for Dr. Matilda White Riley (1911-2004), a woman whose transformative work in the behavioral and social sciences across and beyond NIH is honored by the Office of Behavioral and Social Sciences Research every year.



Dr. Caryn Lerman

In 2016, to better reflect Riley's broad legacy, OBSSR's tradition has blossomed into "Real Life, Labs, Research. The 9th Matilda White Riley Behavioral and Social Sciences Day" on Monday, June 20 from 9 a.m. to 5 p.m. at the United States Institute of Peace in Washington, D.C.

Dr. Caryn Lerman of the University of Pennsylvania will give the Matilda White Riley Lecture for Excellence in Behavioral and Social Sciences. Lerman is the Mary W. Calkins professor in the department of psychiatry, co-director of the Penn Medicine Neuroscience Center and deputy director of the Abramson Cancer Center.

"Dr. Lerman's research integrates neuroscience and behavioral science to understand how the brain's cognitive control system can be enhanced to improve self-control over health risk behaviors such as smoking and overeating," said OBSSR director Dr. William Riley. "She epitomizes the values of the Matilda White Riley Lecture, including the recognition of the complexity and dynamic interplay among processes at multiple levels of explanation and the application of behavioral and social factors to physical health, clinical practice and health policy."

Also speaking will be winners of the first-ever Matilda White Riley Early Stage Investigator article competition: Dr. Stephanie Cook, University of Michigan; Dr. Christopher Marcum, NHGRI; and Dr. Ian McDonough, University of Alabama.

The day will include several career panels to provide advice and networking opportunities as well as a Women in Science: Tales and Trajectories panel.

Dr. Yvonne Maddox, vice president for research at the Uniformed Services University of the Health Sciences, will offer closing remarks.

The event is free, but registration is required. For more information or to register, visit <https://obssr.od.nih.gov/>.—Isabel Estrada-Portales

Pediatric Palliative Care Resources Available in Spanish

As part of its Palliative Care: Conversations Matter campaign, NINR has released Spanish-language versions of its materials for families of children with serious illnesses.

The newly released materials include an at-a-glance fact sheet, a resource card for families on finding support and a series of family stories. In November 2015, NINR released a Spanish-language version of its brochure for families that provides an overview of palliative care. The resources available on NINR's new Spanish-language campaign web page complement the brochure and make additional NINR campaign materials available to the Spanish-speaking population.

To order or download free copies of the Spanish-language materials, visit <https://ninr.nih.gov/conversacionesvaliosas>. To learn more about the campaign, visit www.ninr.nih.gov/conversationsmatter.



Cuidados paliativos para niños



At Fantastic Voyage, Karen Byrne (l) of the department of transfusion medicine explains how blood types are determined. Cpl. Thomas Chiarizia (c) of the NIH Police K9 unit shows off his partner Charlie, one of NIH's 11 service dogs. At right, Dr. Muhammad Yousef, a CC anesthesiologist, lets kids try out intubating a dummy patient using a robotic arm.

PHOTOS: BILL BRANSON, ERNIE BRANSON

TYCTWD

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There were activities to stimulate all the senses. Some kids held models of hearts; others touched a preserved human brain. Some kids peered at cells through microscopes while others tried out gadgets that tested hearing and vision. Many kids and parents tasted farm-fresh cooking during an Earth Day demo. Throughout the day, the smell of curiosity was in the air.

Weeks earlier, many parents went online to register their kids for the limited-space activities, but a few of the most popular events filled up within minutes after being posted. One parent likened the process to

trying to get Springsteen tickets.

One of the most coveted events is the Clinical Center's operating room, where the little apprentices put on scrubs and headed for surgery. They moved robotic arms to reach for paper clips and intubated a dummy patient.

Another popular annual event is Fantastic Voyage, where kids circulate among five stations to learn about blood and other cells. At the microbiology table, kids saw staph, strep, *E. coli* and other bacteria in Petri dishes and viewed parasites through a microscope. At phlebotomy, kids learned about bloodwork. "Don't be scared," said Michael Guyah, a technician in the CC's department

of laboratory medicine. "We look at your blood so the doctor knows how to treat you and make your ouchies go away."

In the CC's audiology clinic, kids visited the sound isolation booth, charted pitch on an audiogram and took hearing tests. In a lab around the corner, kids tested their balance on a moving platform called computerized dynamic posturography.

"Your eyes and inner ears are connected," said NIDCD research audiologist Dr. Chris Zalewski, while handing a child video goggles to try out. "Your vestibular system and eyes work together. Your eyes move when you turn your head or spin around so we can see how well your vestibular system

Kids, Parents Enjoy Meeting the Directors

NIH director Dr. Francis Collins, principal deputy director Dr. Lawrence Tabak and NIH deputy director for extramural research Dr. Mike Lauer took time out of their busy day to host a Take Your Child to Work Day session in Bldg. 1's Wilson Hall. More than 100 kids from grades 1-12 took part in a Meet the Directors event.

"The parents really appreciated that Francis, Larry and Mike spent time with their kids," said Dr. Sharon Milgram, director of the Office of Intramural Training and Education. "It's a really nice opportunity to see this side of the NIH leadership." She introduced the leadership after talking briefly



Above, in Bldg. 1, NIH deputy director for extramural research Dr. Michael Lauer (l), a cardiologist, shares a stethoscope. NIH director Dr. Francis Collins (r) sings about genes and "amazing DNA." Below, NIH principal deputy director Dr. Lawrence Tabak hosts a segment of *NIH Jeopardy*.



about careers in STEM.

When he was a kid, Collins told the group, he wanted to be a truck driver, then considered being a country singer. But a teacher encouraged him to use his love of chemistry in the health field. He talked about some of today's most pressing medical problems and said we need all kinds of people to get involved with such projects as the Cancer Moonshot and Precision Medicine Initiative to help advance health worldwide.

Collins then serenaded the room with his *Walking through the Genes*, to the tune of Del Shannon's *Runaway*, in which the chorus goes: "I wonder why, you've got an A and I've got a G there; what does that say? Amazing DNA."

Tabak then hosted a spirited game of *NIH Jeopardy*, featuring questions drafted by OITE staff. With clickers in hand, kids chose clues from two categories: Doctors and Weird Health Facts. All children left with a certificate of participation.—Dana Talesnik



NIDCD research audiologist Dr. Chris Zalewski helps a child use video nystagmography, in which an infrared video camera mounted inside a pair of goggles tests vestibular function.

senses movement by looking at how your eyes move.”

If you're born with a vestibular system that doesn't work properly, you could still learn to ride a bike, Zalewski explained, but it would be much harder. “We can learn to balance without a normal vestibular system, but we cannot restore hearing once it's lost,” he said, “so it's very important to protect our hearing.”

Over in Bldg. 1, Dr. Michael Lauer, NIH deputy director for extramural research and a cardiologist, took out a 3-dimensional heart model and a bunch of stethoscopes. Kids excitedly jumped in to listen to their heartbeat and learn about this vital organ.

Off campus, more than 100 kids participated in the NIDA-NIMH Brain Science Fair in the Neuroscience Research Center. The kids saw and touched preserved human and animal brains, viewed brain cells through microscopes and participated in other activities.

“My favorite event was the tour of the mouse facility [in the Clinical Center], because we got to see, like, 14 pinkies,” said 8-year-old Caleb Olander. “Pinkies are baby mice and they are super cute. We got to learn how the staff take care of the mice.”

Other activities showed youngsters how to burn off steam, from exercising to creating art. In the fitness center, group classes included CrossFit and jungle yoga. Fitness instructor Ashley Kim led a session called POUND, during which each kid used a pair of drumsticks, adding rhythm to their workout.

Children also learned about stress relief during NHLBI's origami event in Bldg. 31. While some events required parents to wait outside, NHLBI encouraged parents and kids to participate together. Through coloring and the Japanese art of paper-folding known as origami, kids and parents were reminded to make time for stress-reducing activities.

What else helps reduce stress? Some cited listening to music and playing outside; parents said shopping and sleep.

“We don't need highly technical gadgets for people to understand something is healthy for them,” said NHLBI's Kim Copenhaver. “It's important at this age to think about healthy things to create balance in our lives.”

The day also featured open events without a space limit. Hundreds of kids met service dog Charlie and enjoyed the ever-popular NIH Police demonstration on the Bldg. 31 patio.

Many kids enjoyed playing interactive games. NIBIB had iPads set up for kids to play Want to Be a Bioengineer? “Science and communications folks worked to make it mobile-friendly and educational,” said NIBIB's Dr. Tom Johnson. In the CC south lobby and off campus in Rockledge, budding scientists tried out another game app called NIH Scientist, where they learned about research to fight disease, even how to get a research grant.

Mother Nature sent heavy rain that day, so Earth Day activities moved indoors to the Natcher Bldg. Kids and parents roamed

the hallways, learning ways to conserve, compost and cultivate. Many kids posted promises to protect the environment on a Pledge Tree. These included taking shorter showers and turning off lights and the Xbox when not in use.

Professional chef and food educator Jonathan Bardzik prepared quinoa with asparagus and a vinaigrette, which kids and parents happily sampled while learning about sustainable cooking. Winding through the corridor, kids and parents learned about climate change, home and workplace safety and how to grow their own bonsai trees. Many kids received plant seedlings to help start their own garden. NIH's Department of Environmental Protection staff talked about NIH green initiatives, from rooftop solar panels to more plugs to power electric cars. The R&W collected used eyeglasses and cell phones for donation. And the big paper shredder truck was out back, inspiring moms and dads to clean out their offices.

It was another successful Take Your Child to Work/Earth Day that informed and entertained both kids and parents alike. If you missed out on getting a spot for your child in a reserved event that filled up fast, there's always next year. Just remember to sign up early. To see more images from the day, visit the *NIH Record* online.

Rainy NLM Herb Garden Attracts Youngsters

Who knew that medicinal herbs are such an attraction to children? Among the many activities during Take Your Child to Work Day, a visit to the National Library of Medicine Herb Garden was included. However, a mid-morning rain augured a damper on attendance at the outdoor plot.

Much to the surprise of the Montgomery County Master Gardeners who were there to greet guests, children and their parents visited the garden in steady numbers throughout the morning into the early afternoon.

“Not only did our young visitors and their parents visit the garden, but many of them stayed quite a while asking questions of myself and the other Montgomery County Master Gardeners [Sandy Occhipinti, Selma DeLeon and Delore Leatora],” said Mary Musselman.

The children asked which herbs might help soothe a tummy ache or treat a sore throat. Many of the youngsters were knowledgeable about the plants and their properties because they helped their parents create home gardens. In one instance, a teenager asked questions for nearly half an hour as rain poured around him. The teen said the Herb Garden was what he looked forward to most during his visit to NIH.

The Montgomery County Master Gardeners also set up a table with various dishes and asked their young visitors to guess which herbs flavored the food. “We estimate that the NLM Herb Garden had approximately 100 visitors during the day,” said Musselman.

Musselman said she and her fellow gardeners were encouraged by the children's interest in gardening and hoped their initial curiosity would endure through adulthood.—**Judy Folkenberg**



At the NLM Herb Garden are Ana Hartman, age 9, and Alex Hartman, 6. Mom Laura works in the History of Medicine Division.

PHOTO: JUDY FOLKENBERG

Telemedicine

CONTINUED FROM PAGE 1

as Greene pointed out, we're not the first generation to run into roadblocks while trying to get the best medical help to those who need it.

"The challenge of diagnosing at a distance is not new to the 20th century—or even the 19th," he said.

Tracking back to medieval times, Greene noted, mailed letters and drawings and other correspondence document the struggles of physicians back then seeking their faraway colleagues' assistance in identifying and characterizing ailments.

It wasn't until "the advent of closed-circuit and cable television in the late 1950s to the 1970s," he explained, "that one finds an explosion of attention to the visual elements" sharable through electronic media.

To illustrate his point, Greene described the work of two "televsual visionaries"—Dr. Reba Benschoter and Dr. Kenneth Bird.

Doctor at a Distance

A pioneer in television medicine and biomedical communication, Benschoter was hired in 1957 by the Nebraska Psychiatric Institute (NPI) in Omaha to find ways to get health care to the state mental asylum in Norfolk, Neb.—112 miles away.

At a time when many leaders in the field were focused on TV mainly as a tool for health education, she began exploring "new uses of television as a more interactive medium, specifically by employing new technologies of closed-circuit TV and cable to link TVs to cameras at multiple locations and provide instantaneous visual



Greene describes the work of two "televsual visionaries."

WORKSHOP PHOTOS: ERNIE BRANSON

communication," Greene explained.

Head of NPI at the time, Dr. Cecil Wittson, who'd already had success designing telephone systems for medical use, devised a CCTV hookup between the two Nebraska institutions. With NIH funding, Wittson and Benschoter embarked on studies to test the practicality of their new interactive medium to provide expert care from a distance.

Benschoter presented early study results at the New York Academy of Sciences in 1966.

She and colleagues had been surprised. Although set up essentially to keep staff engaged with activities happening in Omaha, put medical residents in touch with mentors and hold joint grand rounds and telelectures, the CCTV system caught on in patient care.

At the time, the asylum did not have a neurologist on staff. Using the TV-camera device, though, a neurologist on site at NPI could observe detailed neurological exams and read EEGs remotely for patients at the asylum.

Patients also benefited more directly, Benschoter reported. Additional CCTV "viewing stations" were installed at both locations, so people hospitalized in Norfolk could visit in real time with their families back home in Omaha.

When the project ended in 1970, Benschoter and team concluded that the study was a success, largely because the inpatient population had dropped by half, from nearly a thousand patients before telemedicine to 476 post-CCTV.

Next Best Thing to Being There?

Greene next shared a story he called, "The Augmented Physician."

On Oct. 4, 1960, a flock of starlings flew into the engine of an aircraft, causing a catastrophic plane crash in Winthrop Bay near Boston's Logan International Airport. The pilots and many passengers perished on impact. However, a large number of people had survived the crash only to die critically injured, without medical attention.

Because of the location of the airport—less than 3 miles from Massachusetts General Hospital, but accessible only via an overcrowded highway system—emergency rescue and medical personnel could not reach the crash site.

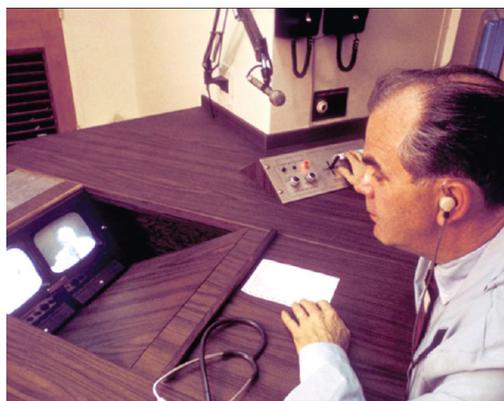
The incident prompted Boston officials to establish an experimental medical station 3 years later at Logan's gate 23 to respond to future airport emergencies. Cardiopulmonary internist Bird became the satellite hospital's first director.

A follower of a writer Greene dubbed the "rock star of media studies," Marshall McLuhan, Bird was keenly interested in "the broader problems of doctor shortages,

limited accessibility to care and ways for new media to impact medicine."

Pursuing new tech advances that could be used as "extensions of medicine," he worked to connect his satellite hospital round-the-clock by telephone to the main hospital, essentially linking the outpost to 24-hour expert medical care.

Soon Bird realized that third-party phone descriptions weren't always



Televsual visionaries. Dr. Reba Benschoter (l) explored ways to make television more interactive, using closed-circuit and cable to link TVs and cameras at multiple locations. At right, it was Dr. Kenneth Bird who coined the term "telemedicine."

PHOTO: MASSACHUSETTS GENERAL HOSPITAL ARCHIVES AND SPECIAL COLLECTIONS



At the keynote presentation are (from l) Dr. Jeffrey Reznick, chief of NLM's History of Medicine Division; Greene; NLM Acting Director Betsy Humphreys; and Dr. Peggy Plympton, deputy director of the National Endowment for the Humanities, which co-sponsored the 2-day workshop.

enough: Sometimes, physicians needed not only to hear but also to see patients. He successfully lobbied for an audiovisual “tele-diagnostic” clinic, which opened in April 1968. It was Bird who coined the term “telemedicine,” defining it as “the practice

that itself is perpetuating disparities by centering resources in a few institutions and urban settings.”

His conclusion about those historical innovators echoed the challenges of today's trailblazing generation with its own strug-



“Revisiting these older engagements of text and image in the history of medicine can open up a wealth of new research for all of these domains.”

-DR. JEREMY GREENE



of medicine without the usual physician-patient physical confrontation, or the practice of medicine via interactive television.”

Let This Be a Lesson

Greene said both stories clearly show that medicine's pathway to adapting and adopting new media has had twists and turns.

Benschoter and team faced misperceptions that telemedicine might one day effectively close down hospitals and put many doctors and nurses out of jobs. Bird tackled problems of logistics and privacy: how to design an effective TV signal that would not be picked up by casual receivers. Also, not everybody in potential patient populations was happy to accept the CCTV concept; some people chafed at the impersonal nature of health exams via television.

Despite the challenges, Benschoter and Bird continued successful careers developing biomedical communications. Both won more grants for further pilot structures and both later built broader systems in VA hospitals. Their perseverance, Greene said, serves as

a lesson for this generation's visionaries.

“The two episodes—one rural, one urban, one psychiatric, one somatic—did not go unnoticed by many, many others within public health and health policy at the time,” he concluded.

These pioneers did not chase “technology for technology's sake,” Greene stressed, but sought advances that offered freedom from “an overly cumbersome health system

Matrix Points to Workplace Resources

Are you eligible for child care services at NIH? Can you participate in the Transshare program? What leave options can you use for family services?

For many, finding the answers to these questions can be confusing and time-consuming. While NIH offers many programs designed to promote the health and well-being of its workforce, eligibility for each program can differ based on an individual's employment status. To reduce the difficulties that many face when attempting to identify available resources or their eligibility for those resources, the women's employment committee, a trans-NIH committee formed by the Office of Equity, Diversity, and Inclusion, created the NIH Workforce Resource Eligibility Matrix.

Sarah Williams, chair of the WEC, said, “We all have a strong interest in ensuring that women at NIH are given an equal opportunity to succeed in whatever career path they have chosen. The NIH has already invested so much into providing resources for those who need them, and people are still making unnecessary sacrifices, because they just don't know that these resources exist. Or, even worse, they are aware of a resource but do not know if they can utilize it. We felt a responsibility to raise awareness about these programs and eligibility in order to alleviate the pressures that all employees face when balancing our personal lives with our careers.”

Am I Eligible for Child Care Services at NIH?



Find Answers With the NIH Workforce Resource Eligibility Matrix

Working with the Office of Human Resources, WEC consulted with experts in each program area and consolidated the eligibility information into a single document. To use the matrix, at <http://1.usa.gov/1VPQxc4>, individuals can find their employee type along the top row and review the corresponding column to identify which of the supportive programs and resources, listed along the left hand column, that they are eligible for. For more information about a particular program, each resource listed in the left hand column includes a link to that program's web page. For those unsure about what employee category they belong to, the second page of the matrix includes descriptions of each employee type. All information contained in the matrix is also available in a text version.

If you believe that a portion of the matrix is inaccurate or requires an update, contact the WEC at edi.women@nih.gov.

The full lecture is archived at <https://videocast.nih.gov/summary.asp?Live=18760&bhpc=1>. **R**

Increased Physical Activity Associated with Lower Risk of 13 Types of Cancer

A new study of the relationship between physical activity and cancer has shown that greater levels of leisure-time physical activity were associated with a lower risk of developing 13 different types of cancer. The risk of developing 7 cancer types was 20 percent (or more) lower among the most active participants (90th percentile of activity) as compared with the least active participants (10th percentile of activity).

These findings, from researchers at NCI and the American Cancer Society, confirm and extend the evidence for a benefit of physical activity on cancer risk and support its role as a key component of population-wide cancer prevention and control efforts. The study, by NCI's Dr. Steven C. Moore and colleagues, appeared May 16 in *JAMA Internal Medicine*.

Hundreds of previous studies have examined associations between physical activity and cancer risk and shown reduced risks for colon, breast and endometrial cancers; however, results have been inconclusive for most cancer types due to small numbers of participants in the studies. This new study pooled data on 1.44 million people, ages 19 to 98, from the United States and Europe, and was able to examine a broad range of cancers, including rare malignancies. Participants were followed for a median of 11 years during which 187,000 new cases of cancer occurred.

The investigators confirmed that leisure-time physical activity, as assessed by self-reported surveys, was associated with a lower risk of colon, breast and endometrial cancers. They also determined that leisure-time physical activity was associated with a lower risk of 10 additional cancers, with the greatest risk reductions for esophageal adenocarcinoma, liver cancer, cancer of the gastric cardia, kidney cancer and myeloid leukemia. Myeloma and cancers of the head and neck, rectum and bladder also showed reduced risks that were significant, but not as strong. Risk was reduced for lung cancer, but only for current and former smokers; the reasons for this are still being studied.

"Leisure-time physical activity is known to reduce risks of heart disease and risk of death from all causes, and our study demonstrates that it is also associated with lower risks of many types of cancer," said Moore. "Furthermore, our results support that these associations are broadly generalizable to different populations, including people who are overweight or obese, or those with a history of smoking. Health care professionals counseling inactive adults should promote physical activity as a component of a healthy lifestyle and cancer prevention."

NIH-Funded Study Reveals How Differences in Male, Female Brains Emerge

Nematode worms may not be from Mars or Venus, but they do have sex-specific circuits in their brains that cause the males and females to act differently. According to new research published in *Nature*, scientists have determined how these sexually dimorphic (occurring in either males or females) connections arise in the worm nervous system. The research was funded by NINDS.

"For decades, there has been little focus on the impact of sex on many areas of biomedical research," said Dr. Coryse St. Hillaire-Clarke, program officer on this NINDS project. "This study helps us understand how sex can influence brain connectivity."



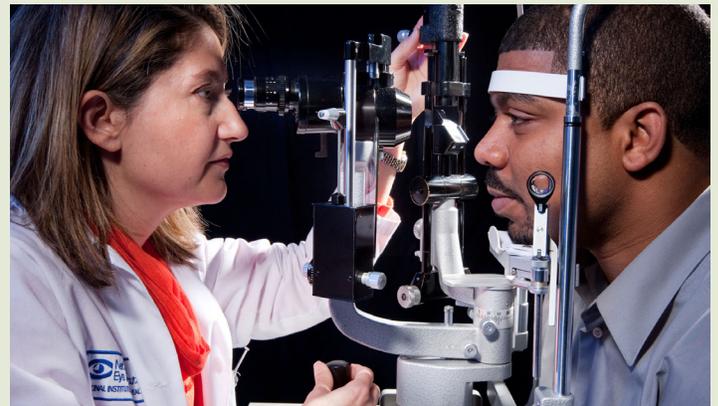
Male and female worms engage in different behaviors, which may result from sex-specific wiring patterns in the brain.

IMAGE: OLIVER HOBERT/COLUMBIA UNIVERSITY

In nematode worms (known as *Caenorhabditis elegans* or *C. elegans*), a small number of neurons are found exclusively in male or female brains. The remaining neurons are found in both sexes, although their connection patterns are different in male and female brains. Dr. Oliver Hobert, professor of biological sciences at Columbia University, and his colleagues looked at how these wiring patterns form.

Hobert's team observed that in the worms' juvenile state, before they reach sexual maturity, their brain connections were in a hybrid, or mixed state, consisting of both male and female arrangements. As they reached sexual maturity, however, their brains underwent a pruning process, which got rid of particular connections and led to either male or female patterns.

"We found that differences in male and female brains develop from a ground state, which contains features of both sexes. From this developmental state, distinctly male or female features eventually emerge," said Hobert.



Findings suggest a need for increased screening to address treatable causes of vision loss. A slit lamp, with its high magnification, allows the eye care professional to examine the front of the patient's eye.

PHOTO: NEI

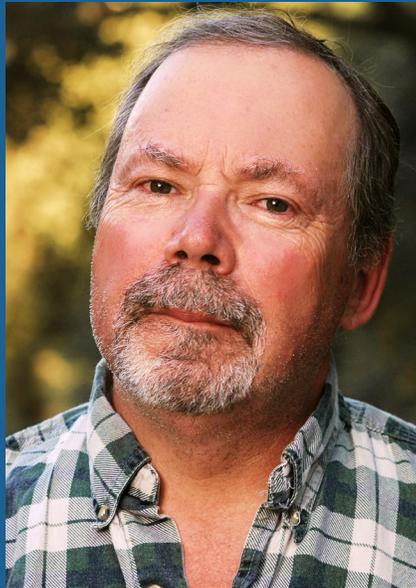
Visual Impairment, Blindness Cases in U.S. Expected to Double by 2050

With the youngest of the baby boomers hitting 65 by 2029, the number of people with visual impairment or blindness in the United States is expected to double to more than 8 million by 2050, according to projections based on the most recent census data and from studies funded by NEI. Another 16.4 million Americans are expected to have difficulty seeing due to correctable refractive errors such as myopia (nearsightedness) or hyperopia (farsightedness) that can be fixed with glasses, contacts or surgery.

The researchers, led by Dr. Rohit Varma, director of the University of Southern California's Roski Eye Institute, published their analysis May 19 in *JAMA Ophthalmology*. They estimate that 1 million Americans were legally blind (20/200 vision or worse) in 2015. Having 20/200 vision means that for clear vision, you would have to be 20 feet or closer to an object that a person with normal vision could see from 200 feet away.

Meanwhile, 3.2 million Americans had visual impairment in 2015—meaning they had 20/40 or worse vision with best possible correction. Another 8.2 million had vision problems due to uncorrected refractive error.

"These findings are an important forewarning of the magnitude of vision loss to come," said NEI director Dr. Paul Sieving. "They suggest that there is a huge opportunity for screening efforts to identify people with correctable vision problems and early signs of eye diseases. Early detection and intervention—possibly as simple as prescribing corrective lenses—could go a long way toward preventing a significant proportion of avoidable vision loss."



Bourne To Give Next 'Mind The Gap' Seminar

Dr. Philip Bourne, NIH associate director for data science and founding editor-in-chief of *PLOS Computational Biology*, will present on the topic "Big Data and the Promise and Pitfalls When Applied to Disease Prevention and Promoting Better Health" at the next Medicine: Mind the Gap seminar. The event is scheduled for Monday, June 13 from 1:30 to 2:30 p.m. via NIH VideoCast, <http://videocast.nih.gov/>. The talk had originally been scheduled for Apr. 26 but was postponed.

"Big Data" is an overused term, but it does speak to a break from the past in the amount and complexity of data being gathered and analyzed, as well as in the methods applied to that data. How disruptive will Big Data be in the long run to biomedical research and health care? Bourne will address this question in light of the Big Data to Knowledge (BD2K) initiative and other trans-NIH data science programs.

Bourne will accept questions before and during his presentation via email at prevention@mail.nih.gov and on Twitter with #NIHMTG.

Register for the event at <https://prevention.nih.gov/programs-events/medicine-mind-the-gap>.

NINDS's Hallett Honored by AINA and China

Dr. Mark Hallett, chief of the Medical Neurology Branch and the human motor control section in the Division of Intramural Research, NINDS, recently received the Association of Indian Neurologists in America (AINA) Lifetime Achievement Award at the American Academy of Neurology annual meeting in Vancouver, British Columbia.

The award—which is made possible through a grant from AINA in conjunction with the American Brain Foundation—annually recognizes a leader in the field of neurology. Hallett was honored for helping neurologists of Indian origin excel in neurology and for promoting innovation and research in the field of neurology.

Hallett also recently received the National Friendship Award and medal from the Chinese government. Approximately 50 foreign experts get the award each year in various areas of endeavor. Liu Yanguo, deputy director of the State Administration of Foreign Expert Affairs, presented the award in Beijing.

Hallett made his first trip to China in the late 1990s. Since then he has returned to the country many times to work with Chinese scientists to help improve treatments for Parkinson's disease and other movement disorders. He was awarded the Friendship honors for his work with Capital Medical University, Xuanwu Hospital and more than 10 other domestic universities and hospitals to advance the diagnosis and treatment of Parkinson's. According to the *Washington Post* China Watch supplement, "The Friendship Award is the highest honor the Chinese government presents to foreigners who have made significant contributions to China's social and economic development."

Hallett earned his medical degree from Harvard University and received his neurology training at Massachusetts General Hospital. He had fellowships in neurophysiology at NIH and in the department of neurology at the Institute of Psychiatry in London.

Before joining NIH in 1984, Hallett served as chief of the Clinical Neurophysiology Laboratory at Brigham and Women's Hospital in Boston and associate professor of neurology at Harvard Medical School. His current research focuses on understanding the physiology of normal human voluntary movement and the pathophysiology of different movement disorders.

Former NIAID Microbiologist Alexander Mourned

BY ROSE MAGE

Cornelius B. Alexander, who worked as a research microbiologist at NIH for 40 years, died at home Apr. 20 after several months of hospitalization and rehab. He was 84.

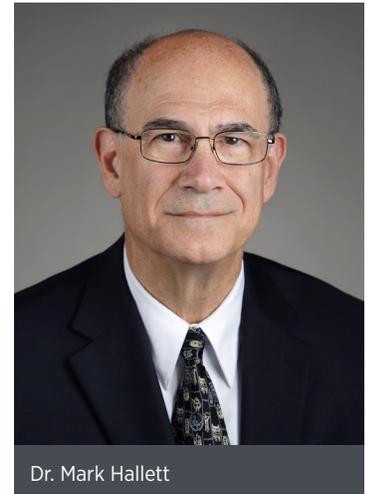
"Alex," as he was known at NIH, was born in Washington, D.C., and educated in D.C. public schools. He received a bachelor of science degree from Bates College in Lewiston, Me., and later entered a master's program at Howard University. He joined the U.S. Air Force during the Korean conflict and served for 4 years.

Alexander contributed to work on genetics of antibodies, first in mice in the lab of Rose Lieberman, and then in rabbits in the molecular immunogenetics section of the Laboratory of Immunology, where he conducted research for 38 years until his retirement in 2007.

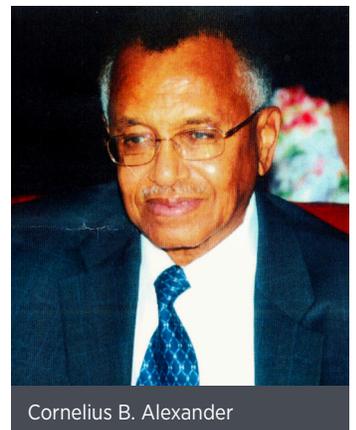
When Alexander retired, he didn't want a party. However, his wife and son surprised him. People from the lab put together a book with all his publications and also gave him two books with photos in honor of his skills with a camera. Colleagues recalled, "He was a great photographer and a great scientist. He gave helpful advice and assistance to members of the entire laboratory, always with a smile that was especially big after the Washington Redskins won a game."

Alexander was an active member of East Washington Heights Baptist Church, where a funeral service was held Apr. 30. Members of the NIH community offered condolences and described Alexander's contributions to the training of young people who joined the laboratory.

Alexander is survived by his wife of 55 years, Barbara Alexander, their son David and a large circle of family and friends. **R**



Dr. Mark Hallett



Cornelius B. Alexander



At left, outside Bldg. 1 are (from l) Dr. Nestor Marimon Torres, director of international relations, Ministry of Public Health; Dr. Pastor Castell-Florit Serrate, director, National School of Public Health; FIC director Dr. Roger Glass; Dr. José Angel Portal Miranda, vice minister of public health; Dr. Jorge Pérez Ávila, director, Pedro Kouri Institute of Tropical Medicine; Dr. Raúl Pérez González, director, National Institute of Hygiene, Epidemiology and Microbiology; Dr. Cristina Rabadán-Diehl, director, Office of the Americas, HHS Office of Global Affairs; Dr. Jorge Marinello Guerrero, president, Cuban Oncology Society; and Kevin Bialy of FIC's Division of International Relations, western hemisphere region. At right, Fogarty's Glass (r) greets Cuba's vice minister of public health at FIC's Stone House.

PHOTOS (EXCEPT BOTTOM): KARIN ZEITVOGEL



Cuban Delegation Visits NIH

Following President Obama's historic visit to Cuba this spring, the HHS Office of Global Affairs hosted Cuba's vice minister of public health and a delegation of Cuban doctors, researchers and public health officials to strengthen scientific and public health collaboration between the two countries. Their visit to the U.S. included a trip to NIH.

NIH director Dr. Francis Collins, NIAID director Dr. Anthony Fauci, FIC director Dr. Roger Glass and other NIH'ers met with representatives from Cuba including Dr. José Angel Portal Miranda, vice minister of public health, and Dr. Jorge Perez Ávila, director of the Pedro Kouri Institute of Tropical Medicine. The vice minister is the highest-level Cuban official ever to visit the NIH campus in Bethesda.

The delegation met for 2 days with HHS representatives in Washington D.C., spent 1 day with NIH officials on campus, where they toured the Dale and Betty Bumpers Vaccine Research Center, and gathered for 2 days with staffers at the Centers for Disease Control and Prevention in Atlanta.

At left, NIH director Dr. Francis Collins (l) welcomes Dr. José Angel Portal Miranda, Cuba's vice minister of public health.



LEFT: The group from Cuba took a tour of the Vaccine Research Center during their visit to NIH. Shown in front of the VRC are (from l) González; VRC deputy director Dr. Barney Graham, chief of NIAID's Viral Pathogenesis Laboratory and translational science core; Portal Miranda; NIAID director Dr. Anthony Fauci; Cuba's top AIDS expert Ávila; Rabadán-Diehl; and Torres, who is also chief editor of the *Cuban Journal of International Public Health*.