

Astronaut Describes Experiences Aboard ISS, Sequencing DNA in Space

BY ERIC BOCK

If it weren't for an NIH grant application, NASA astronaut and biologist Dr. Kate Rubins would never have been the first person to sequence DNA in space.

"I was writing an R01 [grant application] when my friend called me and said there are astronaut applications online," she recounted during a talk at Masur Auditorium on Apr. 25. "And it turned out to be an excellent procrastination tool for grant writing."

She spoke about her 115-day stay aboard the International Space Station (ISS). NIH director Dr. Francis Collins then joined her

on stage for a conversation that was beamed universe-wide to whoever's out there on NIH's Facebook page. This was their second conversation; the first was last Oct. 18, when

the two conducted a "space chat" as Rubins orbited 220 miles above Earth.

Rubins' visit to NIH was part of National DNA Day, which commemorates the successful completion of the Human Genome Project and the discovery of DNA's double helix.

She said the purpose of conducting research aboard the station is to learn about fundamental differences in both physical and biological processes in microgravity, the effects of radiation and the vacuum of space. These conditions allow researchers to conduct

SEE **ASTRONAUT**, PAGE 8



NIH director Dr. Francis Collins interviews NASA astronaut and biologist Dr. Kate Rubins on stage in Masur Auditorium on DNA Day, Apr. 25.

Belkaid Describes Intimate Man-Bug Partnership

Time was when you had to go outside your own skin to confront "the other." That all went out the window when the human microbiota—our passengers throughout birth, life and death—was discovered to exert an enormous effect on health.

According to Dr. Yasmine Belkaid, who gave the annual Rolla E. Dyer Lecture on Apr. 26, the microbes that inhabit us—from the skin-side



in—contribute 100 times the effect on our physiology as our own genome.

Belkaid, who is director of the Microbiome Program at NIAID and chief of the mucosal immunology section in the Laboratory of Parasitic Diseases, spoke on

SEE **BELKAID**, PAGE 4



Kids use stethoscopes to listen to each other's hearts at the NIH Meet the Directors event.

Kids Enjoy Learning at TYCTWD/Earth Day

BY DANA TALESNIK

NIH was teeming with kids on Apr. 27. They skipped across campus, hand in hand with parents and guardians, brimming with enthusiasm and curiosity. It was another successful Take Your Child to Work Day/

SEE **KIDS AT WORK**, PAGE 6



Corps welcomes RADM Joan Hunter. See p. 12.

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Achor To Present Season's Final DDM Seminar, June 15 in Masur

The fourth and final Deputy Director for Management (DDM) seminar of the 2017 series



“Management and Science: Partnering for Excellence” will be held on Thursday, June 15 from 11 a.m. to 12:30 p.m. in Masur Auditorium, Bldg. 10. Guest speaker Shawn Achor will discuss “Positive Psychology, Productivity and the Science of Happiness.” Achor, an expert

on human potential, will connect happiness and success during the seminar.

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

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

Clancy To Keynote NLM Conference On Reproducibility

NLM, the Friends of the National Library of Medicine and Research!America will host a conference, “Consequential and Reproducible Clinical Studies: Charting the Course for Continuous Improvement.” It will take place June 14-15 in Lister Hill Auditorium, Bldg. 38A.



The conference will discuss prevention of non-repeatable research and inconsequential studies, highlight positive strategies to achieve trustworthy results and significant quality improvement in clinical research studies.

Dr. Carolyn Clancy, deputy undersecretary for health

for organizational excellence, Veterans Health Administration, will deliver the keynote address.

Speakers include Dr. Mike Lauer, NIH deputy director for extramural research; Dr. Margaret Mooney, chief, Clinical Investigations Branch, NCI; Dr. Deborah Zarin, director of ClinicalTrials.gov, NLM; Dr. Robert Califf, professor of medicine, Duke University; and Larry Pieperl, chief editor, *PLoS Medicine* at Public Library of Science.

The complete program, along with information about registration, travel and accommodations, can be found at www.fnlm.org/events_upcoming.php.



Sweden's King Visits NIH for Updates

King Carl XVI Gustaf of Sweden (fourth from l) led a 35+ member Swedish royal technology mission to NIH on May 4. Offering an overview of NIH and the role of digitalization in achieving more efficient research was Dr. Lawrence Tabak (fifth from l), NIH principal deputy director. NIAID director Dr. Anthony Fauci (sixth from l) presented the latest developments in antimicrobial resistance research and NINDS director Dr. Walter Koroshetz (seventh from l) updated the group on current BRAIN Initiative research activities. Also on hand were (from l) Björn Lyrvall, Swedish ambassador to the United States; FIC director Dr. Roger Glass; Leif Johansson, chairman of the Royal Swedish Academy of Engineering Sciences; and Prof. Björn O. Nilsson, president of the Royal Swedish Academy of Engineering Sciences. Above, Tabak and King Carl chat during a break in the 90-minute session.



PHOTOS: CHIA-CHI CHARLIE CHANG

NIAMS Vasculitis Researchers Present at Regional Conference

Dr. Peter Grayson, head of the NIAMS Vasculitis Translational Research Program, and Elaine Novakovich, NIAMS research nurse specialist, recently spoke at the Vasculitis Foundation's 2017 Patient and Family Regional Symposium in Bethesda. The purpose of this 1-day conference was to educate patients and their family members about vasculitis.

Grayson described medical advances in the two major forms of vasculitis: ANCA-associated vasculitis (AAV) and large vessel vasculitis (LVV). He discussed how “big data” can be used to develop personalized medicine approaches in AAV and how cutting-edge imaging technologies can be used to assess vascular inflammation in LVV.

Novakovich addressed key findings in the team's research regarding the burden of disease that patients with vasculitis commonly experience. “Connecting with patients at the conference and letting them know that we hear their concerns are invaluable ways to nurture their involvement as we continue to strive to understand this disease through research,” she said.

Both Grayson and Novakovich fielded questions from attendees regarding current vasculitis studies at NIH. For more information on the Vasculitis Translational Research Program, visit the NIAMS web site.



NIAMS's Dr. Peter Grayson (l) and nurse Elaine Novakovich

Szabo To Give NIAAA's Mendelson Lecture

Dr. Gyongyi Szabo will deliver the 2017 Jack Mendelson Honorary Lecture on Thursday, June 8 at 1:30 p.m. in Masur Auditorium, Bldg. 10. Her talk is titled "Mechanisms of Alcohol-Induced Organ Inflammation and Therapeutic Targets in Alcoholic Hepatitis."

Szabo is an internationally recognized expert on the relationship between immune function and liver disease. Over the past 30 years, her work has advanced our understanding of how alcohol impairs immune function and contributes to organ injury. Szabo's research has paved the way for potential pharmacotherapies for alcoholic liver disease and made significant contributions in translating research advances into clinical practice.

Szabo currently serves as Worcester Foundation for Biomedical Research endowed chair and associate dean for clinical and translational sciences at the University of Massachusetts Medical School. Szabo has made important discoveries in understanding the role of innate immune signaling in alcohol-induced injury of the liver, as well as of the gut and brain. Her lab identified the role of the inflammasome, an

innate immune system receptor and sensor that regulates inflammation, in chronic alcohol-induced liver injury.

She and her team also found that cell signaling mediated by interferon regulatory factor 3, a key player in the innate immune system's response to viral infection, is critical in alcohol-induced liver cell death. This work also established a novel role for an endoplasmic reticulum protein in the signaling pathway. These findings have provided original insights into the intracellular signaling pathways involved in binge drinking and the hepatocyte death that underlies liver damage.

Webinar on Use of Electronic Medical Records in Prevention Research

Dr. William M. Vollmer, senior investigator, Center for Health Research at Kaiser Permanente, will present a webinar on widespread use of electronic medical records on Thursday, June 15 from 11 a.m. to noon.

Vollmer is a biostatistician and health services researcher who has been conducting collaborative, multidisciplinary research at Kaiser Permanente's Center for Health Research for more than 30 years. More recently, his research has focused on the use of large, pragmatic trials to test strategies to improve population-based management of chronic diseases.

He will accept questions during his webinar via WebEx and on Twitter with #NIHMTG.

Registration is required—visit <https://nih.webex.com/nih/onstage/g.php?M-TID=e0178eb23f494089d3bd299812a37ba2c>. You will receive a confirmation email with information about joining the webinar.



Dr. Gyongyi Szabo

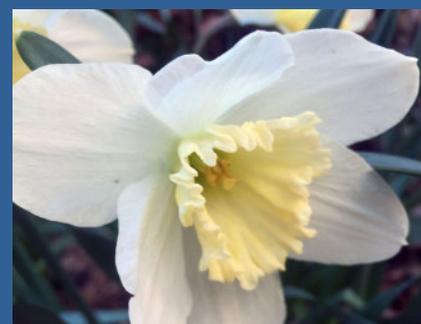
Szabo's clinical research currently focuses on alcoholic hepatitis, non-alcoholic fatty liver disease and viral hepatitis. She has made significant contributions in translating new research discoveries into treatment for patients with alcoholic hepatitis.

Szabo's discovery of the inflammasome's role in alcohol-induced liver injury has led to an NIH-supported multi-center clinical trial of a new therapy for alcoholic hepatitis, for which she is the lead investigator. She also played a key role in the international effort to establish a standard definition of alcoholic hepatitis and in the development of common data elements, both for use in future clinical trials.

As a leading expert in the field of liver disease, Szabo has served in a variety of leadership roles, including president of the American Association for the Study of Liver Diseases. She also has an extensive body of published work, which includes more than 150 articles in journals and 35 book chapters. In addition, she is a member of the Hungarian Academy of Sciences.

Szabo is a highly sought-after speaker; over the course of her career, she has presented at nearly 300 international and national conferences. Szabo has received uninterrupted funding by NIH since 1989, including an R37 MERIT Award from NIAAA, which provides long-term grant support for outstanding investigators.

NIAAA established the lecture series as a tribute to Dr. Jack Mendelson, who made remarkable contributions to the field of clinical alcohol research. Each spring, the series features a lecture by an outstanding alcohol investigator whose clinical research makes a substantial contribution toward increasing our understanding of the effects of alcohol on health and well-being and improving the diagnosis, prevention and treatment of alcohol-related problems. **R**



ON THE COVER: Daffodil in the CRC courtyard

IMAGE: BRANDON HARTZ, ORS

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Belkaid speaks with an audience member at a reception following her talk.

PHOTOS: BILL BRANSON

Belkaid

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“The primary shield: role of our microbes in health and diseases.”

Humans have co-evolved with their microbial partners, she explained. Owing to the technological advances of the past 10 years, scientists have determined the deepening extent to which microbiota control host physiology.

Belkaid said the microbiota is involved in all aspects of the human immune system, from development, to function, to tuning. “Cross-talk between the microbiota and the host is all-inclusive,” she discovered.

Paradoxically, a large number of microbes capable of causing disease are normal constituents of the microbiota, she said. Further, “The microbiota can promote pathogen transmission and the pathological consequences of infection.”

It is as if the yin and yang of microbiota recapitulate, physiologically, man’s capacity for good or evil.

Belkaid said human microbiota provide colonization resistance against a wide range of pathogens. Gut microbiota can stimulate cytokines that promote immunity, she added. “Our response to flu and malaria are controlled by microbiota.”

Those who question the power of gut microbiota to resist pathogens should consider the efficacy of fecal transplant in cases of *Clostridium difficile*, which now approaches 95 percent, Belkaid said.

Though her field has been preoccupied initially by the gastrointestinal tract, Belkaid said, the skin is now a major topic of interest, owing largely to work by NHGRI’s Dr. Julie

Segre, whose microbial genomics section performed the first skin microbiome survey.

“Skin harbors a complex microbiota,” said Belkaid. Nutrients present at various human surfaces determine what kind of microbe grows best there.

The robust dialogue between tissues is not limited to the self, either. “Families share microbiota with their dogs,” Belkaid observed.

“There is much more to be learned about the relationship between microbes and the immune system,” she concluded, “everything from pathways to molecules.” She predicted that mining the microbiota is likely to yield a rich harvest of future therapeutics.

In other words, the more we learn about the generosity of our passengers, the healthier—and possibly less lonely—we may be.—**Rich McManus**

NIAID’s Belkaid Receives Emil von Behring Prize

Dr. Yasmine Belkaid, chief of the mucosal immunology section in NIAID’s Laboratory of Parasitic Diseases, was recently awarded the Emil von Behring Prize of Philipps-Universität in Marburg, Germany. The prize is presented biannually to commemorate Emil von Behring, who discovered the diphtheria antitoxin, implemented serum therapy and won the first Nobel Prize for medicine. The Behring Prize is awarded to scientists for extraordinary contributions to the fields of immunology, microbiology or virology and is one of Germany’s most distinguished scientific awards. Belkaid is the first female recipient.

“Yasmine is an extraordinarily talented and dedicated scientist,” said Ulrich Steinhoff of the Institute for Medical Microbiology of Philipps-Universität. “[She has] uncovered groundbreaking findings about our body’s most complicated immune system—the defense system of the mucosa.”

Belkaid obtained her Ph.D. in 1996 from the Pasteur Institute in France on innate responses to *Leishmania* infection. Following a postdoctoral fellowship at NIAID on immune regulation to infection, she joined the Children’s Hospital Research Foundation in Cincinnati as an assistant professor in 2002. In 2005, she joined the Laboratory of Parasitic Diseases and became a tenured investigator in 2008. Since 2007, she has worked as an adjunct professor at the University of Pennsylvania. Her work explores the role of the microbiota and nutrition in the control of immunity to infection.—**Claudia Wair**



Dr. Yasmine Belkaid (c) receives the Emil von Behring Prize in the company of (from l) Prof. Dr. Hans Dieter Klenk, chairman of the prize committee; Jochen Reutter, Marburg site head and executive director of GSK Vaccines; Prof. Dr. Katharina Krause, president, Philipps-Universität Marburg; and Prof. Dr. Ulrich Steinhoff, laudatory speaker.

PHOTO: MARKUS FARNUNG/PHILIPPS-UNIVERSITÄT MARBURG

NIAAA Charts Research Course with New Strategic Plan

As scientific advances continue to expand our understanding of how alcohol affects human health and point to new ways to address alcohol-related harm, the National Institute on Alcohol Abuse and Alcoholism has released its 2017-2021 strategic plan for research. The new plan serves as a roadmap for optimizing the allocation of NIAAA's resources to areas of alcohol research most likely to benefit from additional support.

"There has never been a better time to accelerate progress across the spectrum of alcohol research," said NIAAA director Dr. George Koob. "Our strategic plan builds on recent transformative developments in basic research, prevention, diagnosis and treatment and charts our course for the next 5 years as we seek to address the many public health challenges caused by alcohol misuse and alleviate human suffering."

Approximately 16 million people in the United States have alcohol use disorder (AUD). An estimated 88,000 people die from alcohol-related causes annually, making alcohol the fourth leading



preventable cause of death in the United States. Alcohol is involved in nearly half of all liver disease deaths and prenatal alcohol exposure is a leading preventable cause of birth defects. Alcohol problems cost the U.S. \$249 billion each year.

For nearly five decades, NIAAA has conducted and supported an integrated and multidisciplinary program of cutting-edge research to reduce the toll that alcohol misuse takes on human health and well-being. This work has significantly broadened our understanding of the factors that contribute to alcohol-related problems and the mechanisms by which they develop.

Once viewed as a moral failing or character flaw, AUD is now widely recognized as a chronic brain disease with potential for recovery and recurrence. This shift in perspective, supported by advances in neurobiological research, has helped reduce the stigma associated with AUD, led to more effective prevention and treatment, provided support for integrating prevention and treatment services into mainstream health care and helped countless individuals afflicted with alcohol use disorders live productive, healthy lives post-treatment.

The NIAAA strategic plan was developed with input from NIAAA's advisory council, the broader research community and the public. The new plan is available at <https://www.niaaa.nih.gov/strategic-plan>.

POSTDOC RETURNS

Wilson Is First Director of Tribal Health Research Office

Dr. David R. Wilson is the first director of the Tribal Health Research Office. The office coordinates trans-NIH research and activities related to the health of American Indians and Alaska Natives (AI/AN) and was established in 2015 within the Division of Program Coordination, Planning and Strategic Initiatives. "We are pleased to have



Dr. Wilson leading this important office," said DPCPSI director Dr. James Anderson.

"As the first NIH office focused on tribal health, we can target research efforts where the needs are greatest within native communities," said Wilson. "We can establish consistent research protocols with the ICs that will ultimately benefit research in tribal communities and investigators alike."

A primary purpose of THRO is to ensure that input from tribal nations is received on NIH research, activities and policies. Wilson's priority is to "establish a tribal community presence and develop the strategic plan with their input. I want the tribes to be engaged and know this is a collaborative effort."

THRO supports the tribal advisory committee, which provides a forum for meetings between elected tribal officials (or their designated representatives) and NIH officials to exchange views and share information. "The TAC is composed of 17 individuals whose breadth and depth of knowledge provides a good cross-sectional representation of the 567 federally recognized tribes," said Wilson. "Their input is important in addressing the research needs of tribal nations."

Wilson is looking to the NIH ICs for opportunities to leverage resources and build collaborations through the research portfolio. "I am excited about the Native American Research Centers for Health program, the All of Us initiative and the Science Education Partnership Awards program, among others. THRO will aim to expand research collaborations and training opportunities and build an NIH unified presence with tribal nations."

Wilson credits his HHS career with preparing him to fill this unique position. He began his career as a postdoc at the National Institute on Aging and later was a senior research scientist.

"When I came here from the Southwest, I was the only Native American in the institute," said Wilson. With the help of NIA leadership, he recruited additional students from the Southwest for summer internships.

"The experience gave me clarity about my career goals," Wilson explained. "My interests were a combination of science, policy and advocacy and encouraging under-represented minorities to pursue science careers."

Before returning to NIH, Wilson served as a public health advisor for the HHS Office of Minority Health and as the AI/AN policy lead.

Asked about his long-term goals, Wilson said, "I would like to see the NIH play a larger role in the recruitment, training and retention of AI/AN research scientists. Additionally, I would like to see a day when tribal leaders would approach this office, present their community's research needs and have confidence that the NIH will develop a plan to meet their needs."—Cynthia Schoonover



Meet the Directors. NIH chief officer for scientific workforce diversity Dr. Hannah Valantine (l), a cardiologist, talks with kids about the anatomy of the heart and echocardiograms; she also demonstrates cardiovascular catheterization on a model heart. NIH director Dr. Francis Collins (c) sings a song about DNA. OD featured several new events including “Hacked,” which showed children what bad guys see when they compromise your computer. Another new activity was “Outrageous Ozobots,” in which children learned how to code their own mini robot. Youngsters also learned how white blood cells, or police of the body, fight robbers of their health and separated dyes from candy in a “Candy Chromatography” activity. More than 375 children participated in the various OD activities. **PHOTOS:** LISA HELFERT At right, youngsters adapt a ride-on toy car for a child with disabilities during the GoBabyGo workshop hosted by NICHHD. The GoBabyGo lab at the University of Delaware, funded by NICHHD, designs and modifies cars to get kids moving. **PHOTO:** MEREDITH DALY

Kids at Work

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Earth Day that enlightened bright, young minds about the many wonders of health and science.

Dozens of fun, educational activities both on and off campus kept the budding scientists engaged. Through arts and crafts, games, simulations and hands-on experiments, kids learned about anatomy, genetics, disease and the environment.

Little apprentices could be seen decked out in scrubs heading to the Clinical Center’s operating room to learn about robotic surgery. Others took a Fantastic Voyage, peering into petri dishes, vials and microscopes to learn about phlebotomy and microbiology. In the CC’s rehabilitation

clinic, physical therapist Melissa Waite led balance and coordination exercises.

Diane Aker, a nurse in the CC’s bone marrow transplant unit, took her two daughters, Catherine, 10, and Mary, 12, to work that day. Mary said their favorite activity was touring the CC’s special clinical studies unit and seeing the protective gear staff wear while tending to highly infectious patients.

NIH’ers from just about every IC hosted creative activities throughout the day; even postdocs got involved. Hundreds of kids came by 7 tables of activities run by postdoctoral fellows along the CC’s 7th floor breezeway. These included information about DNA, the senses, bacteria, viruses and microbes. The fellows were as excited as the kids. “The fellows got a lot of teaching

and mentoring experience, interacting with the kids,” said Erika Barr of the Office of Intramural Training and Education.

At one station, kids built a mouse chromosome to determine its color. Using beads that represented genes, they learned about dominant and recessive genes.

“I told the kids it’s like making a cupcake of your favorite flavor,” said Lymarie Maldonado-Baez, an NINDS postdoc. “The steps of the recipe are the same, but the ingredients are different.”

Over in the Eye Clinic on the 10th floor, Dr. Rachel Bishop, chief of NEI’s consult services section, talked with a group of kids before they divided into smaller sections to tour the optical diagnostic and treatment labs. When she asked how we can protect our



At left, in the CC’s Rehab Clinic, a youngster walks on a treadmill with a safety harness to simulate how patients learn to strengthen their legs and gait after injury. Center, Hanna Cho, 7, daughter of NIAID’s Dr. Hee-Jeong Yang, learns how stormwater runoff carries debris that pollutes the environment. At right, Natalie Hash, 5, is trying to hold an adult brain, but the smell of formaldehyde is overpowering. Her dad, Ryan Hash, was with her at NICHHD’s ‘Unpack the Brain,’ led by Archie Fobbs, a guest host from the Museum of Science and Medicine in Silver Spring. **PHOTOS:** CHIA-CHI CHARLIE CHANG, MEREDITH DALY



Above, Jonah Gillespie, age 13, helps test the safety seals of the positive pressure personnel protection suit in a BSL-4 laboratory. At right, kids try out PiYo (pilates-yoga) class.



eyes from chemicals, machinery and sports injury, one kid exclaimed, “Dodge it?” to laughter. Others more seriously suggested goggles and helmets.

“You’ve been given this incredible body to keep healthy throughout your life,” Bishop said, “and your first job is to take care of yourself in every way you can.” They discussed how simple steps such as washing hands, eating right (including vitamin A and lutein, which promote healthy eyes), wearing sunglasses and sunscreen, exercising and getting enough sleep are important for eye and overall health.

In the diagnostics lab, NEI technician Dessie Koutsandreas let kids try out different gadgets and tests for eyesight, color, glare and depth perception. The Office of Disease Prevention’s Deborah Langer proudly watched her son Brent, age 9, try some of the tests. She wanted him to attend this session, she said, because his grandpa was an ophthalmologist and she wants Brent to learn about the profession.

“I like these types of small events where the kids can do lots of hands-on

experiments,” Langer said. “There is just so long that kids this age can stay focused on one activity.”

The day also featured larger, open activities where anyone could drop by without reserving a spot. On the Bldg. 31 patio, the NIH Police welcomed kids who petted Copper, a K-9 unit dog, tried on safety gear and ran through agility tests similar to the fitness tests NIH officers must pass before being hired.

On the Natcher and Bldg. 1 lawns, hundreds of kids and their parents stopped by Earth Day exhibits to learn about environmental threats such as pollution and climate change and ways each of us, big and small, can help protect the Earth by recycling, composting and conserving energy and water.

It was a gorgeous day, perfect for celebrating Earth and its resources. Some kids took a guided stroll to the NIH stream to learn about plants and wildlife. Outside Bldg. 1, youngsters visited an Audubon Society exhibit where they could pet a 30-year-old Russian tortoise, who kept his head poked out of his shell, seemingly unafraid of the

small hands reaching for him. Other kids fearlessly held earthworms while learning about making compost.

Kids also enjoyed the Summon the Rain exhibit, in which they poured colorful crystals representing trash, then sprayed water, onto an NIH Enviroscope 3-D model to see how rain carries pollutants into rivers and oceans and threatens sea life. “I learned that if you don’t throw trash away in the right place, the Earth can become like a big trash bin,” said 7-year-old Hanna Cho, daughter of NIAID’s Dr. Hee-Jeong Yang.

Back inside, in the Bldg. 31 basement, kids got a hands-on lesson in CPR from Juliann Egebrecht, director and coordinator of NIH’s Basic Life Support Training. Down the hall, in the gym’s group exercise room, parents watched through the window as their kids balanced and stretched in PiYo (pilates-yoga) and beat drumsticks.

By late afternoon, many of the youngsters were still bouncing around while their parents looked proud but exhausted. There’s a good chance adults and kids alike slept well that night.



At left, MPO Brian Sims poses with a young man trying on riot gear. Center: Kids stretch after a PiYo class in the NIH Fitness Center. At right, a NIDA youngster looks through a microscope at NSC.

Astronaut

CONTINUED FROM PAGE 1

experiments in environments that cannot be replicated on Earth.

During her stay aboard the ISS, Rubins demonstrated for the first time that it's possible to sequence DNA in space. One of the reasons for conducting the experiment was to figure out a way to identify microorganisms living on the ISS in real time. This technology might give researchers an opportunity to diagnose diseases, detect potential health threats rapidly, and, perhaps one day, identify unknown DNA-based life forms on other planets.

Her lab featured a small sequencer the size of a TV remote control and a tablet computer. She sequenced mouse, viral and bacterial DNA. The genetic material was prepared in a lab on Earth and sent up in a separate cargo ship.

Before she proved that sequencing can be done in space, there were a few concerns about the experiment. First, fluids behave differently in space. Air bubbles, for example, can form within air bubbles.

"Everything and anything you've ever understood about fluid behavior changes when you don't have the force of gravity influencing that fluid," she explained.

There were also concerns about whether the samples would survive the launch and journey to the ISS and whether the results of the experiment would be similar if the sequencing were conducted on Earth. The samples arrived intact and the experiments conducted on Earth yielded similar results.

Before she could fetch the sequencer, Rubins and another astronaut conducted two spacewalks.

On the first, they installed an



At left, Rubins gets an NIH overview from CC CEO Dr. James Gilman (c) and NIH deputy director for intramural research Dr. Michael Gottesman. At right, NIHGR director Dr. Eric Green, who accompanied the astronaut on her NIH tour, says, "Having Kate visit NIH and share with us her journey from bench to space station was truly inspirational. She is a remarkably accomplished scientist and now astronaut—and also a great role model."



Rubins talks about life 220 miles above Earth.

PHOTOS: ANDREW PROPP

international docking adapter outside the station, which will allow commercial spacecraft to dock at the ISS. On the second walk, the astronauts retracted a thermal radiator and installed high-definition cameras.

After she spoke, Collins came on stage to read Rubins questions submitted by NIH staff and online viewers. The Facebook broadcast had 108,000 live views.

When asked what's preventing astronauts from exploring deeper into space to planets like Mars, she responded, "We need to protect astronauts from radiation." Rubins explained that NASA continues to study how long-term weightlessness affects vestibular, bone and muscle health.

"These are questions that are within our ability to answer within the next 10 years or so," she said. "There are no show-stoppers that are absolutely going to prevent us from going to Mars."

Collins then asked her for advice on how to get children involved in science. She encouraged students to begin experimenting early.

"Biological experiments are a great way to get students interested, you know, thinking about their microbiome and the microbial world around them, thinking about physiology," she said. "All of these things are accessible to kids that are really young."

Rubins knew she wanted to be a scientist



"It's incredibly challenging to do a spacewalk...Even the most trivial tasks require an insane amount of focus, detail and attention."

-NASA ASTRONAUT DR. KATE RUBINS



"It's incredibly challenging to do a spacewalk. You're free floating, you're moving around in all six dimensions and your tools are floating," she explained. "Even the most trivial tasks require an insane amount of focus, detail and attention."

when she was 15. At that age, she attended a conference on recombinant DNA where she discovered scientists could interpret and potentially change the genome. That experience shaped what she studied in school.

One online viewer asked about her favorite thing in space. She responded that "being able to see the Earth from space was the most incredible thing."

During her spacewalk, she was above the coast of North Africa. Viewing the bright Sahara desert set against the stark blue of the ocean through "only your visor is this incredible sight," she marveled.

As for what's next, Rubins said she's learned to go with the flow. "The driving force is to always have interesting questions to ask," but "I guarantee you I'll be doing something scientific." **R**



Study Estimates Number of U.S. Women Living with Metastatic Breast Cancer

A new study shows that the number of women in the United States living with distant metastatic breast cancer (MBC), the most severe form of the disease, is growing. This is likely due to the aging of the U.S. population and improvements in treatment.

Researchers came to this finding by estimating the number of U.S. women living with MBC, or breast cancer that has spread to distant sites in the body, including women who were initially diagnosed with metastatic disease and those who developed MBC after an initial diagnosis at an earlier stage.

The researchers also found that median and 5-year relative survival for women initially diagnosed with MBC is improving, especially among younger women.

The findings appeared online on May 18 in *Cancer Epidemiology, Biomarkers & Prevention*.

In documenting the prevalence of MBC, the findings point to the need for more research into how to address the health care needs of women who live with this condition.

“Even though this group of patients with MBC is increasing in size, our findings are favorable,” said Dr. Angela Mariotto, chief of NCI’s Data Analytics Branch. “This is because, over time, these women are living longer with MBC. Longer survival with MBC means increased needs for services and research. Our study helps to document this need.”

Although researchers have been able to estimate the number of women initially diagnosed with MBC, data on the number of women whose cancers spread to a distant organ site, either as a progression or a recurrence after being first diagnosed with an earlier stage of breast cancer, has been lacking because U.S. registries do not routinely collect or report data on recurrence.

To develop a more accurate estimate of the total number of women living with MBC, researchers used data from NCI’s Surveillance, Epidemiology, and End Results Program to include women who developed MBC after diagnosis. The researchers

estimated that, as of Jan. 1, 2017, more than 150,000 women in this country were living with MBC, and that 3 in 4 of them had initially been diagnosed with an earlier stage of breast cancer.

“These findings make clear that the majority of MBC patients, those who are diagnosed with non-metastatic cancer but progress to distant disease, have never been properly documented,” said Mariotto. “This study emphasizes the importance of collecting data on recurrence at the individual level in order to foster more research into the prevention of recurrence and the specific needs of this growing population.”

Study Finds Tens of Millions Of Americans Drink Alcohol at Dangerously High Levels

Nearly 32 million adults in the United States (13 percent of the U.S. population age 18 and older) consumed more than twice the number of drinks considered binge drinking on at least one occasion, according to a 2013 survey that asked about past-year drinking. This higher level of drinking is associated with increased health and safety risks. A report of the findings is online in the *American Journal of Preventive Medicine*. The study was conducted by researchers at NIAAA.

“This important study reveals that a large number of people in the United States drink at very high levels and underscores the dangers associated with such ‘extreme’ binge drinking,” said NIAAA director Dr. George Koob. “Of the nearly 90,000 people who die from alcohol each year, more than half, or 50,000, die from injuries and overdoses associated with high blood alcohol levels.”

Binge drinking, defined as having four or more drinks on an occasion for women, or five or more drinks on an occasion for men, can produce blood alcohol levels greater than 0.08 percent, which is the legal limit for driving in the United States. Reaching this level is well known to increase the risk of harms to the drinker and others. However, evidence suggests that many people drink far beyond four or five drinks per occasion, defined as extreme binge drinking.

Extreme binge drinking was particularly common among study participants who used other drugs. This is a concern because combining alcohol with other drugs can increase the risk of injuries and overdose deaths.

“Drinking at such high levels can suppress areas of the brain that control basic life-support functions such as breathing and heart rate, thereby increasing one’s risk of death,” said senior author Dr. Aaron White, senior scientific advisor to the NIAAA director. “The risk increases further if other sedative drugs, particularly opioids or benzodiazepines, are added to the mix.”

The researchers noted that their findings



highlight the need to identify interventions to reduce extreme binge drinking and its negative consequences. Additional research is needed to determine how questions about peak alcohol consumption levels can be valuable in screening for alcohol misuse, as well as in assessing gender-specific risk factors and harms for drinking at extreme levels.

Researchers Connect Brain Blood Vessel Lesions to Intestinal Bacteria

A study in mice and humans suggests that bacteria in the gut can influence the structure of the brain’s blood vessels and may be responsible for producing malformations that can lead to stroke or epilepsy. The research, published in *Nature*, adds to an emerging picture that connects intestinal microbes and disorders of the nervous system. The study was funded by NINDS.

Cerebral cavernous malformations (CCMs) are clusters of dilated, thin-walled blood vessels that can lead to seizures or stroke when blood leaks into the surrounding brain tissue. A team of scientists at the University of Pennsylvania investigated the mechanisms that cause CCM lesions to form in genetically engineered mice and discovered an unexpected link to bacteria in the gut. When bacteria were eliminated, the number of lesions was greatly diminished.

“This study is exciting because it shows that changes within the body can affect the progression of a disorder caused by a genetic mutation,” said Dr. Jim Koenig, program director at NINDS.

The researchers were studying a well-established mouse model that forms a significant number of CCMs following the injection of a drug to induce gene deletion. However, when the animals were relocated to a new facility, the frequency of lesion formation decreased to almost zero.

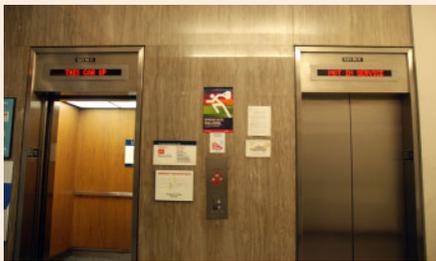
“It was a complete mystery. Suddenly, our normally reliable mouse model was no longer forming the lesions that we expected,” said Dr. Mark L. Kahn, professor of medicine at Penn and senior author of the study. “What’s interesting is that this variability in lesion formation is also seen in humans, where patients with the same genetic mutation often have dramatically different disease courses.”

Have a question about some aspect of working at NIH? You can post anonymous queries at <https://nihrecord.nih.gov/> (click on the Feedback tab) and we'll try to provide answers.

Feedback: The main elevators in Bldg. 10 south lobby are horribly slow and do not appear to properly synchronize/coordinate with one another. These elevators are the most frequently used elevators by staff, patients, deliveries, maintenance workers and other guests and should be functioning at an efficient capacity.

For the past month, these elevators have been slower than ever, leading to wait times of up to 10 minutes or more. This is a safety issue.

When will this problem be addressed appropriately?



Elevator maintenance is a constant challenge across NIH.

Response from the Office of Research

Facilities: Thank you for your feedback. Judging from the timing of your question, the issue cited appears to have been caused by a high volume of ridership resulting from the unscheduled shutdown of two elevators on the east side of Bldg. 10. The passengers who would normally ride east elevators migrated to the center elevator bank at a time when one of the four central elevators was out of service for scheduled repairs.

Since the time of this complaint, the elevators in question were repaired and placed back in service.

Another regrettable aspect of elevator reliability is that vandalism of the interior components or doors has repeatedly occurred. If anyone notices acts of vandalism, please report them to the NIH Police. The Office of Research Facilities is also investigating the feasibility of installing surveillance cameras in elevators to deter vandalism.

Overall, despite mechanical failures and acts of vandalism, Bldg. 10 elevators are operating at 90 percent availability. We do our best to schedule repairs and preventive maintenance, taking into account elevators already out of service. Our goal is to have no more than one elevator in a bank out of service at any one time. We appreciate your understanding.



Dr. David J. Lipman

NCBI Director Lipman Departs

Dr. David J. Lipman, who has served as director of the National Center for Biotechnology Information since its creation almost 30 years ago, is leaving NIH to become chief science officer at Impossible Foods, a new company applying molecular biology to the food industry.

to a staff of hundreds that produce more than 40 integrated databases that serve scientists and the public. Each day, more than 3 million users access NCBI databases and download more than 50 terabytes of data.

Lipman has been an advocate for promoting open access to the world's biomedical literature and launched PubMed in 1997, followed by the full-text repository, PubMed Central (PMC), in 2000. He was instrumental in implementing the NIH Public Access Policy whereby NIH-funded papers are made publicly available in PMC.

He has also maintained an active research program in influenza evolution and molecular evolution of the genome and proteome. Working with CDC, FDA and USDA, he has developed a system for applying whole genome sequencing for the surveillance and detection of foodborne pathogens. These methods have significantly improved the speed of detecting outbreaks of foodborne disease.

His research in creating rapid sequence comparison algorithms such as FASTA and BLAST has earned him an international reputation and his journal articles describing the methods are among the most highly cited in biology.

Among many honors, he is a member of the National Academy of Sciences and the National Academy of Medicine and a fellow of the International Society of Computational Biology,

• • •
“It’s hard to think of anyone at NIH who has had a greater impact on the way research is conducted around the world than David Lipman.”

-DR. PATRICIA FLATLEY BRENNAN

NCBI creates and maintains a series of databases relevant to biotechnology and biomedicine and is a world-renowned and trusted resource for bioinformatics tools and services. Major NCBI databases include GenBank for DNA sequences and PubMed, one of the most heavily used sites in the world for the search and retrieval of biomedical information.

“It’s hard to think of anyone at NIH who has had a greater impact on the way research is conducted around the world than David Lipman,” noted NLM director Dr. Patricia Flatley Brennan. “Under his visionary leadership, NCBI has greatly improved access to biomedical information and genomic data for scientists, health professionals and the public worldwide—something we now practically take for granted.”

Under Lipman’s leadership, NCBI has become an essential resource for biomedical researchers, practitioners, patients as well as the biotechnology and pharmaceutical industries. During his tenure, NCBI has grown from a handful of staff working to link biomedical literature and DNA sequences

the American Academy of Arts and Sciences and the American College of Medical Informatics. He received the Jim Gray eScience Award from Microsoft in 2013.

State Educators Honor NCI

The Maryland State Department of Education recently honored the National Cancer Institute with a 2017 award of excellence in career and technology education during a ceremony in Baltimore. NCI was nominated by Frederick County Public Schools as outstanding business partner in secondary education for its Werner H. Kirsten Student Intern Program.

Dr. Kristin Komschlies, acting director of the Office of Scientific Operations, accepted the award on behalf of NCI acting director Dr. Doug Lowy. “Our laboratories are vibrant places of important investigation, in part, because of students—undergraduates, graduate students and postdoctoral fellows—lending their ideas and enthusiasm to our science,” Komschlies said.



At the Maryland State Department of Education ceremony were (from l): Melissa Porter, OSO administrative manager; Dr. Nadya Tarasova of the Center for Cancer Research; Julie Hartman, OSO program analyst; Dr. Kristine Pearl, supervisor of career and technology education from Frederick County Public Schools; Dr. Karen B. Salmon, Maryland superintendent of schools; Norm McGaughey, coordinator for career and technology education, FCPS; Dr. Kristin Komschlies, OSO acting director; Dr. James Cherry, OSO assistant project officer; Marsha Nelson-Duncan, OSO education program specialist; Dr. Anne Spence, professor of the practice, mechanical engineering from the University of Maryland-Baltimore County; and Dr. Lynne M. Gilli, Maryland assistant superintendent of schools.

"Thanks to the Werner H. Kirsten Student Intern Program, which you honor today, NCI's scientific education and training extend to high school students."

The program, now in existence for more than a quarter century, has served more than 1,000 students from Frederick and surrounding communities who spend an intensive summer program working with mentors in research laboratories and in administrative functions—positions the students continue through their senior years.

Komschlies thanked the mentors who are at the heart of the Kirsten program: staff members from the Office of Scientific Operations, investigators from the Center for Cancer Research and scientific staff from the Frederick National Laboratory for Cancer Research.

NCI was one of nine organizations honored with glass trophies presented by Dr. Karen B. Salmon, Maryland's superintendent of schools, and Dr. Lynne M. Gilli, assistant superintendent.

NCI Alumnus Caban Mourned

Dr. Carlos E. Caban, 75, passed away on May 1 from stage 4 prostate cancer. Born in San Juan, Puerto Rico, he grew up in San Antonio, Tex., the suburbs of Long Island, N.Y., and Philadelphia. He and his family moved to Maryland in fall 1970.

Caban graduated from Colgate University in 1963,



Dr. Carlos Caban at his retirement party in 2008

received his Ph.D. in biochemistry from the State University of New York at Buffalo in 1971, and earned a master's degree in public health from Johns Hopkins University School of Public Health in 1990. He had retired from NIH in 2008 after 38 years of service.

He began his NIH career as a research scientist, moved to the National Cancer Institute as a review administrator, became a program director for Cancer Control Research (now DCCPS) and served as a program policy officer in the Office of Extramural Research. He was a major contributor to NIH publications and guidelines regarding the inclusion of women, minorities and children in clinical research, served a term as president of the NIH Hispanic Employees Organization and received many awards for his contributions to NIH.

Outside of NIH, he served 9 years as a planning commissioner for the City of Rockville in the early 1980s. In the 1970s, he was active in the Rockshire Civic Association. In recent years, he volunteered as an usher at Strathmore.

He loved tennis and was a member of the United States Tennis Association. He played regularly at various facilities, clubs and leagues throughout the Washington metro area. He was a frequent volunteer at Rock Creek Tennis Center tournaments, periodically attended the U.S. Open in Flushing Meadows, N.Y., and completed a "bucket list" goal of traveling to Wimbledon in England in 2015 with his son Jonathan.

Caban is survived by his wife of 52 years, Elinor; his two sons, David Charles Caban of Cleveland and Jonathan Louis Caban of Washington, D.C.; and extended family.

Memorial donations may be made to Hope Connections for Cancer, 9650 Rockville Pike, Bethesda, MD 20814. [R](#)

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.

NIAID Seeks Healthy Volunteers

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

Parkinson's Disease Study

NINDS researchers seek volunteers who have had Parkinson's disease for less than 5 years to participate in a study testing whether N-acetylcysteine (NAC) has a particular effect on brain chemistry. Researchers are evaluating whether NAC can protect the nerve cells in the brain that control brain movement. Compensation is provided. To learn about participating, call 1-866-444-2214 (TTY 1-866-411-1010) or visit <https://go.usa.gov/xXSsQ>. Refer to study 17-N-0076.

Diagnosed with Stomach Cancer?

Have you been diagnosed with stomach cancer? NCI researchers at the Clinical Center need volunteers 18 or older with stomach cancer that has spread to the abdomen for a study at the Clinical Center combining surgery with heated chemotherapy as a potential new treatment for stomach cancer. For more information, call the Office of Patient Recruitment, 1-866-444-2214 (TTY 1-866-411-1010). Learn more online at <https://go.usa.gov/xXnqK>. Refer to study 17-C-0070.

NIAID Seeks Healthy Volunteers

NIAID researchers seek healthy volunteers, 18-50 years old, for an investigational vaccine study targeting RSV. Compensation is provided. For more information, call 1-866-833-5433 (TTY 1-866-411-1010). Email vaccines@nih.gov or visit <http://bit.ly/2nOkOvY>.

PHS Senior Official Visits NIH

Rear Admiral Joan Hunter, director of the Public Health Service Division of Commissioned Corps Personnel and Readiness, visited NIH recently. She



Attendees at the Commissioned Corps all-hands meeting at Stone House included (front, from l) RADM (ret.) Richard Wyatt, RADM Joan Hunter, RADM Richard Childs, RADM Susan Orsega, RADM Helena Mishoe and RADM Peter Kilmarx.

met with PHS flag officers and other senior leaders in the morning and with IC deputy directors during lunch to discuss collaborative efforts.

In the afternoon, she held an all-hands meeting with NIH Commissioned Corps officers to share information from headquarters and to promote an “all-hands-on-deck” leadership philosophy.

Rear Admiral Helena Mishoe of NHLBI, NIH representative to the surgeon general’s policy advisory council, chaired the morning session. It focused on identifying collaborative strategies between NIH and the Office of the Surgeon General to strengthen the corps workforce, particularly in the clinical categories.

Julie Berko, acting director of the NIH Office of Human

Resources, provided an update on personnel issues, comparing the Commissioned Corps and Civil Service systems.

Hunter noted, “Working at the lead agency in biomedical research, NIH officers play a key role in advancing the USPHS mission in protecting, promoting and advancing the health and safety of the nation.”

There are 256 Commissioned Corps officers at NIH staffing 23 ICs, with the greatest number at the Clinical Center. The total includes 85 nurses and 77 physicians. Other categories at NIH include health services officer, scientist, pharmacist, veterinarian, environmental health officer, engineer, therapist and dietitian.

In addition to their regular duties, officers play a key role in health emergency responses, which have included the 9/11 terrorist attacks, hurricanes and the West Africa Ebola outbreak. **R**

Celebrate National Week of Making, June 16-22

The National Week of Making is an opportunity to celebrate the innovation, ingenuity and creativity of “makers”—the diverse community of independent designers and inventors who make their own unique products using a variety of technologies. During June 16-22, join in celebrating the National Week of Making with events and classes held at the NIH Library that will feature makers at NIH.

Stop by the library in Bldg. 10 to see examples of how researchers have utilized maker technologies to create cost-saving solutions that improve research capabilities, laboratory efficiency and experimental reproducibility. The display will feature a variety of 3-D prints and custom labware made by NIH intramural researchers and staff. Come and be inspired by how the NIH community is using 3-D-printed lab instrumentation to transform research and how 3-D-printed molecular and anatomical models facilitate hands-on discovery and communication.

The Week of Making activities will also feature free training classes related to 3-D modeling software and printing, as well as virtual reality demonstrations. The events are open to NIH and HHS staff. Registration is required.

For a list of classes and more information, visit <https://nihlibrary.nih.gov/about-us/news/week-of-making>. For questions about events, contact Verma Walker at verma.walker@nih.gov. Additional resources and information about custom labware and the Maker Movement can be found online at the NIH 3D Print Exchange or by contacting 3Dprint@nih.gov.

The NIH Week of Making is a collaborative effort organized by the NIH Office of Technology Transfer, the NIH Library and the NIAID Office of Cyber Infrastructure and Computational Biology.



NIDA director Dr. Nora Volkow (rear, third from l) and NIDA scientific director Dr. Antonello Bonci (rear, fourth from l) with NIDA IRP investigators and Purdue University biomedical engineering faculty

NIDA Hosts Neural Engineering Symposium

NIDA’s Intramural Research Program hosted a Neural Engineering Symposium on Apr. 7.

Faculty from Purdue University’s biomedical engineering department presented innovative technologies for drug delivery systems, formulations and counterfeit prevention strategies to help curb the opioid overdose epidemic.

In addition, Purdue faculty presented experimental diagnostic and therapeutic medical devices, both wearable and implantable.

NIDA investigators and Purdue faculty spent the day discussing the research tool and clinical applications for these early-stage technologies.

The symposium is a continuation of ongoing research collaborations between the NIDA IRP and Purdue University and will lead to further development of these technologies for diagnostic and therapeutic utility.