

INAUGURAL LECTURE NIAID's Marston Outlines Scientific Response to Coronavirus

BY RICH MCMANUS

While the Wednesday Afternoon Lecture Series goes on hiatus due to restrictions on travel and gathering imposed by the novel coronavirus, a new virtual lecture series has taken its place.

On Apr. 15, NIAID's Dr. Hilary Marston became the first speaker in a series begun by the intramural program's new COVID-19 scientific interest group (SIG), which began in March.

Her talk, "The Biomedical Research Response to COVID-19: A View from NIAID," attracted nearly 1,200 viewers



Dr. Hilary Marston

at the start and was introduced by Dr. Michael Gottesman, NIH deputy director for intramural research. He said the new SIG had already had more than 1,000 sign-ups to its listserv.

Marston, medical officer and policy advisor for global health and pandemic preparedness at NIAID, joined NIH in 2013 and has experience in outbreak response, including Zika virus and Ebola. She offered a broad overview of NIAID preparedness response.

SEE **MARSTON**, PAGE 4

NIH's Kastner Comes to Aid of Cruise Ship Passengers

BY ERIC BOCK

On Mar. 11, Lcdr. Tameika Kastner of ORS's Division of Occupational Health and Safety (DOHS) received a phone call: she was to deploy for the Public Health Service's response to support passengers who had returned to the United States on the Grand Princess cruise ship.

Three days earlier, the ship docked in Oakland, Calif., because of an on-board COVID-19 outbreak. Nearly 3,000 passengers disembarked and quarantined for 14 days at military bases across the country. Roughly 800 were sent to Travis Air Force base, a military base east of Oakland, for 2 weeks.

"When I got called into deployment, it was unexpected," she said. "I got the call at 10:30 at night, saying 'You're going to get

SEE **KASTNER**, PAGE 8

NIAMS Jumpstarts Volunteer Response to Coronavirus

BY ALISA ZAPP MACHALEK

When an NIAMS intramural researcher became the first NIH employee to test positive for the novel coronavirus on Sunday, Mar. 15, NIAMS mobilized. By the next morning, the institute had sent out an email to its clinically trained staff and had recruited five volunteers to help mitigate the spread of the virus on campus.

"The speed of the response was quite striking to me—not surprising, but striking," said Dr. Robert Colbert, director of the NIAMS clinical research program. "Because we had the index case, we got involved very quickly in the process of working with OMS [Occupational Medical Service], which was already being overwhelmed with calls from NIH staff about symptoms."

Volunteers from across NIH joined the early NIAMS staffers to create a robust

SEE **VOLUNTEERS**, PAGE 10

EARLY ALTERNATIVE MEDICINE? Historian Looks at Hypnosis, Hype and Health

BY CARLA GARNETT

Entranced girl. Caged lion. Fascinated audience. Clever carnay. Reads like all the ingredients for a reality TV segment, but this particular recipe was ripped from 19th century French headlines. What's more, the sensational mauling death that resulted from the incident in Beziers, France, wasn't even a unique occurrence.



Dr. Katrin Schultheiss

Mind control, whether it was possible and who should be allowed to practice it were all

SEE **HYPNOSIS**, PAGE 6



Ad hoc telework colleagues grow more comfortable shell-tering in place. See p. 12.

ALSO THIS ISSUE

NIH Launches Partnership to Speed COVID-19 Vaccine, Treatments	3
NIH Recognizes AAPI Month	5
NIH Mobilizes National Innovation Initiative for COVID-19 Diagnostics	7
NCATS's Hall Among Unsung Heroes	8
Digest	9
Milestones	11
Seen	12

Webinar on Epidemiology in Screening, Diagnosis of Diabetes

The Office of Disease Prevention (ODP) will hold a Methods: Mind the Gap webinar with Dr. Elizabeth Selvin on Wednesday, May 20 at 2 p.m. The lecture will discuss the importance of epidemiologic evidence in informing strategies and cut points for screening and diagnosis of diabetes. A focus will be on the evidence supporting the importance of the hemoglobin A1c (HbA1c) test and current controversies regarding screening and diagnosis of prediabetes.



Selvin is a professor of epidemiology at Johns Hopkins Bloomberg School of Public Health and holds a joint appointment in the School of Medicine, division of general internal medicine. She is the author or co-author of more than 350 papers in the peer-reviewed literature including landmark papers

in the *New England Journal of Medicine*, *JAMA*, *Lancet*, *Annals of Internal Medicine* and other major medical journals. Selvin has devoted her career to leading translational research projects designed to evaluate and improve screening, diagnosis and patient care for people with diabetes.

Registration, which is required, is available at prevention.nih.gov/education-training/methods-mind-gap/importance-epidemiology-screening-and-diagnosis-diabetes. The webinar will be recorded and available on the ODP website within about a week.

Website Features Messages of Hope to Health Care Workers

The National Institutes of Health Federal Credit Union (NIHFCU) has launched SendAMessageofHope.com, a website where anyone can post an inspiring message of gratitude to health care workers, showing support for them during this challenging time. As video or photo messages are posted, they are shared with hospitals, health care clinics and more.

"We have always been honored to serve those who help keep the world safe, from the committed health care professionals who care for our health to the amazing biomedical professionals at the National Institutes of Health," said Rick Wiczorek, NIHFCU president and CEO. "In these unprecedented times, there are so many people, including our members, who have stepped up to combat this crisis on the front lines and we wanted to find a way to express our gratitude and share support."



While We Were Away...

In the time since NIH went primarily telework-only in mid-March due to the novel coronavirus pandemic, wildlife has stepped into the ecological hole left by humans. Above, a den of at least 3 foxes has made a home outside the entrance to Bldg. 30. Jamie Schetrompf, assistant program manager for the animal facility at NIDCR, captured the image. The image at right is from a short video of the foxes made by a person who forwarded it to Schetrompf. Below, a wild turkey roams free between Bldgs. 2 and 31 on Mar. 29, captured by ORS's Dr. Heike Bailin. Deer and Canada geese have always been workday neighbors of NIH employees. What species will next become more apparent amid our flora and fauna? And will they do a phased exit as we do a phased reentry?



The site welcomes everyone who wants to post a video or photo message to share with health care professionals. For example, messages can consist of a child's work of art, a tribute song and so on. When the frontline workers take a short break or get home from their shift, they can visit the site and get a dose of hope from all who contribute.

Steve Levin, NIHFCU's vice president of marketing and business development, added, "Thousands of our credit union members are among the millions of health care heroes worldwide fighting COVID-19. Through the site, we can all send a message of hope to these amazing people as they make sacrifices for the rest of us."

NIH Launches Partnership to Speed COVID-19 Vaccine, Treatments

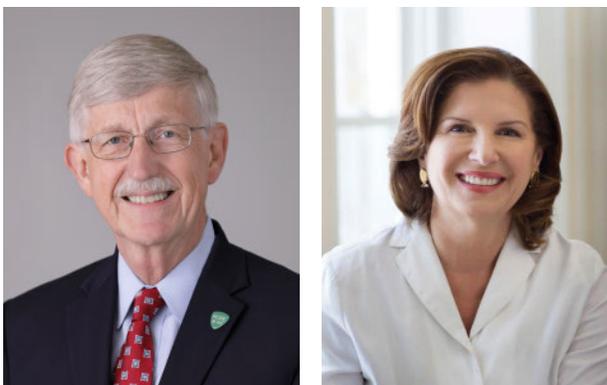
NIH and the Foundation for the NIH are bringing together more than a dozen leading biopharmaceutical companies, the HHS Office of the Assistant Secretary for Preparedness and Response, the Centers for Disease Control and Prevention, the Food and Drug Administration and the European Medicines Agency to develop an international strategy for a coordinated research response to the COVID-19 pandemic.

The planned Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV) partnership will develop a collaborative framework for prioritizing vaccine and drug candidates, streamlining clinical trials, coordinating regulatory processes and/or leveraging assets among all partners to rapidly respond to the COVID-19 and future pandemics.

“We need to bring the full power of the biomedical research enterprise to bear on this crisis,” said NIH director Dr. Francis Collins. “Now is the time to come together with unassailable objectivity to swiftly advance the development of the most promising vaccine and therapeutic candidates that can help end the COVID-19 global pandemic.”

At a virtual town hall meeting on Apr. 24, Collins said such partnerships “usually take 1 to 1½ years to organize. This time we did it in about a week and a half, which is a reflection of the urgency of the challenge we are facing.”

Coordinated by FNIH, ACTIV government and industry partners will provide infrastructure, subject matter expertise and/or funding (both new and in-kind) to identify, prioritize and facilitate the entry of some of the most promising candidates into clinical trials. Industry partners also will make available certain prioritized compounds, some of which have already cleared various phases of development, and associated data to support research related to COVID-19. The partnership is being developed with input from a steering committee managed by FNIH that includes leaders from NIH, FDA and the research and development organizations of the companies.



Collaborating on the new ACTIV partnership are NIH director Dr. Francis Collins and FNIH president Dr. Maria Freire.

“COVID-19 is the most significant global health challenge of our lifetime, and it will take all of us working together as a global community to put an end to this pandemic,” said Dr. Paul Stoffels, vice chairman of the executive committee and chief scientific officer, Johnson & Johnson. “We will need to harness the best ideas from multiple stakeholders, including governments, regulatory authorities, academia, NGOs and industry to stop COVID-19.”

“Battling the COVID-19 pandemic is far too great a challenge for any one company or institution to solve alone,” adds Dr. Mikael Dolsten, chief scientific officer and president, worldwide research, development and medical, Pfizer. “We are seeing an unprecedented level of collaboration across the innovation ecosystem to address this global health crisis, and this potentially powerful NIH initiative may allow us to further accelerate the delivery of much-needed therapies to patients around the world.”

The research community is currently sifting through more than 100 potential preventives and therapeutics for COVID-19. ACTIV will aim to provide guidance that can be used to prioritize the range of vaccine and therapeutic candidates in development and connect clinical trial networks to test new and repurposed candidates quickly and efficiently.

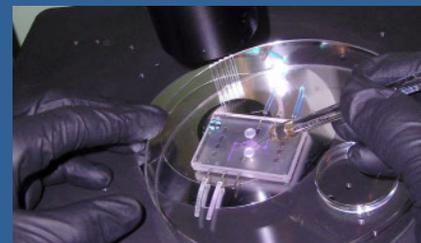
“Using the most advanced clinical trial methods to rapidly test multiple interventions will help get the answers we need as soon as possible to expedite potential prevention and treatment approaches to fight COVID-19,” said FDA commissioner Dr. Stephen Hahn. “Collaboration is a

critical ingredient for success and the FDA will continue to use every tool possible under our Coronavirus Treatment Acceleration Program to speed the development of safe and effective medical countermeasures.”

ACTIV will have 4 working groups uniting the efforts of some 70 experts.

“This powerful public-private partnership will focus and expedite R&D activities required to combat COVID-19,” said Dr. Maria Freire, FNIH president and executive director. “Working

in lockstep, the public and private sectors will maximize the chances of success and provide a roadmap to pre-emptively manage future threats.” **R**



ON THE COVER: Scientists supported by the National Center for Advancing Translational Sciences work on a kidney on a chip.

IMAGE: NCATS

The NIH Record

Since 1949, the *NIH Record* has been published biweekly by the Editorial Operations Branch, Office of Communications and Public Liaison, National Institutes of Health, Department of Health and Human Services. For editorial policies, email editor or phone (301) 496-2125.

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/>



The *NIH Record* is recyclable as mixed paper.

NIH National Institutes of Health
Turning Discovery Into Health

“Part of NIAID’s mission is rapid response,” she said, “and the world has provided ample fodder [for pandemic preparation], for better or worse.”

NIAID leads the biomedical research response to emerging infectious diseases; in this role, it partners closely with other federal components, she explained. Other key players include three HHS entities—the Public Health Emergency Medical Countermeasures Enterprise, the Office of the Assistant Secretary for Preparedness and Response and the Biomedical Advanced Research and Development Authority—as well as the FDA, CDC, Department of Defense and other agencies.

Working in partnership with those agencies, scientific entities have taken one of three approaches to preparedness, she said.

- **Priority-pathogen approach:** “This is a list of all the scary viruses we know are out there, including Lassa, Ebola, MERS and SARS. It also includes Disease X, something that takes us all by surprise.”

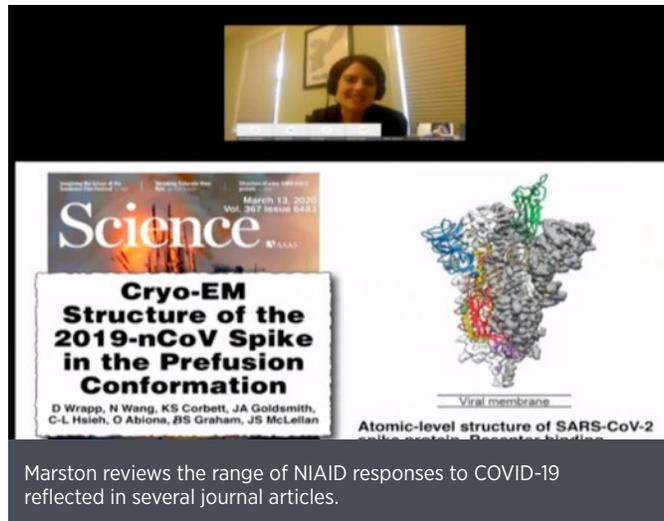
- **Vaccine platform technologies:** Using a vaccine platform, such as a viral vector or nucleic acid material, researchers insert the gene or genes of interest from the pandemic threat.

- **Prototype pathway:** Here, researchers can leverage what they know about certain virus families, for example flaviviruses—which were deeply studied during the Zika outbreak of 2015-2017—to be ready for the next new or re-emerging disease. “We already had a significant amount of bench strength, and some ideas for a roadmap, from that experience,” Marston said.

The new coronavirus, SARS-CoV-2, “is quite large, about 30 kilodaltons,” said Marston. It belongs to a family of 4 viruses responsible for some 15-30 percent of common colds.

Coronaviruses were not thought to be associated with serious illness until SARS emerged in 2002 in Guangdong Province, China. Unlike COVID-19, which can have mild to virtually no effect on some of those infected, SARS had clear signs and symptoms.

“Most [infected] people had very clinically apparent illness,” said Marston. There were some 8,000 cases worldwide and nearly



Marston reviews the range of NIAID responses to COVID-19 reflected in several journal articles.

800 deaths. “There was also a significant amount of economic disruption and a good deal of fear.”

SARS came under control within about a year due to basic public health measures, including containment and travel advisories, said Marston. The Vaccine Research Center (VRC) at NIH had a phase 1 SARS vaccine in trials within 20 months of full genome sequencing.

In 2012, Middle East respiratory syndrome, which is similar to SARS, emerged in Saudi Arabia in a camel host. Although it didn’t sicken the animals, MERS was nonetheless deadly in a few small outbreaks, including South Korea, where in 2015, 185 cases resulted in 33 deaths. Like SARS-CoV-2, MERS “tended to be severe in those with underlying medical problems,” said Marston.

As with SARS, countermeasure development for MERS quickly progressed in animal models, including mice and macaques.

“We knew that coronaviruses would be a constant epidemic threat,” said Marston. When COVID-19 broke out in China late in 2019, experts in the U.S. and abroad quickly suspected another coronavirus as the cause.

“Every country in the world is likely affected at this point,” said Marston.

Spread was exacerbated by factors including transportation. The virus was thought to have originated in a large seafood market in Wuhan, one of China’s largest cities.

“Now, however, we believe this was not the origin but a site of spread and outbreak amplification,” said Marston. The market is close to a high-speed rail line that connects Beijing and Hong Kong. “It was the perfect set-up for spread,” she noted.

The new coronavirus has a wide spectrum of effects, ranging from carriers who are asymptomatic to severe cases, including septic shock and multi-organ dysfunction.

“About 80 percent of cases are characterized as mild,” said Marston. Seventeen percent are severe and 2-3 percent are fatal. “There is a clear association with underlying disease and advanced age.”

For patients hospitalized with COVID-19, days 7 and 8

are crucial: “That’s when some patients take a turn for the worse, if it’s going to happen,” said Marston.

She reviewed the range of NIAID response, from basic research, through diagnostics (mostly conducted by CDC), therapeutics and vaccines. Some highlights:

- On Jan. 11, Chinese scientists published the SARS-CoV-2 genome in *Science*. “We were pleased it was shared so quickly,” said Marston. More than 200 genomes were posted globally within weeks, and the number continues to rise.

- NIAID scientists at the Rocky Mountain Laboratories quickly verified that the ACE-2 receptor in the lungs is the site of viral entry, “which is similar to SARS, but not to MERS,” Marston noted. RML scientists also discovered that several types of monkeys are a good disease model; other researchers are studying ferrets, guinea pigs, golden Syrian hamsters and mice.

- VRC scientists Dr. Barney Graham and Dr. Kizzmekia Corbett characterized the structure of the virus’s pre-fusion spike and have an mRNA vaccine candidate in phase 1 trials. “We hope that this approach to antigen design might work across all of the coronaviruses,” Marston said, especially since there is a large animal reservoir of beta-coronaviruses, globally.

- A range of therapeutics have been identified that target the viral life cycle, including the virus itself and viral polymerase. The nucleoside analog remdesivir, used in Ebola and MERS (in animals), is being studied in a randomized controlled trial that began Feb. 25; results were expected in 4-6 weeks. The oral antiviral

EIDD-2801 is being studied, as are hydroxychloroquine and azithromycin (in a French trial) and convalescent plasma (“NIAID is interested in hyperimmune globulin as a potential therapy,” said Marston).

In the future, Marston said her institute expects an expanded role in sero surveys, transmission and natural history of COVID-19, and perhaps the development of monoclonal antibodies.

During a Q&A session, Marston was asked if some current vaccines such as oral polio vaccine might offer cross-protection against COVID-19.

“That’s an interesting hypothesis,” she said, “and it’s gotten the attention of some great scientific minds.” There is some ecological data indicating that vaccines, including oral polio vaccine and especially BCG (used primarily against tuberculosis), are associated with lower rates of COVID-19, said Marston. “It may boost non-specific innate immunity in some way.”

Her full talk is available at <https://videocast.nih.gov/watch=36375>. **R**



NIAID Director Becomes Folk Hero

Ben Weinstein of Bethesda models a mask featuring the image of NIAID director Dr. Anthony Fauci, who has become the government’s principal scientific spokesperson on the novel coronavirus pandemic. A sudden icon of American popular culture, Fauci has recently been played by Brad Pitt on *Saturday Night Live*, had a best-selling bobblehead doll named after him, appeared on donuts and pastries and been featured on the Fauci Pouchy, a line of take-out cocktails marketed by a local restaurant.

PHOTO: JOSEPH MCMANUS

NIH Recognizes AAPI Month

For Asian American Pacific Islander Heritage Month, the Office of Equity, Diversity and Inclusion joined with the Federal Asian Pacific American Council in highlighting the achievements of Dr. Vivek Murthy, the nation’s first Indian American surgeon general.

To further mark the occasion, EDI highlights the accomplishments of individuals in the AAPI community who have embodied Murthy’s spirit in their scientific work and contributions at NIH. They are:

MURTHY HONORED



- Dr. Zhiyong Lu, NIH’s first Earl Stadtman investigator in the area of computational biology and bioinformatics. Before becoming a Stadtman investigator in 2011, he served as a staff scientist at the National Center for Biotechnology Information since 2007. Today, Lu is deputy director for literature search at NCBI. Most recently, he played a key role in developing LitCovid, an open-resource literature hub that curates the most comprehensive collection of international research papers on the new coronavirus disease COVID-19.



- Dr. Noni Byrnes, director of the Center for Scientific Review. Born and educated in Pakistan, she came to the U.S. for college. Before working at NIH, she worked for Procter & Gamble’s pharmaceutical division, developing and evaluating analytical methods as part of drug development. In 2000, Byrnes began working at CSR as a scientific review officer and worked her way up to become director in February 2019.

Honorees include (clockwise, from top) Dr. Zhiyong Lu, Dr. Noni Byrnes, Dr. Leighton Chan and Dr. Maryland Pao.

- Dr. Maryland Pao is clinical director and deputy scientific director at the National Institute of Mental Health. A pediatrician and child and adolescent psychiatrist, she studies distress, suicide and

correlates in medically ill children. Pao has published more than 120 research articles and chapters and helped develop *Voicing My Choice*, a new advance-care planning guide for adolescents and young adults.

- Dr. Leighton Chan is chief of the Clinical Center’s rehabilitation medicine department. He oversees an organization that collaborates with investigators from across NIH to provide innovative rehabilitation services. Chan has published more than 125 peer-reviewed articles, including 10 in the *New England Journal of Medicine*, *JAMA* and *The Lancet*.

Hypnosis

CONTINUED FROM PAGE 1

fodder for a recent NLM History of Medicine lecture, “Girl in the Lion Cage: Regulating Hypnotism in 19th Century France,” by Dr. Katrin Schultheiss, associate professor and chair in the department of history at George Washington University.

“The phenomenon of hypnosis was of immense interest to doctors and researchers as well as the general public in the 19th century,” she said. “While the scientific community debated—heatedly at times—whether susceptibility to hypnotic suggestion was a sign of nervous pathology or a normal feature of the human mind, the general public marveled at the seemingly limitless and potentially dangerous ability of one mind to control another.”

In the event described above, Schultheiss said, “the hypnotist’s goal was to demonstrate to the gathered crowd how profound and authentic [the girl’s] hypnotic trance was—so profound that she would neither protest nor show fear when introduced into the cage, so profound that the lion would presumably show no interest in her.” Which, of course, is not how things turned out.

But to some in the medical community—especially the esteemed Dr. Jean-Martin Charcot, widely regarded as the father of modern neurology and a recognized expert on hypnotism—such staged theatrics represented much more than tragic circus: It amounted to practicing medicine without a license, or even proper training.

A similar mauling had already occurred in another part of France weeks earlier. That victim, also a young female, survived the lion attack. Still, the dangers of just anyone using hypnosis seemed clear to Charcot.

He and others believed “susceptibility to hypnotism and hypnotic suggestion was a sign of underlying hysteria, a sign of neurotic pathology,” reported Schultheiss. And since the subjects were ill, any attempts to delve into their minds ought to be governed by professional codes and standards.

“The need to regulate hypnotism stemmed from a belief that there were people with latent hysteria whose pathology could be triggered by exposure to hypnotism outside of a medical setting,” Schultheiss said.

Then and now, Charcot’s voice carried



Schultheiss said hypnotism was having something of a heyday in the 1880s and 1890s as “public, legal and medical interest skyrocketed across Europe.”

LECTURE PHOTOS: CHIA-CHI CHARLIE CHANG

a lot of weight in scientific and medical communities. He was the first to describe multiple sclerosis. His work laid the foundation for our early understanding of Parkinson’s disease. Amyotrophic lateral sclerosis, or ALS, was first known as “Charcot’s disease,” owing to his observations of the disorder. He taught renowned Austrian founder of psychoanalysis Dr. Sigmund Freud.

Using medical illustrations, scientific journals and Charcot articles and correspondence found in NLM’s History of Medicine collections, Schultheiss is putting the finishing touches on a book about the pioneering neurologist’s other work, however—his somewhat sketchy theories about hysteria and his use of hypnosis as an entryway into the recesses of the mind.

During the 1880s to 1890s, Schultheiss said, hypnotism was having something of a heyday as “public, legal and medical interest skyrocketed across Europe...

No one bore more responsibility for introducing the public to the practice of scientific hypnotism than Charcot.”

In 1882, at the prestigious Academy of Sciences, Charcot argued for hypnotism’s legitimacy with a paper describing three phases of the

practice. At Salpêtrière Hospital, which had become a famous neuropsychiatric teaching center, he routinely conducted his own demonstrations, always employing female subjects. The hip crowd attended these exhibitions, too. Audiences often included politicians, artists and authors as well as neurologists, ophthalmologists and psychologists.

Multiple factors occurring at the same time helped set the scene, Schultheiss recounted. In mid- to late-19th century Europe, there were, for instance, “overall efforts to regulate medical practice, trepidation about the unknown powers of the unconscious mind, democratization of political power and psychology of the crowd as well as the influence of commercial entertainers and the growing presence of women in public spaces.”

Mind-reading, telekinesis, hallucination, communication with the dead as well as mesmerism or magnetism—two contemporary terms for hypnotism—and other “psychical” phenomenon were all topics of fascination not only for the general public, but also for those exploring the mysteries of the brain.

In Paris around the same time, Schultheiss recounted, hypnotism was also being debated in a highly publicized court case. A young woman stood accused of murder. Her defense claimed she was the innocent victim of a diabolical mesmerist/lover who hypnotized her into strangling a rich man they could later rob.

A defense witness was called from Nancy, in eastern France, the center of a school of medical thought that held that “hypnotic



A Clinical Lesson at the Salpêtrière, an 1887 painting by André Brouillet, shows Dr. Jean-Martin Charcot presenting a demonstration on hypnotism.

sleep was not qualitatively different from normal sleep and all people were to one degree or another suggestible,” Schultheiss said. “Normal human susceptibility to hypnotic suggestion was not pathological and in fact could be put to positive use for behavior modification, pain relief and even as a form of anesthesia.”



From NLM's digital collection, an 1826 lithograph, *Le Magnétisme*, by French artist Louis Léopold Boilly

The accused had been manipulated by a schemer skilled at mesmerization, argued the defense, and should not be held accountable for her actions. The argument failed to sway the court, however.

Citing Charcot, the prosecutor general concluded, “Hypnotism could never overcome an individual's core convictions or alter her fundamental character and personality. In hypnotic sleep, the will can be stolen, but not abolished.”

The Salpêtrière community was undeterred, Schultheiss noted. “To many doctors, including Charcot, the serious criminal potential of unregulated hypnotism was more hypothetical than real,” she said, “and the more ominous threat was not to law and order, but to public health.”

By the late 1880s, unregulated popular hypnotism was legally prohibited in most of Europe. In France, however, Charcot's efforts to officially police the practice largely failed.

“The threat presented by hypnotism should, I think, be understood simultaneously as a professional response to a real public health threat, as an expression of anxiety about the powers of the mind that were only beginning to be explored, and by the rapid social, political and cultural changes that marked the last decade of the 19th century,” Schultheiss concluded. “This was the Belle Epoque, but beneath the elegant surface of an affluent, carefree society lay many uncertainties and potential dangers—dangers like nervous weaknesses that could by accident or intention be brought to the fore.” **R**

RADx KICKS OFF

NIH Mobilizes National Innovation Initiative for COVID-19 Diagnostics

NIH announced on Apr. 29 a new initiative aimed at speeding innovation, development and commercialization of COVID-19 testing technologies. With a \$1.5 billion investment from federal stimulus funding, the newly launched Rapid Acceleration of Diagnostics (RADx) initiative will infuse funding into early innovative technologies to speed development of rapid and widely accessible COVID-19 testing.

At the same time, NIH will seek opportunities to move more advanced diagnostic technologies swiftly through the development pipeline toward commercialization and broad availability. NIH will work closely with the Food and Drug Administration, the Centers for Disease Control and Prevention and the Biomedical Advanced Research and Development Authority to advance these goals.

The stimulus investment enhances NIH research efforts already underway that are focused on prevention and treatment of COVID-19, including the planned Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV, see p. 3) public-private partnership to coordinate the international research response to the pandemic.

“We need all innovators, from the basement to the boardroom, to come together to advance diagnostic technologies, no matter where they are in development,” said NIH director Dr. Francis Collins. “Now is the time for that unmatched American ingenuity to bring the best and most innovative technologies forward to make testing for COVID-19 widely available.”

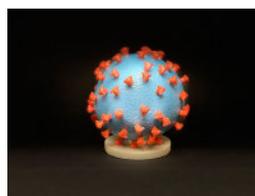
As part of this initiative, NIH is urging all scientists and inventors with a rapid testing technology to compete in a national COVID-19 testing challenge for a share of up to \$500 million over all phases of development. The technologies will be put through a highly competitive, three-phase selection process to identify the best candidates for at-home or point-of-care tests for COVID-19. Finalists will be matched with technical, business and manufacturing experts to increase the odds of success.

If certain selected technologies are already relatively far along in development, they can be put on a separate track and be immediately advanced to the appropriate step in the commercialization process. The goal is to make millions of accurate and easy-to-use tests per week available to all Americans by the end of summer 2020, and even more in time for the flu season.

“Americans are innovators and makers,” said Dr. Bruce Tromberg, director of the National Institute of Biomedical Imaging and Bioengineering. “We need American tech experts, innovators and entrepreneurs to step up to one of the toughest

challenges we've faced as a country, to help get us safely back to public spaces.”

While diagnostic testing has long been a mainstay of public health, newer technologies offer patient- and user-friendly designs, mobile-device integration, reduced cost and increased accessibility both at home and at the point of care. RADx will expand the Point-of-Care Technologies Research Network (POCTRN) established several years ago by NIBIB. The network will use a flexible, rapid process to infuse funding and enhance technology designs at key stages of development, with expertise from technology innovators, entrepreneurs and business leaders across the country.



POCTRN supports hundreds of investigators from multiple universities and businesses through five technology hubs: Emory University/Georgia Tech; Johns Hopkins University; Northwestern University; University of Massachusetts Medical School, Worcester; and the Consortia for Improving Medicine with Innovation & Technology (CIMIT) at Harvard Medical School/Massachusetts General Hospital.

Led by the coordinating center at CIMIT, the network has assembled expert review boards covering scientific, clinical, regulatory and business domains that will rapidly evaluate technology proposals. In order to roll out new products starting at the end of summer/fall 2020, a parallel process will allow quick throughput of projects. Projects will be assessed at each milestone and must demonstrate significant progress to receive continued support. **R**

PBS Airs ‘The Gene’

PBS recently aired the two-part documentary *Ken Burns Presents The Gene: An Intimate History*. The National Human Genome Research Institute helped support the show, which featured several NIH scientists. The series, which is based on *The Gene* by Dr. Siddhartha Mukherjee, journeys through key discoveries in genetics that are some of the greatest achievements in the history of science. For more information, visit <https://www.genome.gov/outreach/the-gene-an-intimate-story>.



Dr. Siddhartha Mukherjee speaks at NIH in 2017.

In 2017, Mukherjee spoke about his book with NIH director Dr. Francis Collins at the inaugural NIH Big Read, the culminating event following several informal, mini book club discussions around NIH. Read the *Record's* coverage of the event at <https://nihrecord.nih.gov/2017/06/16/mukherjee-provides-intimate-look-gene>.



Lcdr. Tameika Kastner (rear, second from r) was part of the PHS response to support passengers who had returned to the United States on the Grand Princess cruise ship.

she was one of 500 officers sent to help in response to Hurricane Harvey in Houston.

Kastner's first deployment was "a little stressful because we were bouncing all over the place. We slept in nine different locations." Then Hurricane Irma made landfall in Florida. She helped in that disaster response, as well. Her recent deployment went much smoother and wasn't as stressful. She stayed in one location.

"What's crazy is that schools closed the same day I was

Kastner

CONTINUED FROM PAGE 1

deployed tomorrow afternoon."

She was part of a swab team, helping to test passengers with possible COVID-19 infections. Over the next 2 weeks, she was part of an effort that collected samples from almost 470 passengers.

When she first arrived, public health officials trained her in procedures for donning and doffing protective personnel equipment and how to collect and prepare samples.

Kastner worked with two other PHS officers to first ask passengers whether they wanted to be tested or not.

"A clinician collected the sample from a guest, a second person took the tube and bagged it properly and a third person provided new personal protective equipment for the person who collected the sample," she said.

At NIH, Kastner is food safety and drinking water program manager for DOHS.

The deployment to Travis Air Force base was her second PHS assignment. In 2017,

deployed," she said. "My husband still had to physically go into work." Fortunately, her parents offered to watch her kids for 2 weeks.

Once she came back, she adjusted to a new life. Like so many other NIH'ers, she began teleworking full-time while homeschooling her children. There were, for example, no swim lessons, dance classes or math tutoring.

"The COVID-19 outbreak did not just hit the ship," Kastner said. "The whole country was impacted." **R**

An All-Out Response to the Need for Therapies

"Life is completely different," said Dr. Matthew Hall, acting chief of NCATS's Early Translation Branch. "I assumed when I decided to start telecommuting that I'd spend a frustrating few weeks or months working with my group on writing manuscripts and planning grand schemes for when we returned to the lab. Instead, the work over the past few months building COVID-19 assays has evolved into an all-out response to the need for therapeutic candidates—through drug repurposing and repositioning and new screening.

"At NCATS," he continued, "we have a group of volunteer researchers working in the lab planning screening and receiving therapeutic candidates from intramural and extramural labs to test and provide data as quickly as possible. They are supported by program and administrative staff



Dr. Matthew Hall of NCATS

who haven't missed a step in transitioning to telework."

Hall's branch has about 10 different assays, he said, and plans to test each against about 2,500 approved drugs, and thousands more pre-clinical drug candidates that could be repurposed.

"We've also received several dozen candidates from various labs for testing. The yellow robots (seen in photo) are a big part of that testing.

"The NIH intramural environment exists for exactly this kind of challenge," said Hall, "and it's been highly gratifying to see intramural friends and collaborators from various ICs bring their expertise and energy to bear on COVID-19 science and help out—with approval from Bldg. 1, of course—with no questions asked. We have a long way to go, but the spirit of teamwork at NIH gives me great hope. We are all in this together."

NIH Trial Shows Drug Speeds Recovery from Advanced COVID-19

Hospitalized patients with advanced COVID-19 and lung involvement who received remdesivir recovered faster than similar patients who received placebo, according to a preliminary data analysis from a randomized, controlled trial involving 1,063 patients, which began on Feb. 21. The trial (known as the Adaptive COVID-19 Treatment Trial, or ACTT), sponsored by NIAID, is the first clinical trial launched in the United States to evaluate an experimental treatment for COVID-19.

An independent data and safety monitoring board overseeing the trial met on Apr. 27 to review data and shared their interim analysis with the study team. Based on their review of the data, they noted that remdesivir was better than placebo from the perspective of the primary endpoint, time to recovery, a metric often used in influenza trials. Recovery in this study was defined as being well enough for hospital discharge or returning to normal activity level.

Preliminary results indicate that patients who received remdesivir had a 31 percent faster time to recovery than those who received placebo. Specifically, the median time to recovery was 11 days for patients treated with remdesivir compared with 15 days for those who received placebo. Results also suggested a survival benefit, with a mortality rate of 8 percent for the group receiving remdesivir versus 11.6 percent for the placebo group.

More detailed information about the trial results, including more comprehensive data, will be available in a forthcoming report. As part of the Food and Drug Administration's commitment to expediting the development and availability of potential COVID-19 treatments, the agency has been engaged in sustained and ongoing discussions with Gilead Sciences regarding making remdesivir available to patients as quickly as possible, as appropriate.

Remdesivir, developed by Gilead Sciences Inc., is an investigational broad-spectrum antiviral treatment administered via daily infusion for 10 days. It has shown promise in animal models for treating SARS-CoV-2 (which causes COVID-19) infection and has been examined in various clinical trials.

Study Links Severe Sleep Apnea to Higher Blood Glucose Levels in African Americans

African Americans with severe sleep apnea and other adverse sleep patterns are much more



Associations of sleep apnea and high blood glucose levels were stronger among black men than black women, an NIH-funded study found.

likely to have high blood glucose levels—a risk factor for diabetes—than those without these patterns, according to a new study funded in part by NHLBI.

The findings suggest that better sleep habits may lead to better blood glucose control and prove beneficial for type 2 diabetes prevention and diabetes management in African Americans, who are at higher risk for type 2 diabetes than other groups. They also point to the importance of screening for sleep apnea to help fight the potential for uncontrolled blood sugar in this high-risk group, the researchers said.

Previous studies have linked disturbed sleep patterns, including sleep apnea, to increased blood glucose levels in white and Asian populations. But this new study is one of the few to use objective measurements to link these disturbed sleep patterns to increased blood glucose levels in black men and women, the researchers said. Their findings appeared online on Apr. 28 in the *Journal of the American Heart Association*.

“The study underscores the importance of developing interventions to promote regular sleep schedules, particularly in those with diabetes,” said Dr. Yuichiro Yano, the lead study author and a researcher in the department of family medicine and community health at Duke University. “It also reaffirms the need to improve the screening and diagnosis of sleep apnea, both in African Americans and other groups.”

Dr. Michael Twery, director of NHLBI's National Center on Sleep Disorders Research, added that the study highlights important associations between untreated sleep apnea and poorly regulated blood sugar. “It also adds to growing evidence that protecting our sleep, like diet and exercise, may help reduce the risk of diabetes and the related risk of cardiovascular disease.”

In addition to studying sleep apnea, the researchers found that participants who experienced other types of disturbed sleep—including sleep fragmentation and sleep duration

variability—were also more likely to have increased measures of blood glucose.

Yano and his team also found that associations of sleep apnea and high blood glucose levels were stronger among black men than black women.

Infant Temperament Predicts Personality More Than 20 Years Later

Researchers investigating how temperament shapes adult life-course outcomes have found that behavioral inhibition in infancy predicts a reserved, introverted personality at age 26. For those individuals who show sensitivity to making errors in adolescence, the findings indicated a higher risk for internalizing disorders (such as anxiety and depression) in adulthood. The study, funded by NIH and published in *Proceedings of the National Academy of Sciences*, provides robust evidence of the impact of infant temperament on adult outcomes.



A study funded by NIH provides robust evidence of the impact of infant temperament on adult outcomes.

“While many studies link early childhood behavior to risk for psychopathology, the findings in our study are unique,” said Dr. Daniel Pine, a study author and chief of the NIMH section on development and affective neuroscience. “This is because our study assessed temperament very early in life, linking it with outcomes occurring more than 20 years later through individual differences in neural processes.”

Temperament refers to biologically based individual differences in the way people emotionally and behaviorally respond to the world. During infancy, temperament serves as the foundation of later personality. One specific type of temperament, called behavioral inhibition (BI), is characterized by cautious, fearful and avoidant behavior toward unfamiliar people, objects and situations. BI has been found to be relatively stable across toddlerhood and childhood; children with BI have been found to be at greater risk for developing social withdrawal and anxiety disorders than children without BI.



NIAID research study coordinator Holly Ann Baus (l) and NIAMS intramural researcher Dr. Keith Sikora are among those who volunteer to test members of the NIH workforce for the novel coronavirus.

PHOTO: KEITH SIKORA

they should be monitored...whether they can go back to work or not,” Bergeron explains. “It’s definitely interesting.”

When the screening began in mid-March, OMS was inundated with calls. Many NIH travelers returning from overseas feared they had been exposed to the virus.

“Initially, there were so many calls,” Bergeron says. At the time, she was making up to 10 calls a day. “Now things have toned down,” at least partly, she says, because travel (and its risk of exposure) has been curtailed.

In addition, the screening process has been improved and streamlined. For example, in the early days of the response, before the online questionnaire had been developed, telephone screening was done in hard copy (on paper) by volunteers sitting in FAES classrooms in the Clinical Center.

“They spaced out the workstations at least 6 to 10 feet apart, and each station was numbered,” Bergeron recalls. “We noted the number of our seat and had to wipe down the station with sterile wipes before we used it. Eventually we were required to wear masks in the room.”

Now, volunteers can make the calls from home and log responses electronically.

Clinical Center screening

The Clinical Center initially limited the number of patients admitted to the hospital, canceled or postponed outpatient procedures and restricted visits from family and friends. But this policy was due to be loosened toward the end of May.

The main cafeteria is closed, as is the gift shop, hair salon and credit union. Still, hundreds of people enter the building every day—doctors, nurses, patients, housekeeping staff, those who bring in food, deliver packages or care for research animals. Every one must undergo in-person

screening and evaluation.

When people enter the Clinical Center, they are directed to one of the privacy booths erected in the north lobby. There, they are greeted by an NIH clinician or Public Health Service officer dressed in personal protective equipment. The clinician gives the person a surgical mask and a squirt of hand sanitizer, then asks a series of questions: Why do you need to enter the hospital? Do you have any of the following symptoms? Recent travel? Known exposure to the virus?

Depending on the answers, the person is asked to leave the hospital (if the visit is for non-essential business), allowed to enter (and required to wear the mask while inside) or asked to self-isolate and call OMS. When leaving the booth, the person’s hands are treated again with sanitizer.

People who have clear symptoms of coronavirus are escorted to a special COVID-19 testing area within the hospital.

NIAMS nurse practitioner Alice Fike is one of those who screens people coming in the hospital’s entrance. She is also a commander in the Commissioned Corps. After several weeks of volunteering, she was officially deployed to help with the Clinical Center’s coronavirus response.

“We’re trying to keep any virus out of Bldg. 10, which now contains only the sickest, most vulnerable patients,” she says.

Volunteers

CONTINUED FROM PAGE 1

system for screening, testing (“swabbing”) and monitoring members of its workforce who show symptoms of the COVID-19 virus.

The screening process continues to change in response to the rapidly evolving situation. At the time of this writing, here’s how it works.

Rigorous screening for NIH staff

If NIH’ers are concerned they are infected with the virus, the first step is to contact their health care provider. Next, they should complete the OMS online questionnaire. This screening tool is available to the entire NIH workforce, including federal employees, contractors and trainees. It is designed for those who have symptoms of COVID-19 (the disease caused by the novel coronavirus SARS-CoV-2) and believe they were exposed to the virus in the previous 14 days.

Every NIH’er who completes the questionnaire will receive a call from an OMS staff member or volunteer who will help determine the next steps for each person. Ly-Lan Bergeron, a physician assistant at NIAMS, is one of these volunteers.

“You have to go through multiple questions with each employee, trying to figure out if they qualify for swabbing or not, whether



NIH’s coronavirus response team includes clinically trained NIH volunteers, such as those mentioned in this story, as well as deployed members of the Public Health Service Commissioned Corps. Shown here are Ltjg. Ruth Widener (l) and Lcdr. Brenda Holbrook.

PHOTO: CHIA-CHI CHARLIE CHANG

Testing for the virus

Only a portion of NIH'ers screened for the virus will need to be swabbed for it. Still, it's a big job.

To test workers who have symptoms of COVID-19, NIH assembled its volunteers into teams. Each team includes a greeter, two swabbers (who use a long sterile swab to take tissue samples from deep within the nasal cavity), two swab assistants (who package the samples) and a labeler. A safety officer monitors the operation for unsafe situations and to develop measures for assuring personnel safety.

April Brundidge, a research nurse with NIAMS, has rotated among all the roles. Her many previous volunteer experiences include helping at homeless shelters in Florida and Virginia, administering vaccines to children in Hawaii and teaching workers in Liberia how to conduct a vaccine trial during the Ebola crisis.

"This volunteering experience feels different," she says. "I know I'm here to help, but it's very eerie driving onto an empty, quiet campus. It feels like I'm a character in a sci-fi movie."

Like Brundidge, nurse practitioner Carol Lake has extensive volunteer experience. She came to NIH less than 6 months ago and works for both NIAMS and NHGRI. She was credentialed as a specialist in rheumatology in February—just 3 weeks before non-essential employees were asked to work remotely. For years prior to that, she provided primary care and infectious disease control in an outpatient community clinic. In a way, this new volunteering experience is a return to her roots as a generalist.

"Honestly," she says, "I feel more comfortable [helping with the COVID-19 response] than seeing patients for rheumatology."

NIAMS intramural researcher Dr. Keith Sikora works as a swabber. "I volunteered because I'm a physician first," he says. "I became a doctor to help people."

Sikora describes the swabbing process as "very methodical. We follow very special steps to clean ourselves between each patient...I've been very satisfied with how we were trained to prevent transmission to the volunteers."

Nonetheless, he says, "I think we all just want everything to get back to normal." **R**

NIDCD Scientific Director Griffith Steps Down

Following 22 years of dedicated service to the intramural research program at NIH, Dr. Andrew J. Griffith will step down in late spring to take an academic leadership role at the University of Tennessee Health Science Center in Memphis.

An esteemed geneticist and otolaryngology head-and-neck surgeon, Griffith has spent two decades as a principal investigator at the National Institute on Deafness and Other Communication Disorders, during which he led the NIDCD intramural program as scientific director for 11 years. Dr. Thomas B. Friedman, an NIDCD principal investigator who leads studies on molecular and human genetics, will serve as acting scientific director until a permanent scientific director is named.

NIDCD director Dr. Debara Tucci said, "Andy's time at the NIDCD was more than valuable, it was vital. He not only shared his passion and vision for science at the Intramural Research Program; he also deftly led it into a modern age of diversity, productivity and excellence in research training."

While serving as NIDCD scientific director, Griffith fostered high-risk, high-reward science, particularly in translational and clinical research. He encouraged scientists to take advantage of the Clinical Center's resources to perform clinical trials, and he established the NIDCD Otolaryngology Surgeon-Scientist Program to train clinicians to conduct research. He also facilitated the establishment and administration of new core facilities covering advanced imaging, genomics and computational biology and mouse auditory testing. These facilities provide NIH intramural investigators with easy access to essential resources.

Griffith had a major impact across NIH and beyond, serving as a spokesperson for NIDCD in NIH, congressional and public

settings. He served in many leadership roles at NIH. Notably, he played a major role in the response to the NIH Red Team report, as well as the reorganization of intramural clinical research as NIH deputy director for intramural clinical research, a post he has held since 2016.



Dr. Andrew J. Griffith

Griffith joined NIH in 1998 as a member of the senior medical staff of the Clinical Center. He then came to NIDCD as a senior staff fellow and received additional training with Friedman. Since 2000, Griffith has served as chief of the Otolaryngology Branch and the molecular biology and genetics section of the NIDCD intramural program. He made seminal contributions to the understanding of the genes, molecules and processes involved in hearing and hearing loss.

His laboratory conducted pioneering studies that led to the discovery of the TMC gene family and demonstrated that the TMC1 and TMC2 genes encode protein components of the mechano-electrical transduction channel of inner ear sensory cells. The components of this channel had proven elusive to the hearing research community for many years.

Griffith has received many honors, including a 2002 Presidential Early Career Award for Scientists and Engineers. He has also received two NIH Director's Awards in the past 3 years for his distinguished service.

Griffith earned a B.S. in chemistry from the University of California, Davis, and an M.D. and Ph.D. from Yale University. He completed an otolaryngology-head and neck surgery residency at the University of Michigan.

"I will miss many things [about NIDCD]," said Griffith, "but what I will miss the most are the people, including my colleagues and co-workers at NIDCD across NIH, and the brave and generous patients and their families that I have had the privilege to work with at the NIH Clinical Center." **R**

Telework Aides Offer Reason to Put Phone on Mute

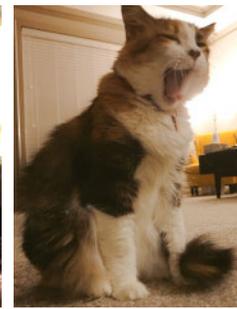
Raise your hand if your pet ever interrupted one of your telework efforts, to your embarrassment.

Here are more of NIH's prized telework helpmates, who have assisted their (alleged) masters since the workforce was encouraged to begin telework in mid-March.

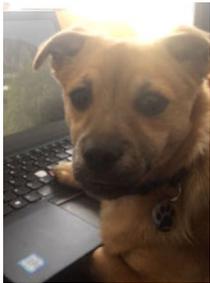
On Apr. 24, NIH'ers learned that telework remains the preferred mode of operations until the end of May. Here's hoping the unprecedented amount of attention works to the benefit of all.



Clockwise (from lower left): "After draining the pond, we were pleased to discover that Fluffy the turtle had, in fact, survived her first winter outside," said Jennifer Sizemore of NIGMS. • "My dog, Sally, appreciates me being home and taking her on walks during conference calls," said Dr. Peter Kilmarx, deputy director of the Fogarty International Center. "Here she is modeling and providing scale for a neighbor's display of what 6-foot separation looks like." • "I'm going to have a serious discussion with my coworker about boundaries," said Nicole Popovich, a management analyst in NIEHS's Division of Extramural Research and Training. • Gerry, who usually floats about at FIC, was also sent home to telework. Gerry was rescued from a wading pool at an NIH event back in June 2017. Spoiled with love from staff, the fish has grown to be quite beautiful and friendly, said Mili Ferreira, FIC global health program specialist. • "My current favorite companion is our kitty Mystic," said Dr. Pat Brown, director of OER's Office of Laboratory Animal Welfare, who has had many pets over the years. "He was a rescue that my son found as a kitten in Salisbury, hanging around the student apartments. He is now 11 and considers himself the master over me."



Clockwise from above: "I am loving this social distancing rule because now I am able to spend ALL day with mom and we get to go on 47,473 walks a day!" says Princeton, owned by Ashley White, recruitment & outreach specialist in the Clinical Center's Office of Patient Recruitment. • "I have two cats and this one [Moon] is the oldest," said Judy Bartz, an administrative technician at NIEHS. "She turned 20 in January. She thinks she is a kitten yet. She lightens the mood and helps us stay upbeat." • "My quarantine coworker, Kona, at work providing IT support," says Karen White, web content manager at NICHD. • NIEHS's Debbie Gaffney has a personal assistant, Lansky, who she says "will be getting a 2 on his PMAP for social distancing!" • NIEHS's Ru-Pin "Alicia" Chi has a cat named Gary who yawns constantly, not realizing it is contagious. • Hazel supports Omar Echegoyén, Clinical Center patient recruitment specialist, during his telework days. • Dr. Erica Spotts, health scientist administrator in the Office of Behavioral and Social Sciences Research, notes, "My supervisor is working hard."



From I: One day while eating lunch, NIAMS's Alisa Machalek caught sight of this red-shouldered hawk in her backyard. Using her husband's new zoom lens, she was able to capture this image. • "How can we play if you're working all the time?" says Charlie, who belongs to Richard Barnes of the Online Information Branch, OD. • "Billy provides 'round-the-clock IT support,'" says Dr. James Onken, a contractor for OD. "The PrtSc key [has been] retrieved from his mouth. G key still missing." • "Listen up, this is what we are going to do to get her out of our house!" say cats Pixel and Luna, who belong to Eli Ney of NIEHS. "As you can see," says Ney, "they don't practice social distancing either." • "Are you having a ruff time?" asks Max, a German shepherd belonging to Gladys Gonzalez, a study recruiter at NIEHS. • "This is Luce (the mini labradoodle), who has been stealing the show during Zoom and Webex meetings since the start of the pandemic," says Dr. Alyssa Brooks of the Clinical Center. "She wishes everyone would mute themselves except when they are speaking, but not as much as she wishes she had more treats." • Gabby, a 13.5-year-old lab, comes in for some petting from Joseph Shealey, senior electrical engineer at the Research Triangle Park Facilities Management Branch. • Justin Kosak of NIEHS has two at-home supervisors.



From I: "This is Clark," says Dr. Allen Deary, program director in the NCI Cancer Research Data Commons. "He is a 1.5-year-old whippet. He loves the beach, which is unfortunately closed right now. But every day, he helps keep me sane and focused and serves as a reminder of what's important." • Christine Sizemore of the Fogarty International Center has an assistant, "Peck," a green-rumped parrotlet who loves NIH's director. • The support team belonging to Paul Williams, communications director at NICHD • "Goldie, a 4-week-old Nubian goat, is my telework co-worker and also my stress relief," says Erica Jaworski, clinical manager of oncology clinics in Bldg. 10. "My kids bottle-feed Goldie and her goat sister three times a day. We are all getting an education of the farm-yard variety." • Duncan, a cat belonging to Christine McGowan, an NCI research nurse specialist, likes to catch up on email. • Bo has been the best co-worker during this extended time of teleworking, says Stephanie Wildridge, clinical manager of 3NW Adult Oncology in the CC. • Bella is in the habit of distracting both Daniel Avila, an anesthesia tech in Bldg. 10, and Belinda Avila, supervisor of sterile processing in the hospital.