

ALL HANDS ON DECK

HEAL Investigators Meet, Collaborate to Tackle Opioid Crisis

BY DANA TALESNIK

It started with a disastrous miscalculation. The danger continued undetected, bubbling under the surface for nearly two decades. Prescription opioids dispensed to relieve pain were mistakenly deemed non-addictive as long as the patient was in pain, and doctors increasingly prescribed them, triggering dependence, an upsurge in illicit opioid use and deadly overdoses.

The federal government has declared the opioid epidemic a national public health emergency and summoned an



Dr. Rebecca Baker directs the NIH HEAL Initiative, involving hundreds of scientists.

all-hands-on-deck approach to combat the crisis. Congress so far has allocated \$1 billion to NIH's HEAL (Helping to End Addiction Long-term) Initiative, which has

awarded more than 400 research grants and contracts nationwide to expedite solutions to opioid addiction and develop safer treatments for pain.

More than 2 million Americans are addicted to opioids. Most of them do not receive effective treatment, and those who do often don't stay in treatment long enough to recover fully. In 2017 alone, more than 47,000 people died from opioid-related overdoses.

"The [opioid] crisis is a formidable challenge that's rapidly evolving, so our research response has to match both in magnitude and in urgency," said HEAL Initiative director Dr. Rebecca Baker during remarks at a 2-day meeting that convened hundreds of HEAL investigators in January at the Hyatt Regency in Bethesda.

The latest statistics show the first glimmers of improvement. In 2018, opioid

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ENABLING DATA-DRIVEN DECISIONS

How Asthma, Pollution Affect Health of Pregnancy, Newborns

BY CARLA GARNETT

If you're pregnant and have asthma, you or your newborn may have complications during delivery. Either of you might have residual health problems afterwards, or you both may be fine. Until recently there wasn't a lot of information to help you and your medical team make a plan. Over the past decade or so at NIH—and over the course of her



Dr. Pauline Mendola

SEE **ASTHMA**, PAGE 4

Goodman Aims to Measure Research Engagement

BY ERIC BOCK



Dr. Melody Goodman

Despite the importance of involving patients and other partners in the research process, there's no way to measure their engagement. Dr. Melody Goodman, an associate professor of biostatistics

at New York University, is developing a survey tool she hopes will change that.

"The extent to which stakeholders in research partnerships feel engaged has not received scientific attention," said Goodman at a recent Wednesday Afternoon Lecture

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Point-of-care technology touted; see p. 3.

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Rare Disease Day Set, Feb. 28

About 7,000 rare diseases affect people and only a few hundred of those have any treatment. Although each rare disease affects fewer than 200,000 in the United States, in total, these illnesses affect an estimated 30 million individuals in this country. On Friday, Feb. 28, NIH will host an event to raise awareness about these diseases, the people they affect and research collaborations that strive to advance new treatments.

Sponsored by the National Center for Advancing Translational Sciences and the Clinical Center, Rare Disease Day at NIH will take place from 8:30 a.m. to 4:30 p.m. in Kirschstein Auditorium, Bldg. 45. Admission is free and open to the public.

The event will feature personal and scientific stories from patients, advocates and researchers, as well as interactive panel discussions on shortening the diagnostic odyssey, individualized therapies and personalized medicine and improving access to rare diseases information. Other highlights include inspiring TED-style talks, an NIH Town Hall question-and-answer session, NIH clinical trial resources, posters and exhibits by rare disease groups and researchers, networking opportunities and tours of the Clinical Center and the National Library of Medicine.



The event marks the 10th Rare Disease Day at NIH, an important milestone that conveys the dedication and commitment of NCATS, the Clinical Center and other parts of NIH to advance research and develop treatments in collaboration with rare disease patients, families and advocates, said Dr. Alice Chen Grady, a program officer in the NCATS Office of Rare Diseases Research who leads the RDD planning committee.

Learn more about the event, view the agenda and register at <https://ncats.nih.gov/rdd>. Follow activities on social media at #RDDNIH and download the free NIH NCATS Events app from your phone's app store.

Prior to the event, NIH is hosting a Twitter chat on rare diseases on Friday, Feb. 21, from 2 to 3 p.m. The chat will feature NIH director Dr. Francis Collins, NIH staff and representatives from the rare diseases advocacy community. Follow @ncats_nih_gov and join the conversation using #NIHchat.

NLM Lecture Examines Uses of Google Images

Mar. 4

The next talk in the NLM Informatics and Data Science Lecture Series will be "Using Google Street View Images to Examine Links Between the Built Environment and Health."

It will be held Wednesday, Mar. 4 from 2 to 3 p.m. in Lister Hill Center Auditorium, Bldg. 38A.

Speaking will be Dr. Quynh Nguyen, assistant professor of epidemiology and biostatistics at the University of Maryland School of Public Health. She is a social epidemiologist focusing on contextual and economic factors as they relate to health.

Advances in neighborhood research have been constrained by the lack of neighborhood data for many geographical areas. Nguyen will discuss the use of Google Street

View images as a source of national data on built environment features and the use of computer vision to label images for indicators of walkability, urban development and physical disorder.

The lecture will be live-streamed and subsequently archived at <http://videocast.nih.gov/>.

Those who need sign language interpreting and/or other reasonable accommodation to participate should contact Ebony Hughes at Ebony.Hughes@nih.gov and/or the Federal Relay at 1-800-877-8339. Requests should be made 5 days in advance.

NIMHD 10th Anniversary Scientific Symposium, Mar. 3

The year 2020 marks the 10th anniversary of the National Institute on Minority Health and Health Disparities. The NIMHD 10th Anniversary Scientific Symposium: Innovations to Promote Health Equity will showcase the latest discoveries in minority health and health disparities research. It takes place Tuesday, Mar. 3 from 9 a.m. to 4:30 p.m. in Kirschstein Auditorium, Bldg. 45.



Recent news coverage on topics such as maternal mortality, medication ineffectiveness, vaping and diet-related cancers reflect both the acknowledgment of disparities in health and health care and the urgent need to ensure all populations are fully engaged in biomedical research. Leading researchers investigating these and other topics will help crystalize and further explore our current knowledge about the determinants of health and their impact on minority health and health disparities.

Audience members will engage with panelists to help identify research opportunities and optimal

strategies for reducing health disparities among racial/ethnic minorities, persons of disadvantaged socioeconomic status, sexual and gender minorities and underserved rural residents.

The symposium will feature four panels focused on:

- Integrative Biological and Behavioral Sciences
- Community Health and Population Sciences
- Clinical and Health Services Research
- Multidisciplinary Intramural Research at NIMHD

The symposium will close with remarks on future directions for ensuring that all populations have an equal opportunity to live long, healthy and productive lives.

Register for the symposium at <https://meetings.nigms.nih.gov/Home/Registration/25928>. The event will be available on NIH Videocast and archived for those unable to attend in person.

Learn more at <https://www.nimhd.nih.gov/about/10-year-anniversary/symposium.html>.

Jones To Present NINR Director's Lecture

On Thursday, Mar. 5, Dr. Randy Jones will present the first 2020 NINR Director's Lecture, from 11 a.m. to noon in Lipsett Amphitheater, Bldg. 10. In his presentation "Complex Decision-Making in Prostate Cancer," Jones will describe his program of research, which focuses on health disparities, prostate cancer, chronic illness, end-of-life care and decision-making. The lecture will also be broadcast live and archived at <http://videocast.nih.gov>.

Jones is a professor at the University of Virginia School of Nursing. He has received funding from organizations such as NIH, the Robert Wood Johnson Foundation (RWJF), American Cancer Society and the American Nurses Foundation. He is currently a principal investigator on an NINR-funded study focusing on treatment decision-making among patients with advanced prostate cancer.

Jones is a fellow in the American Academy of Nursing (AAN), a RWJF Nurse Faculty Scholar alumnus and a national advisory committee member for RWJF Clinical Scholars and AAN's Institute for Nursing Leadership. He is committed to promoting research, evidence-based practice, health policy and enhancing higher education and clinical practice.

The event is free and open to the public. For more information and to register, visit <https://go.usa.gov/xd5DK>.



Dr. Quynh Nguyen



Dr. Randy Jones

Experts Team Up to Tackle Global Health Challenges

BY THOMAS M. JOHNSON

NIH recently hosted the IEEE Special Topic Conference on Healthcare Innovations and Point-of-Care (POC) Technologies, which highlighted how unmet clinical needs are driving technical solutions. The conference comes at a time when health care costs and access to care are of great concern in the U.S. At the same time, significant problems in developing countries and low-resource communities persist, such as high rates of sexually transmitted diseases and tuberculosis, as well as the need for better HIV diagnosis and treatment and women's access to pre- and postnatal care.

The conference highlighted the important role for research, communication and transparency in developing point-of-care technologies. "Innovators, scientists, clinicians and patients need to work together to continually evaluate and refine the technology," said program chair Dr. Diane Lawrence, an NIAID program officer. "Such a partnership ensures that the new technology is validated, measures what is really needed and actually makes a positive impact on human health."

The conference featured a relatively new participant—artificial intelligence. Several keynote speakers as well as numerous new technologies showcased by poster presenters highlighted the AI built into their latest inventions.



Dr. Umut Gurkan (l) of Case Western Reserve University and Dr. Ran An demonstrate the Gazelle integrated point-of-care hemoglobin variant and malaria testing system, which is being used to test children for sickle cell disease in Africa and Asia.

PHOTO: NIBIB

Participants demonstrated, for example, how diagnosis and treatment could be sped by having women provide the vaginal swabs for gonorrhea and chlamydia testing themselves, in the waiting room lavatory. Having determined that women did not mind doing the self-swabbing, researchers found that the strategy resulted in the POC test being performed in time for the doctor to have the result in hand when first seeing the patient.

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“It is exciting to see the maturing of the development of POC technologies, approaches and strategies to get these innovative diagnostics into the field.”

—DR. TIFFANI LASH

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In the opening keynote address, Dr. Mira Irons, chief health and science officer at the American Medical Association, spoke about the great promise of AI to support physicians and improve patient outcomes across the health care spectrum. However, she also warned of the potential risk to patients if AI tools for clinical decision-making are not grounded in rigorous evidence-based research and validation. She prefers to think of AI as “augmented intelligence” that focuses on AI’s assistive role, emphasizing the fact that its design enhances rather than replaces human intelligence.

Other prominent themes included the constant pursuit of smaller, cheaper and faster diagnostics for persistent global infectious diseases such as gonorrhea and chlamydia. Along with technical improvements, considerations such as integration of a device into the normal workflow of both modern health care facilities and clinics in the field were hot discussion topics.

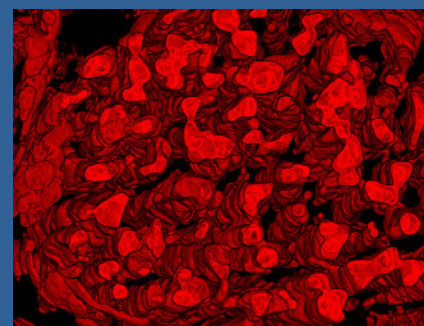
Such a protocol allows the doctor to prescribe treatment immediately to individuals testing positive for infection. In addition, the rapid result allows doctors to talk to patients about letting sexual partners know they should be tested and treated. It even allows patients to offer advice on how to broach the subject—a strategy that can dramatically reduce infection rates across entire regions.

A number of presenters described the critical challenge of turning an innovative technology built in the lab into a product that makes the harrowing journey to become a POC diagnostic used successfully in the field. The keys to success might be summed up as perseverance, personal sacrifice and partnerships—with a common sentiment being, “We thought we were at the end, but it was just the beginning.” The key message was that the blending of technology, assessment of clinical need, making it work in the field, manufacturing and commercialization takes

multiple partnerships that should be assembled as early as possible.

“It is exciting to see the maturing of the development of POC technologies, approaches and strategies to get these innovative diagnostics into the field,” said Dr. Tiffani Lash, director of the NIBIB Point of Care Technologies Research Network and this year’s conference co-chair. “At the same time, it is equally exciting to see young investigators use potentially game-changing AI and machine learning to improve their device design as well as efficiently identify underserved communities where targeted diagnosis and treatment will have maximal impact.”

Lash noted that the conference started with a collaboration between NIBIB, the Institute of Electrical and Electronics Engineers (IEEE) and the IEEE Engineering in Medicine and Biology Society and has grown tremendously over the years. **R**



ON THE COVER: 3-D rendering of mitochondrial networks within the mouse heart. Mitochondria, known as the powerhouses of the cell, are a promising target for the treatment of heart disease. February is American Heart Month.

IMAGE: BRIAN GLANCY, NHLBI, NIAMS

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Asthma

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career—Dr. Pauline Mendola, senior investigator in NICHD’s Epidemiology Branch, has sought to change that. She gave the year’s first NIH Director’s Seminar Series lecture, “Asthma and Pregnancy: Adverse Outcomes and Susceptibility to Air Pollution,” on Jan. 10 in Wilson Hall.

“Maternal asthma is really important in terms of population health,” she said. About 10 percent of pregnancies in the United States are complicated by asthma, which makes the lung disorder the most common chronic disease in pregnancy.

The clinical course of asthma in pregnant women seems to follow a widely variable “third third third rule,” Mendola explained. “About a third of women are supposed to get better, some get worse, some stay the same... Because there is very little in the way of empirical data, clinicians by and large are left to watch people and hope things go well.”

Add air pollution to the mix, Mendola said, and documented data on pregnancy health effects become even more scarce.

In general, she said, both air pollution and asthma independently increase obstetric and neonatal risks of poor outcome. Each condition can also lead to long-term effects for both mother and offspring. Air pollution can make asthma worse, Mendola pointed out, but there’s very little data on the potential joint effects of asthma and air pollution.

“We don’t think about it, but breathing is a ubiquitous exposure that we can’t really do a lot about,” she said. “We have to breathe the air that’s there.”

The air that’s there contains several potentially harmful compounds and many of them are tiny enough to penetrate the body’s upper airways and infiltrate deep into our general circulation, Mendola explained.

All day, we’re all breathing in various combinations of what sounds like chemical alphabet soup. Our air contains such particles as PM₁₀ and PM_{2.5}, gases like carbon monoxide and sulfur dioxide and such air toxics as PAHs, or polycyclic aromatic hydrocarbons, and VOCs, or volatile organic compounds.

With previous research posts at the Environmental Protection Agency and CDC’s National Center for Health Statistics, Mendola has studied the intersection

★ ★ ★
“Right now, clinicians are seeing 10 percent of the obstetric population with asthma and there is very little data to help them predict who’s going to get worse and who’s going to get better.”

—DR. PAULINE MENDOLA

★ ★ ★
between reproductive and environmental epidemiology for more than 20 years. The current increase in lung disease does not surprise her.

“The reason we’re seeing so much asthma now in the obstetric population is because we had the childhood epidemic of asthma in the 1980s and 1990s and those people are having babies now,” she said.

She discussed data from several significant studies, citing three NICHD-led efforts in particular: the Consortium on Safe Labor (CSL), a nationwide obstetric cohort conducted 2002–2008; the Air Quality and Reproductive Health (AQRH) Study, which Mendola designed using hourly U.S. weather and emissions grids; and Breathe-Wellbeing Environment, Lifestyle and Lung Function (B-WELL-Mom Study), a clinical study.

CSL collected information from electronic hospital admissions records on more than 223,300 singleton deliveries. Over 17,000 of those deliveries were complicated by maternal asthma.

“We found that mothers with asthma have really high rates of obstetric complications,”

she said. These include preeclampsia, gestational diabetes, breech presentation, preterm birth and pulmonary embolism. “For nearly every complication we studied, asthmatic women had higher risk.”

In addition, newborns of mothers with asthma also showed increased health risks such as being small for gestational age, NICU (neonatal intensive care unit) admission and jaundice.

“Interestingly, we find that newborns of mothers with asthma also have higher rates of upper respiratory conditions,” continued Mendola. “So their lung function even as neonates is poorer than babies born to moms who don’t have asthma.”

Examining the effects of certain pollutants on pregnancy complications such as preterm birth and preeclampsia, the AQRH study found significant differences in risks between women with asthma and those without at the same exposure levels.

“Even when the VOC exposure increased preeclampsia risks for non-asthmatic moms, the risk was twice as high for the asthmatic moms,” Mendola said.



Mendola chats with Dr. Roland Owens of NIH’s Office of Intramural Research.

PHOTOS: CHIA-CHI CHARLIE CHANG

Looking at neonatal respiratory outcomes and air pollution, there was no difference in risk between asthmatic and non-asthmatic moms; all showed about the same amount of risk from air exposure.

Finally, Mendola described the B-WELL-Mom study, which recently completed data collection.

As a clinical study, B-WELL-Mom has several advantages over CSL and AQRH. B-WELL-Mom offers detailed biologic assessments, follows patients over time and looks at whether and how asthma is being controlled and how much symptoms bother the participants. A GPS component can give more detail about the various environments where participants travel over the course of their pregnancies.

B-WELL-Mom also looks at underlying factors that may account for changes in asthma control during pregnancy, such as what may be happening with immune system T cells.

“There are a few studies that suggest the better your asthma control is during pregnancy, the better your outcomes will be,” Mendola said. “So, good asthma control really mitigates poor outcomes.”

B-WELL-Mom’s primary aim is to identify factors that predict asthma control variability during pregnancy, thereby providing caregivers with data they can use in treatment situations.

“Your immune response to pregnancy—does that tell us something about that phenotype of asthma that may be useful for other therapeutics?” Mendola asked. “[Asthma] is not a trivial disease and has a substantial impact on lifelong morbidity and mortality...These studies also teach us something about the immunology of pregnancy.”

About 5 percent of pregnant asthmatics will be hospitalized with an asthma crisis, she pointed out. Her team wants ways to identify those patients in advance of trouble and perhaps provide clinical interventions.

“Right now, clinicians are seeing 10 percent of the obstetric population with asthma and there is very little data to help them predict who’s going to get worse and who’s going to get better,” Mendola concluded. **R**

Ngai Named BRAIN Initiative Director

COMING IN MARCH

Dr. John J. Ngai, Coates family professor of neuroscience at the University of California, Berkeley, is the new director of NIH’s Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative. He is expected to join NIH in March.

The NIH BRAIN Initiative is a large-scale effort to accelerate neuroscience. Since it was launched in 2013, the initiative has funded hundreds of research projects that have led to several breakthroughs, including the creation of a self-tuning brain implant that could help treat Parkinson’s disease patients, the development of a computer program that can mimic natural speech from people’s brain signals and the construction of a brain cell inventory. BRAIN-funded researchers have also shown the ability to make high-speed, high-resolution, 3-D films of a nervous system in action.



Dr. John Ngai is the new director of NIH’s BRAIN Initiative.

“Recent technological and scientific advances are transforming our understanding of the brain,” said Ngai. “I am deeply inspired by these advances and look forward to my new role in enabling BRAIN Initiative investigators to unlock the secrets of the brain and lay new foundations for treating human brain disorders.”

He will oversee the long-term strategy and day-to-day operations of the initiative as it takes on the challenges of the next 5-year plan, just announced a few months ago. Congress has enthusiastically supported BRAIN through the appropriations process and the 21st Century Cures Act.

Ngai earned his bachelor’s degree in chemistry and biology from Pomona College and Ph.D. in biology from the California Institute of Technology (Caltech). He was a postdoctoral researcher at Caltech and at Columbia University College of Physicians and Surgeons before starting his faculty position at UC Berkeley.

During more than 25 years as a Berkeley faculty member, Ngai has trained 20 undergraduate students, 24 graduate students and 15 postdoctoral fellows in addition to teaching well over 1,000 students in the classroom. His lab uses a wide array of tools and techniques to study the cells and molecules behind olfaction, or the sense of smell, including fundamental research on how the nervous system detects odors and turns them into neural signals sent to the brain.

Ngai is also interested in unraveling the diversity of cell types in the brain and understanding how the nervous system repairs itself following injury or degeneration. His work has led to the publication of more than 70 scientific articles in some of the field’s most prestigious journals and 10 U.S. and international patents.

He has received many awards including from the Sloan Foundation, Pew Charitable Trusts and McKnight Endowment Fund for Neuroscience.

As a faculty member, Ngai has served as director of Berkeley’s Neuroscience Graduate Program and Helen Wills Neuroscience Institute. He has also provided extensive service on NIH study sections, councils and steering groups, including as previous co-chair of the NIH BRAIN Initiative Cell Census Consortium steering group.

NIH BRAIN is managed by 10 institutes whose missions and current research portfolios complement the goals of the initiative.



HEAL meeting participants (from l) weigh in: In closing remarks, Alex Azar, secretary of Health and Human Services, discusses the HHS response to the opioid crisis, which includes improving treatment, recovery and prevention services and advancing research on pain and addiction. Vice Adm. Dr. Jerome Adams, U.S. surgeon general, who delivered the keynote address, urges everyone to carry naloxone, an overdose-reversing medication that can save a life. NCCIH director Dr. Helene Langevin makes a comment during a panel discussion. NICHD director Dr. Diana Bianchi contributes to a breakout session on incorporating stakeholder input.

PHOTOS: CHIA-CHI CHARLIE CHANG

HEAL Initiative

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overdose deaths began to decline for the first time in 20 years, reported Health and Human Services Secretary Alex Azar at the meeting. Estimates from 2019 show more people are receiving effective treatment for opioid use disorder (OUD), while opioid prescriptions have continued to decline since 2016.

“While we’re beginning to turn the tide on the crisis, our job is far from complete,” said Azar. “All of HHS has been enlisted in this fight.”

HEAL is a collaborative effort among federal partners, academic researchers, the private sector, patients and communities. Across NIH, 20 of 27 institutes and centers are lending research expertise on cross-cutting challenges that span addiction science, neuroscience, mental health, pediatric health, complementary medicine and development of non-addictive drugs and devices.

“We didn’t get into this difficulty overnight and we’re not going to get out of it overnight either,” said NIH director Dr. Francis Collins. “The long-term solutions to addiction have to include finding ways to help those who are currently addicted, but also doing prevention and providing opportunities for people with chronic pain so they don’t fall into the same trap.”

At the same time, “research findings coming out of this initiative should not sit in

publications or under embargo before they can be accessed by our broader community,” said Baker. The HEAL Initiative aims to be a pioneer in open access to data, recognizing that collaboration flourishes in that kind of environment, she explained. People who are addicted or experiencing daily chronic pain need alternatives fast.

Treating Pain

More than 50 million Americans live with chronic pain.

“Opioids are incredible short-term analgesics,” said Dr. Lynn DeBar of Kaiser

of complex chronic conditions. Numa, a retired Air Force master sergeant and current photography/media student, had tried various pain medications over the years that didn’t work or had serious side effects. On a panel discussing pain, Numa said she wishes doctors had shared drug-free alternatives with her sooner. She has found relief through yoga, acupuncture and cognitive-behavioral therapy.

“Had I had that approach in the beginning, it would’ve been a better result for me,” said Numa, who already takes many medications to control her conditions. “Once I realized it didn’t have to be a pain medication, it could be something else [to ease my pain], it was a welcome breath of fresh air.”

For others, medication may be the best option, but as doctors dispense fewer opioid prescriptions, many pain patients are struggling to find potent, safer alternatives. “You want to be out of pain,” said Numa, “but you don’t want to be addicted.”

Dr. Travis Rieder, a bioethics expert at Johns Hopkins University, developed opioid dependence after receiving

multiple and increasing doses of opioids for 5 weeks while in the hospital for a series of surgeries.

“I had my foot blown apart in a motorcycle accident,” he said, “and it was nothing like the horror of opioid withdrawal.”

Doctors had told Rieder to stop taking opioids and he ended up spending 29 days suffering through intense withdrawal symptoms because nobody, not even pain



NIDA director Dr. Nora Volkow moderates a panel exploring opioid use disorder, underscoring the massive collective effort needed to solve the crisis. Dr. Travis Rieder of Johns Hopkins University tells of his harrowing experience becoming dependent on prescription opioids.



Permanente Washington Health Research Institute during a panel discussion. “But when you look at patients with persistent pain, the conversation you want to have is [regarding] their long-term functioning.” In many cases, non-drug-based therapies, such as physical therapy and exercise, can get people active and lessen disability, she said.

Dupelia B. Numa, a pain patient since 2008, was in constant pain from a series



“Once you’ve had pain, the fear of it coming back is so frightening...the anticipation of pain drives the need but then also sets people up to use [opioids] when they may not need them,” said NINDS director Dr. Walter Koroshetz (l) while moderating a panel on understanding and addressing pain. Dupelia B. Numa (c), a patient at Walter Reed National Military Medical Center, has found relief with complementary approaches for her chronic pain. NIMH director Dr. Joshua Gordon moderates a panel discussion on the stigma of addiction.

management doctors, could advise him how to safely discontinue them.

“Without better options, this crisis will go on for real people whose recovery will take time and whose pain management will take time,” said Baker.

Through the HEAL Initiative, investigators are working to expand pain management options, from medications to device-based interventions and other complementary approaches. Researchers are developing and validating new targets for pain therapies, studying prevention strategies and working to better understand, test and treat pain for different and co-occurring conditions.

“Through the research,” said Numa, she is hopeful “there will be more options.”

Reducing Stigma

“Our biggest killer isn’t cigarettes or obesity or even [the illicit synthetic opioid] fentanyl,” said Vice Adm. Dr. Jerome Adams, U.S. surgeon general and a practicing anesthesiologist, during his keynote address. “Our biggest killer is stigma because stigma keeps people in the shadows; [it] keeps people from asking for help or even admitting they have a problem.”

For Adams, it’s personal. He told of his

younger brother, Phillip, currently incarcerated for crimes committed to support his opioid addiction, which stemmed from unrecognized, untreated mental illness.

“Stigma can undermine our efforts at every stage of our prevention-to-treatment continuum,” said University of Delaware investigator Dr. Valerie Earnshaw. “We can develop the best behavioral intervention, medications or treatment, but if stigma prevents people from using them, then our efforts within this initiative will be stunted.”

HEALing Communities

Overcoming the opioid epidemic will require the collective efforts of many

communities: clinicians, patients, researchers, policymakers, business leaders, law enforcement, educators.

The surgeon general encourages everyone to become first responders, by getting trained to administer and carrying naloxone, an FDA-approved drug that can save the life of someone overdosing on opioids. Adams also urges more conversations. Discuss prevention, share stories, fight stigma, he urged.

“I feel we are making an impact in significant ways,” said Adams, “not just distributing naloxone—because that saves a life today—but also using that opportunity to lower stigma and change the narrative, which will save lives tomorrow [and for years to come].”

Healing communities means finding effective non-opioid treatments for pain as well as proven strategies to prevent and treat opioid misuse and addiction. HEAL investigators are researching: novel medications for OUD from craving to overdose, withdrawal to relapse; treatments for vulnerable populations such as newborns exposed to opioids and adolescents at risk of misusing opioids; and strategies to implement proven interventions at the local level.

“Tragically, in so many ways, the federal government was too slow in recognizing the seriousness of the opioid addiction crisis, but we’re now moving rapidly,” said Azar. “I want to assure you: Your work will save lives and we will put it to use as quickly as possible.” **R**



To wrap up the 2-day meeting, NIH director Dr. Francis Collins led the crowd in a reworked version of the Carrie Newcomer song *If Not Now [Tell Me When]*. The performance earned a standing ovation.



Goodman acknowledges that more work is needed to enhance patient engagement.

PHOTOS: CHIA-CHI CHARLIE CHANG

Goodman

CONTINUED FROM PAGE 1

in Lipsett Amphitheater. “It’s important to understand how engagement levels in partnerships are developing and to what extent engagement level is a predictor of outcomes.”

Research on stakeholder involvement is an evidence-based approach for addressing health disparities. It ensures that patients and communities are at the center of research and provides a unique perspective about patient and community needs.

The existing measures of stakeholder engagement don’t capture that, Goodman said. One measure assumed that attendance at events and activities qualified as engagement.

“Showing up doesn’t necessarily mean you’re engaged. You may show up for pizza and cookies, but not really engage in the conversation that’s happening,” she explained.

Other measures tried to quantify the degree to which participants felt they were part of a positive community, felt comfortable sharing their thoughts and had confidence in the problem-solving process.

“All of these things are related to engagement, but are not measuring engagement directly,” she observed.

Goodman is developing a 32-item measure of 8 engagement principles with a community advisory board that will assess both the quantity and quality of stakeholder-engaged research. To start, she invited 19 academics, researchers and patients and their advocates to participate in a 5-round Delphi process, a technique for collecting and organizing informed opinions from experts.

The principles are: focus on community perspectives and determinants of health;

partner input is vital; partnership sustainability to meet goals and objectives; foster co-learning, capacity building and co-benefit for all partners; build on strengths and resources within the community or patient population; facilitate collaborative, equitable partnerships; involve all partners in the dissemination process; and build and maintain trust in the partnership.

“One of the things that became really clear to us in this process was that definitions were important, so we could be on the same page. We worked through definitions for each of the engagement principle titles,” Goodman noted.

Once the measure—called the research engagement survey tool—was created, Goodman tested it. She administered 4 versions of the survey to almost 400 people who were involved in a research study over the course of 2 years. She rewrote some questions to make sure the respondents without academic backgrounds could understand them.

The respondents were from across the country, mostly African American or white, having some college or higher education and mostly female, “something that’s representative of the population we’re trying to reach,” Goodman said. “We didn’t do a good job with Hispanics, Asians and other multiethnic groups.”

In 2020, she will create an iterative algorithm that will be tailored to a person’s responses. It will reduce the time they spend taking the survey. Additionally, she will start thinking about how to tailor the survey tool to members of groups, accounting for such factors as age, race and ethnicity and geographic area.

It’s important to engage the people most impacted by research, Goodman said. By reviewing data on engagement levels, researchers can take steps to identify people who should be engaged in research and devise strategies to include them.

“And yes, that may require a little bit more work and a little bit more time, but the science will greatly benefit from that,”

Goodman concluded. **R**

‘Friday Before Pi Day,’ a Pi Day Celebration

MAR. 13

The Office of Data Science Strategy is hosting “Friday Before Pi Day,” a Friday-the-13th inspired Pi Day celebration on Friday, Mar. 13 in Bldg. 35 beginning at 9 a.m. The event celebrates the wonder of pi and highlights the role of data science and mathematics fields in biomedical research.

There will be two pi-themed sessions:

🔪 Scary stories about data and the lessons we can learn from them. NIH employees will share horror stories related to data visualization, data management, data sharing, etc., and then provide solutions to make sure attendees don’t become the subject of a “tall tale.”

🔪 Pi-tionary: 3:14-minute illustrated lightning talks. Offices and labs will have a teammate give a 3:14-long talk about their office/lab while a fellow teammate draws the content of the talk. Bonus points will be given for groups



that incorporate pi into their drawings, tell a “scary” story as part of their presentation and use lay terms. It’s a Pi Day version of Pictionary! This will be an audience-judged event with the winner(s) receiving a full-size pie as prize.

The day’s activities will also feature a keynote lecture from data scientist Dr. Rebecca Nugent, an award-winning professor of statistics and data science at Carnegie Mellon University (CMU), where she holds the Stephen E. and Joyce Fienberg professorship in statistics & data science. Nugent’s talk will focus on how data science is the “science of the people” and how data can be harnessed by everyone.

She is a past recipient of the American Statistical Association’s Waller Education Award, a national award for innovation in statistics education. She is also a past chair of the Women in Data Science Conference at CMU.

To learn more about “Friday Before Pi Day” visit datascience.nih.gov/Friday-before-pi-day-2020.

Additional sponsors include OD, NLM, CIT, NIAID and NCI.

EDI Names Fraser a Game Changer, Gorham a Change Agent

Colin Fraser, program specialist at the Center for Scientific Review, serves as chair of the partners in review committee (PIRC). The NIH Office of Equity, Diversity and Inclusion (EDI) has named him a Black History Month Game Changer for his role in creating the committee, which seeks to enhance communication and working relationships between extramural support staff and scientific staff. The



Colin Fraser

committee is made up of senior staff and people in administrative, human resources and scientific fields.

"I would have to say this career has chosen me," Fraser said. "NIH is full of diversity and we play a big role when it comes to helping others in

need. One of the professional accomplishments I am most proud of is forming PIRC."

He offers this advice to any new employee starting a career at NIH: "Collaborate and get involved," Fraser said. "I have found that working with others who have a different outlook on things than me and getting involved in making the organization work better for all of us has helped me to grow in my career...Diversity is very important to me at NIH, because seeing others who look like me have the same chance and opportunities as everybody else is motivating."

Shileta Gorham has been recognized by EDI as a change agent for bringing attention to the accessibility challenges for individuals with physical disabilities. Because of Gorham, the sidewalk between Bldg. 2 and Bldg. 31 on the main campus was removed and replaced at a less-steep grade that allows individuals with physical disabilities to access Bldg. 31 safely without needing to change their route.

"This career most certainly found me," Gorham said, "and I enthusiastically wanted to be a part of it. I wanted individuals like me to have a seat at the table and have a voice. I gained an appreciation and passion for inclusion before coming to NIH, but as an individual with a disability, I wouldn't have it any other way.

"People with disabilities are often not considered for most careers," she continued, "and though this is changing—progress is slow—the fact remains that the unemployment rate of persons with disabilities is much higher than that of individuals without disabilities."

People with disabilities are a demographic of individuals who want to work, she pointed out, "and more often than not, will work harder than an individual without a disability, in my opinion."

Gorham, who works in EDI's Division of Guidance, Education and Marketing, said her proudest professional accomplishment is the Global Accessibility Initiative.



Shileta Gorham

"The initiative came to be during my first few months as a new employee of NIH during my commute around campus," she explained. "I noticed a few barriers that prevented me from being able to travel the campus independently and efficiently. When traveling to and from Bldgs. 2, 31 and others, I noticed that many of the entryways were difficult to get into and out of, due to them being heavy or not easy to open. Not only that, I noticed that the sidewalks were either steeply sloped in certain areas and either cracked or uneven, making it difficult for me to travel."

Realizing that these things could be barriers to others with disabilities, Gorham wanted to help. So she started taking note of things that would make the campus more accessible for her and others in the NIH community. She also invited others to identify barriers they experienced while traveling around the campus and send them to her.

Gorham then compiled a list of things that would make NIH both more inclusive and more accessible. That list developed into the accessibility initiative.

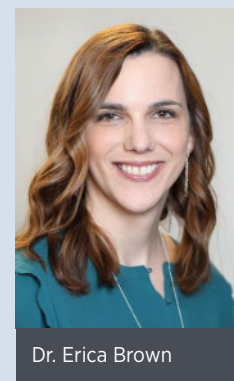
"Diversity is important in general—not only within NIH," she said. "Diversity brings people together from different cultural backgrounds and experiences. A diverse workforce allows for an environment where a range of different approaches and ideas can be cultivated and implemented to achieve the mission of NIH."

Gorham said she values NIH as a workplace.

"I haven't been with NIH for as long as some of my colleagues, but in my time here, I have enjoyed the environment in which I work, the people I've had the opportunity to interact with and the copious amount of activities held on campus that allow for work/life balance," she concluded. "There are also the many opportunities to grow and succeed. The experiences you gain at NIH will last you a lifetime." **R**

New Leadership in Extramural NIGMS

Dr. Erica Brown has been selected as associate director for extramural activities and director of NIGMS's Division of Extramural Activities (DEA). In this role, she oversees the receipt, referral, review and fiscal management of the



Dr. Erica Brown

institute's grants. Additionally, she serves as executive secretary of NIGMS's advisory council and advises senior staff on the planning, development and administration of institute grant activities.

Brown joined NIGMS in 2017 as deputy DEA director and has served as

acting director since early 2019. Her prior NIH experience includes overseeing the *NIH Guide to Grants and Contracts*, directing NIH's AREA program and serving as a scientific review officer at NIAID.

Brown received her B.S. in biochemistry from Elizabethtown College in Pennsylvania and her Ph.D. in microbiology and immunology from Wake Forest University School of Medicine.

Dr. Darren Sledjeski has been selected as DEA deputy director. He will work with institute



Dr. Darren Sledjeski

staff to optimize and modernize DEA's processes and procedures. He will continue to oversee the NIGMS council preparations and operations and will assist with the oversight of grants management and review functions.

Prior to this appointment, Sledjeski was chief of the Genetic

Mechanisms Branch in the Division of Genetics and Molecular, Cellular and Developmental Biology at NIGMS, where he administered research grants in the area of transcription mechanisms and protein synthesis and postdoctoral training grants in medical genetics. He previously worked in NIAID's Office of Initiative Development and in the institute's Scientific Review Program.

Sledjeski earned a B.S. in biology from the College of William and Mary and a Ph.D. in microbiology from the University of Maryland.

First Human Trial of Monoclonal Antibody to Prevent Malaria Opens

A phase 1 clinical trial testing the safety and effectiveness of a monoclonal antibody (mAb) against malaria has begun enrolling healthy adult volunteers at the Clinical Center.

The trial, sponsored by NIAID, is the first to test mAb CIS43LS in humans. It aims to enroll up to 73 volunteers ages 18 through 50 years old who have never had malaria. After receiving mAb CIS43LS, most of the volunteers will be exposed to malaria parasite-carrying mosquitoes under carefully controlled conditions at the Walter Reed National Military Medical Center to assess the ability of the mAb to confer protection from malaria infection.



NIAID research nurse Jennifer Cunningham looks on as a healthy volunteer receives an infusion of an experimental monoclonal antibody against malaria.

IMAGE: NIAID

“If proven safe and effective in this study and in larger trials, this monoclonal antibody might be used prophylactically by tourists, medical workers or military personnel who travel to areas where malaria is common,” said NIAID director Dr. Anthony Fauci. “In the absence of a highly effective, long-lasting vaccine, preventing malaria infections for several months with a single dose of monoclonal antibody also could be valuable in specific parts of Africa where malaria cases increase greatly during annual rainy seasons.”

Homicide Is a Leading Cause of Pregnancy-Associated Death in Louisiana

Homicide is a leading cause of death among pregnant and postpartum women in Louisiana, according to an analysis of birth and death records from 2016 and 2017. The study, appearing as a research letter in *JAMA Pediatrics*, was funded by NICHD. The research team was led by Dr. Maeve E. Wallace of Tulane University School of Public Health and Tropical Medicine in New Orleans.

The authors wrote that they undertook their analysis because few studies have looked at non-obstetric causes of death during pregnancy and the year after birth. They analyzed maternal death data from the Louisiana department of health and homicide data for women and girls of reproductive age from a Centers for Disease Control and Prevention database.

Of the 119 pregnancy-associated deaths for 2016 and 2017 in the state, 13.4 percent (16) were homicides. They estimated that, for every 100,000 women who were pregnant or postpartum, there were 12.9 homicide deaths, which outnumbered deaths from any single obstetric cause, including hypertensive disorders (3.2) and amniotic fluid entering the bloodstream (4.8).

The risk of homicide death was twice as high for women and girls during pregnancy and the postpartum period, compared to women and girls who were not pregnant. Pregnancy and postpartum deaths were highest for women and girls ages 10 to 29.

Benefits of Fetal Surgery to Repair Spina Bifida Persist Through School Age

Children as young as 6 years old who underwent fetal surgery to repair a common birth defect of the spine are more likely to walk independently and have fewer follow-up surgeries, compared to those who had traditional corrective surgery after birth, according to researchers funded by NIH. The study appears in *Pediatrics*.

The procedure corrects myelomeningocele, the most serious form of spina bifida, a condition in which the spinal column fails to close around the spinal cord. With myelomeningocele, the spinal cord protrudes through an opening in the spine and may block the flow of spinal fluid and pull the brain into the base of the skull, a condition known as hindbrain herniation.

In 2011, the Management of Myelomeningocele Study, funded by NICHD, found that by 12 months of age, children who had fetal surgery required fewer surgical procedures to divert, or shunt, fluid away from the brain. By 30 months, the fetal surgery group was more likely to walk without crutches or other devices.

For the current study, NICHD-funded researchers re-evaluated children from the original trial when they were 6 to 10 years old.

Scientists Reverse HIV and SIV Latency in Two Animal Models

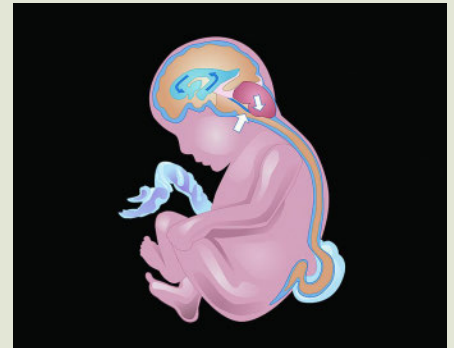
In a range of experiments, scientists have reactivated resting immune cells that were latently infected with HIV or its monkey relative, SIV, in cells in the bloodstream and a variety of tissues in animals. As a result, the cells started making copies of the viruses, which could potentially be neutralized by anti-HIV drugs and the immune system.

This advance, published Jan. 22 in two papers in *Nature*, marks progress toward a widely accessible cure for HIV.

The new research was conducted by investigators from the Collaboratory of AIDS Researchers for Eradication (CARE) based at the University of North Carolina at Chapel Hill and from the Emory Consortium for Innovative AIDS Research in Nonhuman Primates, both funded by NIH.

Scientists from ViiV Healthcare and Qura Therapeutics collaborated on the research. CARE is part of the Martin Delaney Collaboratories for HIV Cure Research, the flagship NIH-supported HIV cure research program. The joint efforts of scientists from a variety of specialties made the new findings possible.

“A simple, safe and scalable cure for HIV is an aspirational goal that, if achieved, would accelerate progress toward ending the HIV pandemic,” said NIAID director Dr. Anthony Fauci. “These new findings help sustain our cautious optimism that an HIV cure is possible.”



With myelomeningocele, the spinal cord protrudes through an opening in the spine. The protrusion of the spinal cord may change the flow of spinal fluid and pull the brain stem into the base of the skull.

IMAGE: NICHD

Reed Appointed CSR Deputy Director

Dr. Bruce Reed has been named deputy director at the Center for Scientific Review.

He came to NIH in 2015 as director of CSR's Division of Neuroscience, Development and Aging. In this role, he oversaw 47 study sections and numerous special emphasis panels and more than 60 scientific and support staff.



Dr. Bruce Reed

In addition, he has led a number of important initiatives at CSR. These include study section evaluations through CSR's new Evaluating Panel Quality in Review (ENQUIRE) process. He has also been instrumental in developing targeted outreach efforts, redesigning the annual CSR orientation sessions for incoming study section chairs and enhancing internal communications regarding policy and nomination slate guidelines.

CSR director Dr. Noni Byrnes said, "As a former grantee, reviewer and study section chair, Bruce brings a valuable perspective to the CSR leadership team. Since his arrival at the NIH, he has done a terrific job gaining expertise in review policy and building coalitions both within and outside CSR that have resulted in a number of positive changes to peer review."

Reed is a licensed psychologist with clinical experience in the northern California Veterans Administration Health Care System. He was a professor in the department of neurology at the University of California, Davis, and associate director of the California Alzheimer's Disease Center from 1997 to 2015. He has more than 150 publications in the area of cognitive aging. His research focused on the interaction between vascular factors and Alzheimer pathology using a range of neuroimaging techniques and on factors that can mitigate the impact of brain pathology on cognitive function.

Reed was principal investigator and co-investigator on multiple NIH R01s and co-PI of the clinical core grant for the University of California, Davis, Alzheimer's Disease Center.

In his time in academia, he served as a reviewer for many NIH panels, including serving as chair of the adult development and psychopathology of aging study section and chair of the clinical neuroscience and neurodegeneration study section. He also was active in community service, serving as vice president of the board of directors of

Alzheimer's services of the East Bay in Berkeley, Calif., for 7 years.

He earned a Ph.D. from the State University of New York, Stony Brook, in clinical psychology, and did postdoctoral work in clinical neuropsychology at Braintree Hospital with Tufts-New England Medical Center and Boston University Medical Center.

As deputy director, Reed will help advance the CSR director's strategic vision to conduct evaluations of peer review and peer reviewers, increase transparency and accountability through engagement with the scientific community and diversify the reviewer pool.

NIDCR Senior Scientist Yamada Mourned


Dr. Yoshihiko Yamada, a senior scientist in the Laboratory of Cell and Developmental Biology in the National Institute of Dental and Craniofacial Research, passed away on Dec. 16, 2019. He was 76.

Yamada served NIH for 40 years, 34 of them at NIDCR. In 1978, he joined the National Cancer Institute to study gene evolution and regulation of collagen genes.

In 1983, he joined NIDCR, where he studied the function of the extracellular matrix in a variety of tissues including teeth, cartilage and basement membranes to better understand its role in development and disease. He had more than 350 publications and two patents.

In addition to his illustrious research career, he was an ardent supporter of the Japan Society for the Promotion of Science (JSPS) fellowship program at NIH, hosting dozens of fellows in his lab and regularly organizing symposia for the program.

In 2011, he and others at NIH received an award from the Japanese embassy in recognition of NIH's support of the Japanese research community after the March 2011 earthquake and tsunami disasters. Yamada was involved in the NIH-JSPS-Tohoku Symposium in 2017 in Sendai, Japan, which was a scientific response to the devastating Tohoku earthquake and the subsequent disruption to the local scientific community.

He will be sadly missed by his family, friends and colleagues. 



Dr. Yoshihiko Yamada

Healthy Volunteers Needed

NIAID researchers seek healthy volunteers, 18-50 years old, for the study of an investigational product targeting malaria. Financial compensation is provided. To learn how to participate, call 1-866-833-5433 or email vaccines@nih.gov.

Patients with Leukemia, Lymphoma Sought

Do you or someone you know have chronic lymphocytic leukemia or small lymphocytic lymphoma? Is your current treatment failing? Researchers at the Clinical Center are testing a new drug called duvelisib. Treatment and research tests are provided at no cost. Travel may be provided. Contact us at 800-411-1222, PRPL@cc.nih.gov. Refer to study 20-H-0016. Read more at <https://go.usa.gov/xdTQU>.

Have Unresectable FLC?

Do you or someone you know have unresectable fibrolamellar hepatocellular carcinoma (FLC)? Have previous treatments failed? Researchers at the Clinical Center are testing a new antibiotic to treat unresectable FLC. Treatment and research procedures are provided at no cost. Travel may be provided. Contact us at 800-411-1222, PRPL@cc.nih.gov. Refer to study 19-C-0125. Read more at <https://go.usa.gov/xptYM>.

Have a Diagnosis of HCC?

Do you or someone you know have hepatocellular carcinoma (HCC)? Have previous treatments failed? Researchers at NIH are testing the use of an immunotherapy medication called durvalumab with two other chemotherapy medications, doxorubicin-eluting beads and bevacizumab. This clinical research study will investigate if this combination of medications can stop the progression of HCC. Treatments and research procedures are provided at no cost. Travel may be provided. Contact us at 800-411-1222, PRPL@cc.nih.gov. Refer to study 19-C-0094. Read more at <https://go.usa.gov/xpeBG>.

Sailing Association Open House, Mar. 4

The NIH Sailing Association invites everyone to its open house on Wednesday, Mar. 4 from 5 to 7:30 p.m. at FAES House at the corner of Old Georgetown Rd. and Cedar Ln.

Explore your interest in learning to sail and discover opportunities for sailing with NIHSA. There will be information about 6-week basic training classes, the club's racing program and social activities offered by NIHSA. A fee of \$5 at the door includes pizza, drinks and snacks. Cash bar for beer and wine—\$2 each.

Look for NIHSA posters and flyers around campus. For more information, visit www.nihail.org/.

CELI Holds Project Symposium

BY LAURIE COHEN

Developing meaningful and effective micro-learning videos for staff training and strategies for increasing diversity of NIH peer reviewers were two of the topics presented during the recent 2019 Cement Extramural Leadership Institute (CELI)



Group TV4PO includes (from l) Dr. Joseph Tiano of NIDCR, Demia S. Wright of NIEHS, Dr. Leslie Marshall of NIAID, Tara Knox (seated) of NHLBI, Dr. Julio Aliberti of NIAID and Dr. Jianxin Hu of CSR.

PHOTOS: CHLOE JAMES

Project Symposium. The symposium was both the culmination of a 3-month leadership program and a stand-alone training event for NIH employees.

CELI, which is coordinated through the NIH Office

of Extramural Research, expands the decision-making and leadership skills of extramural staff. The 40 participants in the 2019 cohort heard from engaging leaders from within and outside NIH, who shared strategies and principles of effective management and leadership. Dr. Yvonne Maddox, vice president, Uniformed Services University; Dr. Lynn Goldman, dean, Milken Institute School of Public Health at George Washington University; Dr. Alison Cernich, NICHD deputy director; and NIH director Dr. Francis Collins were among the speakers.

Throughout the 10-week program, CELI participants worked in teams, reinforcing lessons learned as they conducted research and developed a proposal to address an extramural challenge.

Topics included:

- Peer Review 2030
- Strategies to Increase Diversity in NIH Peer Review
- Recommendations for Patient-Centered Disease Consortia
- Artificial Intelligence in Medicine and the Life Sciences: The Need for a Chain of Trust
- Risk and Opportunities of Science as a Global Enterprise
- Measuring Scientific Efficacy at NIH and Possible New Directions
- Advancing Research and Training Opportunities at Minority-Serving Institutions
- Microlearning Videos to Complement Staff Training

Each CELI group presented a proposal at the symposium.



Diversity Warriors are (from l) Dr. Susan Sunnarborg of NHLBI, Dr. Jane Na of OD, Dr. Jennifer Alvidrez of NIMHD, Dr. Karen A. Kehl of NINR and Tawanda Abdelmouti of OD.

The TV4PO group created and shared two videos for training program officials. Presenter Dr. Julio Aliberti, NIAID scientific review officer, explained, "Our two pilot micro-learning training videos show an improper and an appropriate response by a program official, [with] transition text and voiceovers, reinforcing correct NIH procedures for external stakeholder interactions."

Another feature discussion was from the Diversity Warriors, who outlined four strategies to increase diversity in the NIH peer review process: communicate NIH's commitment to diversity when recruiting reviewers; increase the representation of assistant professors or equivalent in peer review; increase the role of public representatives in peer review; and capture and utilize other domains of reviewer diversity and experience. These strategies, combined with ongoing efforts such as the NIH Early-Career Reviewer Program, can broaden the definition of diversity in peer review and increase the diversity of NIH review panels.

For details, visit <https://stafftraining.intranet.od.nih.gov/cement-extramural-leadership-institute>.

Nirenberg Lecture Features Nobel Laureate Arnold

Nobel laureate Dr. Frances H. Arnold will deliver the annual Marshall W. Nirenberg Lecture as part of the 2019-2020 Wednesday Afternoon Lecture Series. Her lecture, "Innovation by Evolution: Bringing New Chemistry to Life," will be held on Tuesday, Feb. 25 at 3 p.m. in Lipsett Amphitheater, Bldg. 10.

Arnold is the Linus Pauling professor of chemical engineering, bioengineering and biochemistry at the California Institute of Technology. Research in the Arnold group focuses on evolutionary protein-design methods and using the results of laboratory evolution experiments to elucidate principles of biological design.

She will describe how we can use the most powerful biological design process, evolution, to optimize existing enzymes and invent new ones, thereby circumventing our profound ignorance of how sequence encodes function. Using mechanistic understanding and mimicking nature's evolutionary processes, we can generate whole new enzyme families that catalyze synthetically important reactions not known in biology, Arnold says. Recent successes include selective carbene insertion to form C-Si and C-B bonds,



and alkyne cyclopropanation to make highly strained carbocycles, all in living cells. Extending the capabilities and uncovering the mechanisms of these new enzymes derived from natural iron-heme proteins provides a basis for discovering new biocatalysts for increasingly challenging reactions. These new capabilities increase the scope of molecules and materials we can build using synthetic biology and move us closer to a sustainable world where chemical synthesis can be fully programmed in DNA.

Arnold's honors include the 2018 Nobel Prize in chemistry "for the directed evolution of enzymes," National Inventors Hall of Fame (2014) and the National Medal of Technology and Innovation (2011). She is a member of the National Academy of Sciences and a fellow of the American Academy of Arts and Sciences, American Association for the Advancement of Science and the American Academy of Microbiology.

The Nirenberg Lecture, established in 2011, recognizes Dr. Marshall Nirenberg for his work to decipher the genetic code, which resulted in his receiving the 1968 Nobel Prize in physiology or medicine. Nirenberg's research career at NIH spanned more than 50 years; his work also focused on neuroscience, neural development and the homeobox genes. The Nirenberg Lecture recognizes outstanding contributions to genetics and molecular biology.

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