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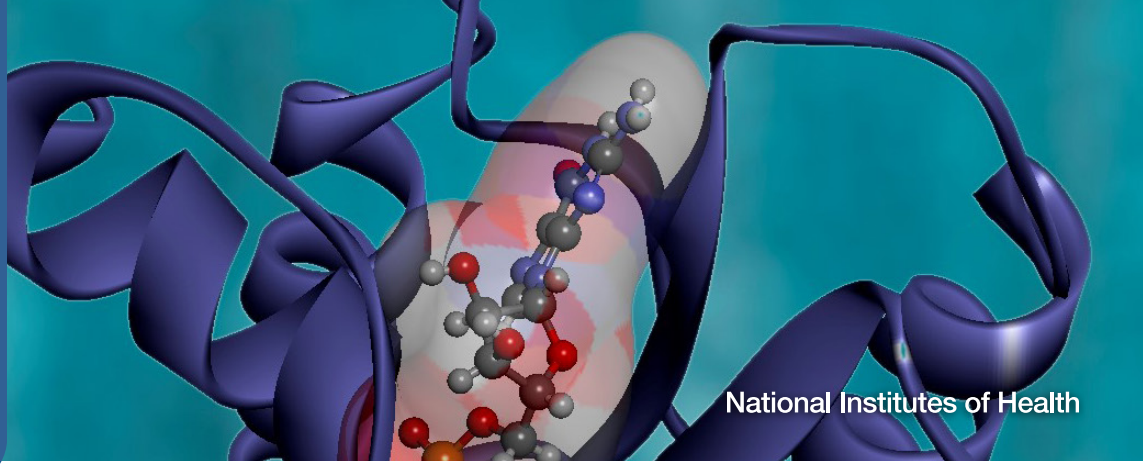


A Convergence of History and Science at Research Festival

This is the second and final installment of our NIH Research Festival coverage.

'SACRED MISSION'

Former NIH Director Describes Experiences That Shaped His Journey

BY DANA TALESNIK

Dr. Elias Zerhouni first publicly uttered the phrase "disease knows no politics" during his first congressional hearing 23 years ago. Soon after, in May 2002, Zerhouni was sworn in as NIH's 15th director. Now, that phrase serves as the title of his newly published memoir, which he discussed at a keynote lecture at the NIH Research Festival.

At his 2002 confirmation hearing, Zerhouni had touched on themes that became a hallmark of his career—multidisciplinary research, training and retaining the best scientists—while treading carefully when discussing his position on a particularly polarizing issue: human embryonic stem cell research.


Dr. Elias Zerhouni

"It was quite a hot political potato at the time I was appointed [NIH director]," Zerhouni recounted.

SEE **ZERHOUNI**, PAGE 4

MUCINS AND MENTORING

Ten Hagen Inspires at Research Fest

BY AMBER SNYDER

"Life will take you in many different directions, so enjoy the ride."


Dr. Kelly Ten Hagen

Dr. Kelly Ten Hagen of NIH's National Institute of Dental and Craniofacial Research (NIDCR) delivered this advice as the 2025 honoree

SEE **MUCINS**, PAGE 8


Bldg. 64 has a refurbished playground, p. 12.

ALSO THIS ISSUE

COVER PHOTOS: CHIA-CHI CHARLIE CHANG

"JOHN, WE HAVE AN EMERGENCY"

Burklow Recounts Pivotal Moments in Recent NIH History

BY DANA TALESNIK


John Burklow (r) with lecture namesake Dr. Victoria Harden

When faced with an unprecedented situation that could quickly devolve if mismanaged, it's essential to have a point person who can act decisively and remain calm under pressure. For 25 years, John Burklow was that person guiding NIH directors through many thorny issues—often infusing a little humor in the process.

SEE **BURKLOW**, PAGE 5

Long-Ignored Microproteins Play Important Roles in Biological Processes

BY ERIC BOCK


Dr. Gisela Storz

The smallest proteins play some of biology's most important roles. However, they've been overlooked because identifying something so tiny is challenging, said Dr. Gisela Storz, who recently delivered the G. Burroughs Mider Lecture in Lipsett Amphitheatre.

"There are thousands of microproteins waiting to be discovered. We're missing many, many proteins. They serve as regulators in all domains of life," said Storz, an NIH

SEE **STORZ**, PAGE 7

NIH's Bonnemann to Deliver Astute Clinician Lecture

Dec. 17

Dr. Carsten Bonnemann

Dr. Carsten Bonnemann, senior investigator with NIH's National Institute of Neurological Disorders and Stroke (NINDS), will deliver the 2025 Astute Clinician Lecture in Lipsett Amphitheater on Wednesday, Dec. 17 at 2 p.m., ET. His lecture is titled, "Clinical Encounters in Neurogenetics: Taking Cues from Single Patients to Discover Genes, Mechanisms and Therapeutic Approaches."

Bonnemann's lecture will describe three personal journeys of discovery that led him and his team from encountering a single enigmatic patient to uncovering new genes, mechanisms and treatment approaches, while also providing fundamental insights into human neurobiology. The journey will follow the peripheral nervous system from the motor neuron, via the muscle, to the sensory system.

The first case will describe the discovery of a new gene for childhood-onset ALS (amyotrophic lateral sclerosis) in a young woman with unexplained motor deterioration that led his team to recognize dysregulation of sphingolipid metabolism as a new mechanism for ALS. This led to a new precision therapy to address it. He will also discuss a patient with a severe form of congenital muscular dystrophy that now emerges as one of the most common single causes for this disease. In a third patient, his team encountered complete absence of proprioception (the sense of body position in space) leading to new insights and the development of a sensory prosthesis.

To watch Bonnemann's lecture online, visit: https://videocast.nih.gov/watch=57136.

Bldg. 31 Shuttle Stop Relocates

The Bldg. 31A shuttle stop on NIH's main campus has been relocated to the Bldg. 31B entrance in the NIH Police parking lot until Oct. 2027 due to the Center Drive utility tunnel construction project.

On Oct. 20, NIH's Office of Research Facilities began the second phase of the utility tunnel construction project. The new tunnel will carry steam and chilled and domestic water lines to Bldgs. 2, 6, 6A and 33. The project, which replaces lines that were first installed nearly 70 years ago, will take approximately two years to complete.

Campus North, Campus South, and the Bldg. 31A/Metro Express shuttle all stop at Bldg. 31. The new shuttle stop is equipped with a bus shelter to protect riders from the elements and is fully compliant with disability access requirements.

To view NIH shuttle schedules, visit: https://go.nih.gov/JcSZ3bX.

Walsh Appointed to Lead NIEHS

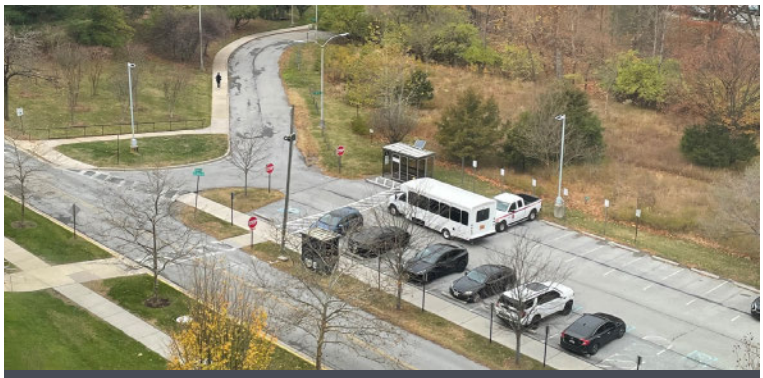
Dr. Kyle Walsh was appointed director of NIH's National Institute of Environmental Health Sciences (NIEHS) in October.

Dr. Kyle Walsh

Walsh joined NIH from Duke University, where he served as associate professor of neurosurgery, pathology, population health sciences and pediatrics, and as director of the Division of neuro-epidemiology. He is also a senior fellow in the Duke Center for the Study of Aging and Human Development and a member of the Duke Cancer Institute.

Walsh's research bridges laboratory and population-based science to understand how genetic, epigenetic and environmental factors interact to shape brain health, cancer risk and aging. His pioneering work on glial senescence and gliomagenesis has deepened our understanding of how environmental exposures and molecular mechanisms of aging converge to influence disease development.

Walsh succeeds Dr. Rick Woychik, who led NIEHS since 2020 and has accepted a senior appointment with the NIH Office of the Director, where he will focus on advancing the *Make America Healthy Again* initiatives. Under Woychik's guidance, NIEHS advanced groundbreaking research in environmental epigenomics, community-engaged science and the integration of exposomics into public health.



Due to construction, the Bldg. 31 shuttle stop is now located behind the building, across from the 31B entrance. **PHOTO: ERIC BOCK**

Enrollment Open for the NIH Leave Bank

Open Enrollment for the NIH Leave Bank has started and runs until Dec. 23. The membership period will begin on Jan. 11, 2026.

The Leave Bank is a pooled bank of donated annual and restored annual leave available to eligible members. It acts like a safeguard for your paycheck and amounts to paid leave for members who have exhausted all of their own sick and annual leave and are affected by a personal or family medical emergency.

To become a Leave Bank member, access the Integrated Time and Attendance System (ITAS) during Open Enrollment and select "Leave Bank Membership" to enroll. If you are a 2025 Leave Bank member, your membership will automatically continue into 2026, unless you opt out in ITAS during Open Enrollment.

The yearly membership contribution is one pay period's worth of annual leave accrual. The membership contribution will be waived automatically if you lack sufficient leave or have an open VLTP and/or Leave Bank recipient account.

For more information, visit bit.ly/4izXoG2 or contact the Leave Bank Office at (301) 443-8393 or LeaveBank@od.nih.gov.

VOLUNTEERS

Volunteers Needed for ASD Study

Researchers are studying the brain's response to language and sound to measure how different parts of the brain communicate. This study is currently enrolling teens ages 11 to 17 with autism spectrum disorder (ASD).

The study is being conducted at the NIH Clinical Center in Bethesda, MD. Some procedures may be conducted virtually. There is no cost to participate, and compensation may be provided up to $1,000.

To learn more, visit www.nimh.nih.gov/JoinAStudy. Contact the NIH Office of Patient Recruitment at 833-JOIN-NIH (TTY users dial 7-1-1) or email ccopr@nih.gov. Refer to research study #20-M-0159; go.nih.gov/w9w5NzJ.

Chan Investigates Role of Diet, Microbiome on Colorectal Cancer Risk

BY JENNIFER LOUKISSAS

Dr. Andrew T. Chan, professor of immunology and infectious diseases at Harvard T.H. Chan School of PublicHealth, delivered the 2025 Arthur Schatzkin Memorial Lecture at NIH's National Cancer Institute (NCI) in September.

Dr. Andrew Chan

Through research spanning population epidemiology to clinical trials, Chan focuses on prevention and treatment of gastrointestinal cancers. His talk touched on key observations and discoveries that can inform our understanding of dietary factors and gut microbial characteristics that influence colorectal cancer risk.

Chan described a large, collaborative effort to combine gut metagenomic data from 18 studies that found strain-level associations with colorectal cancer. Some of the colorectal cancer-associated species overlap with cardiovascular and immune-mediated diseases, which suggests these species may represent pro-inflammatory risk factors for colorectal cancer. Chan also described the development of dietary scores related to the gut microbiome and colorectal cancer risk.

In addition to the lecture, Chan participated in two roundtable discussions focused on early-onset colorectal cancer (EOCRC) and the microbiome. He discussed the PROSPECT Study for the Cancer Grand Challenge, which he co-leads with Dr. Yin Cao of Washington University in St. Louis.

Chan said his team will utilize an innovative and interdisciplinary approach—encompassing epidemiology, laboratory research and clinical intervention studies—to uncover the underlying causes and mechanisms behind the development of EOCRC. With these new insights, they aim to create and test groundbreaking strategies to prevent disease in future generations.

The team convenes multidisciplinary researchers from five countries, including experts in population sciences, clinical trials, behavioral science, genomics, cancer biology, immunology, computational biology, biochemistry and nutrition. They also include clinicians who care for patients with, or at-risk of, cancer and patient advocates, who will ensure that studies address the needs of diverse communities.

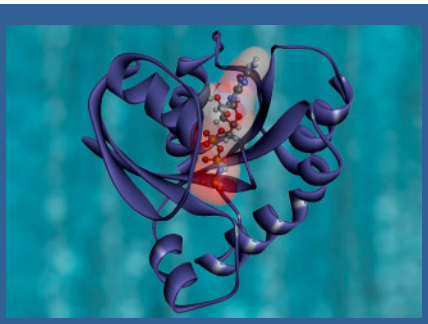
His team has three overarching objectives: identify risk factors associated with EOCRC; characterize the underlying mechanisms of causal risk factors; and develop precision prevention strategies.

"It was a great discussion," said Dr. Giovanny Herrera Ossa of NCI's Metabolic Epidemiology Branch (MEB). "He emphasized the importance of being adaptable and building a strong team, and the fellows seemed to really connect with that. The Q&A was also engaging, with questions about career turning points, handling uncertainty and making collaborations work."

From l, Chan, Dr. Rashmi Sinha and NCI senior investigator Dr. Christian Abnet

Chan is also professor of medicine at Harvard Medical School; chief, Clinical and Translational Epidemiology Unit at Massachusetts General Hospital (MGH) and director, epidemiology at MGH Cancer Center.

In introducing the lecture, host Dr. Rashmi Sinha, a MEB senior investigator, reflected on the career of her colleague and lecture namesake, the late Dr. Arthur Schatzkin, who greatly contributed to the field of nutritional epidemiology, including establishing the landmark NCI Polyp Prevention Trial and the NIH-AARP Diet and Health Study. As an example of his innovative thinking, Sinha recounted Schatzkin's idea to collect stool from trial participants, which sadly was rejected at the time. "Think of what we could have learned from such samples!"



ON THE COVER: *RAS is a family of related proteins expressed in all animals. KRAS is one of three RAS genes found in humans. RAS genes are mutated in approximately one-third of all human cancers.*

IMAGE: NATIONAL CANCER INSTITUTE

The NIH Record

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Zerhouni speaking in Bldg. 1's Wilson Hall in 2011

Zerhouni (second from l) greets then-President George W. Bush (r) at the Clinical Center in 2005. Also pictured: former National Cancer Institute Director Dr. Andrew von Eschenbach and Maryland Governor Robert Ehrlich.

Zerhouni

CONTINUED FROM PAGE 1

"How I would handle that was critical to both the credibility of NIH and the credibility of science."

At that hearing, he reiterated his conviction about the NIH director's role. "The NIH director should be impartial and nonpartisan," he said. "We represent something much bigger than us."

The American Dream

"I'm an immigrant," Zerhouni declares proudly, in awe of having had the opportunity to rise to such prominence in the U.S.

Born in Algeria, he spent his formative years in the war-torn country, which had a profound effect on him. "Oppression is an experience you never forget," he said.

During the Algerian War, schools were closed for long stretches, impelling young Zerhouni to find new ways to learn. His father was a teacher but had to split his time among their large family.

"So I learned to learn by myself," Zerhouni said. "I developed a mindset about learning and that stayed with me."

Zerhouni is the fifth child of seven boys. He had a sister, Chahida, who died when she was 18-months old of measles, a disease that would later be preventable by vaccination.

Zerhouni grew up loving science and exploring new ideas. But his bad handwriting led him to stop taking notes. He vowed, "I'm going to listen more carefully to what people say but also synthesize it and crystallize it—because you can't remember every word—at the same time." This skill, he noted, would help during future Senate hearings and in compiling the hundreds of ideas collected toward creating NIH's Roadmap.

After graduating from medical school at the University of Algiers and marrying Nadia, his childhood sweetheart, Zerhouni and his wife headed to the U.S. He entered the radiology residency program at Johns Hopkins in Baltimore.

"My intention was not to immigrate to the U.S.," Zerhouni recalled. "I wanted to learn bioengineering and imaging and return to [Algeria]." He'd planned to work at the new hospital when it was built. But instead of a public hospital, the Algerian regime built a military one, which Zerhouni didn't want to join.

"Life is not a golden plan," he said. "There will be surprises and opportunities, so go with it. But there are principles and values that you cannot ignore."

Second Home

Zerhouni would come to consider Hopkins his home away from home. He ultimately would spend 20 years there pioneering imaging research, chairing radiological sciences, teaching.

"Many people don't appreciate how important research universities are," said Zerhouni. "When I came there, I was immediately embraced as someone who had ideas and quickly learned the value of a research university as the place where you train, where you create intellectual talent, and you're mentoring the next generation of scientists and doctors."

Zerhouni was never afraid of trying something new, and he dove in eagerly across the fields of imaging: CT scans, MRI, ultrasound. Then he hit a wall.

"There was something in science standing in [our way]—the siloed nature of disciplines, departments and institutes."

He was growing frustrated. "I wanted to do research that required me to have a physicist on my team, a radiology engineer, a computational scientist, a biologist," he said, but he couldn't form that team in the existing system. Zerhouni brought the discussion to the top at Hopkins and, ultimately, through permissions among departments and dual appointments, he recruited and formed his multidisciplinary team.

"We were going to be stymied," he said, "if we didn't understand how to organize scientific teams differently for the complexity of the issues we were dealing with."

Zerhouni discusses his memoir at the NIH Research Festival.

PHOTOS: CHIA-CHI CHARLIE CHANG

NIH Rocks

Once confirmed as NIH director in 2002, Zerhouni arrived to find a similar hindrance. Institutes and centers were siloed. Zerhouni quickly set out to foster more cross-collaboration. He invited hundreds of scientists to share ideas and concerns and help define new goals toward a new strategic plan.

"Science may have moved from the structure of NIH," Zerhouni had acknowledged. "Are we missing fields of science that because of our structures, we cannot fund them, we cannot advance them?"

NIH collected nearly 1,000 responses. Sifting through them led to Zerhouni's "rock, pebble, sand" strategy. Most ideas are pebbles and sand. He said we need to find the rocks, the ideas that could lead to high-impact changes. From this process, multiple themes emerged. The rocks included training the next generation of scientists, addressing the complexity of biological systems and re-engineering the clinical research enterprise.

The ideas crystallized into the NIH Roadmap for Medical Research. Within the Roadmap, the Common Fund was created and ultimately signed into law within the NIH Reform Act of 2006. This appropriation would fund high-priority projects that cut across multiple disciplines and institutes.

Zerhouni's memoir, he said, recounts "a complex journey that represents and reflects fundamental values of our country, of our scientific enterprise, of NIH at the core of it."

The book is filled with lessons learned throughout his life and career. Don't limit yourself; consider different perspectives and approaches. "If we stifle uniqueness, we bury genius," he wrote in his memoir.

On life's journey, take calculated risks. Be curious, humble and compassionate. Be good stewards of our intellectual capital, he said. "Science is an investment in the future."

Burklow

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Currently, Burklow is a senior vice president at the Foundation for the NIH, where he also serves as chief strategic communications and engagement officer. He first arrived at NIH nearly 40 years ago as an intern, then rose through the ranks to head NIH communications and ultimately serve as NIH's chief of staff.

For decades at NIH, Burklow had a front-row seat to—and played an active role in planning—major events while mitigating challenges. He shared his observations of some of these key moments at the NIH Research Festival on Sept. 10, where he delivered the Victoria Harden lecture in NIH history.

Throughout his tenure, he has seen NIH budgets rise and fall, even through strong bipartisan support for the agency.

One divisive issue, though, that Burklow called "a narrow political minefield" for many years that remains is the use of human embryonic stem cells (hESC) in research. Starting in 2000, the debate over whether hESC research was immoral or pioneering dominated the news. In May 2002, incoming NIH Director Dr. Elias Zerhouni chose his words carefully. Burklow recalled, "Elias had to walk a fine line between supporting the science and not alienating the [U.S.] president, who was his boss."

Five years later, Zerhouni testified before the Senate that the president's stem cell policy impeded the momentum of science, as Burklow subsequently fielded media queries. The issue kept NIH on pins and needles for almost a decade.

"The saga illustrated to me in a profound way all the audiences paying attention to NIH—the media, Congress, the White House, professional societies, patient groups and industry," Burklow said. "It also changed the status of NIH in Washington. The agency was seen as a major player...in the center of a red-hot political issue."

Burklow (l) with Zerhouni outside Bldg. 1

Another development during that time, Burklow noted, "literally changed the face of NIH and its relationship with its neighbors." After 9/11, NIH began erecting a perimeter fence around its 300+ acre Bethesda campus. Once completed, the fence changed the atmosphere, preventing anyone from openly traversing campus grounds.

"The fence also created an impression that dangerous, top-secret research was being conducted on campus," Burklow observed, though the true objective was to keep NIH staff and patients safe. Meanwhile, much to his chagrin, the fence and many security checkpoints inadvertently kept VIPs out, no matter how much they prepared for these visits. The fence, he said, became a lasting reminder of the new normal.

In fall 2003, a homegrown controversy erupted when a series of newspaper articles exposed conflicts of interest at NIH. Some intramural scientists, including some top leaders, were leveraging government work for private gain.

"Seven painful, embarrassing House oversight hearings over the following months revealed improprieties Dr. Zerhouni found impossible to defend," Burklow recalled. He and his colleagues prepared the director for those hearings and, while comprehensive in gathering data, the committee staffers countered with incriminating evidence they'd collected directly from the companies.

While some high-profile scientists quit, the controversy inspired a much-needed overhaul of NIH's ethics program. "It was a bumpy cultural shift," Burklow said. "Clearly, the scandal and fixes that followed profoundly changed the culture of NIH and what was considered acceptable behavior."

A decade later, there was a shocking discovery on the Bethesda campus. As staff were relocating from Bldg. 29A, they discovered a box in a cold storage room dated 1954. Inside were six vials of smallpox, two of which contained live virus. Smallpox was eradicated in 1980 after an extensive global vaccination effort, making this discovery especially unsettling. What's more, staff found more than 300 vials of other pathogens.

Burklow (r) with his son Thomas
PHOTO: CHIA-CHI CHARLIE CHANG

This got everyone's attention, noted Burklow—HHS, the White House, Congress, local government, the State Department, FBI, World Health Organization—to name a few. Meanwhile, NIH staff were upset they weren't notified before this incident hit the news.

"That was a lesson I'll never forget and a mistake we tried never to repeat," Burklow said. "Always overcommunicate in a crisis."

Subsequently, every freezer and storage room on campus was subject to an inventory. Following the investigation, countless hours were spent reconceiving all policies and procedures related to select agents and pathogens, which ultimately changed the safety culture at NIH.

The final recollection Burklow shared was not a singular event but an outreach strategy—the effort to invite influential people to NIH from different fields. Over the past 15 years, NIH welcomed actors, musicians and artists among its high-profile visitors who toured, lectured and engaged with researchers.

Burklow recalled the many months of advance work prior to the visit of His Holiness the Dalai Lama in 2014 and yet nothing prepared him for a last-minute surprise that morning. The State Department asked Burklow to accommodate 800 Tibetans who wanted to meet His Holiness. Meanwhile, the 1,000 NIH ticket-holders would soon be in line outside the Natcher Conference Center.

Burklow figured it out. He worked with NIH Police to get the Tibetans through security. They entered on one side, met with His Holiness, and then NIH staff—perplexed at the long delay—entered through the opposite entrance.

"It was the most daunting logistical challenge I ever encountered in my tenure at NIH, but what a historic event," Burklow said.

Looking back on his tenure, Burklow noted the high expectations and increased scrutiny that came along with NIH's increased visibility.

"Blind spots in any organization tend to develop slowly, insidiously, and are very difficult to recognize and accept," he said. "It usually takes a crisis to bring about a new perspective."

Some crises were internal, others a response to outside factors.

"For NIH, the challenge for the agency was to acknowledge the problems and take decisive action, sometimes unpopular action, necessary to remedy the problem and preserve the integrity and reputation of the institution."

From l, Burklow with former NIH Director Dr. Francis Collins and actor Alan Alda, an advocate for science communication who has visited NIH several times over the years.

Through the ups and downs and culture shifts, NIH staff have continued to grow more resilient, Burklow noted. He hopes when future historians look back on these times, "they also study the degree to which NIH nurtured its most vital resource and key ingredient to its success—the people who work here."

NIH Establishes Organoid Development Center

In September, NIH awarded contracts for launching the Standardized Organoid Modeling (SOM) Center. The center will use cutting-edge technologies to develop organoid models that deliver robust, reproducible patient-centered research findings.

Organoids are small, lab-grown tissue models that replicate the structure and function of human organs, offering alternatives to animal models. However, most organoid models are currently produced in academic settings through trial and error, slowing their ability to be reproduced across labs. The NIH SOM Center will address these reproducibility challenges using technologies including artificial intelligence, robotics and a variety of human cell sources to establish standardized organoid models that can be used widely by researchers and accepted by regulators, accelerating scientific discoveries and decisions.

With contracts totaling $87 million for the first three years, the center will be housed at the Frederick National Laboratory for Cancer Research, a facility supported by NIH's National Cancer Institute (NCI).

"This groundbreaking initiative will transform how we conduct biomedical research through innovative approaches to advancing human-based technologies," said NIH Director Dr. Jay Bhattacharya. "By creating standardized, reproducible and accessible organoid models, we will accelerate drug discovery and translational science, offering more precise tools for disease modeling and public health protection, and reducing reliance on animal models."

The NIH SOM Center will support a wide array of users, including scientists and researchers from academic institutions, industry and government; clinicians in need of patient-specific models; and the broader scientific community, including industry partners and educators. It will provide open access to protocols, data and organoids, promoting global collaboration.

The center will also work with regulatory bodies, including the Food and Drug Administration, to develop models that meet preclinical testing standards, accelerating development of new disease treatments. The center will initially focus on organoid models of the liver, lung, heart and intestine, with plans to expand to additional organ systems and disease-specific models.

"The NIH SOM Center is truly a first of its kind," said Dr. Nicole Kleinstreuer, acting NIH deputy director for Program Coordination, Planning, and Strategic Initiatives. "It will serve as a national resource...offering a unique combination of AI and machine learning to develop world-class organoid protocols, advanced robotics for large-scale production, and open-access repositories for physical samples and digital resources."

Storz

CONTINUED FROM PAGE 1

Distinguished Investigator in the section on environmental gene regulation in NIH's *Eunice Kennedy Shriver* National Institute of Child Health and Human Development.

Proteins—the building blocks of life—play pivotal roles in all biological processes. Scientists have studied protein activity, determined the shape and structure of millions of proteins and can accurately predict the function of many proteins.

"Despite all that we've learned, there's a class of proteins that have long been ignored," she said.

This class, known as microproteins, measures 50 amino acids or less in bacteria and 100 amino acids or less in eukaryotes. Standard-sized proteins are several times larger, for comparison. What's undiscovered make up the "dark proteome."

Most techniques to identify and characterize proteins do not work for the smallest proteins, Storz said. Researchers also face challenges in annotation, the process of identifying and assigning biological information to specific locations within a genome's DNA sequence.

"It's hard to convey how difficult it is to work on these small proteins," she said. "There's a reason people didn't work on them."

The first microproteins were discovered serendipitously, Storz said. Now, there are new approaches for detecting microproteins. One method is ribosome profiling. This technique allows researchers to precisely determine which messenger RNAs are actively being translated into proteins in cells. Computational approaches for detecting microproteins have also advanced.

Storz and her lab have been searching for microproteins in bacteria like *Escherichia coli* using these techniques. The microproteins they've identified perform important roles in cell function.

One microprotein that is 15 amino acids long binds to the cAMP receptor (CRP), a transcription factor that helps turn specific genes on or off by binding to nearby DNA. CRP regulates genes involved in energy metabolism. Typically, *E. coli* cells prefer glucose as a energy source. However, bacteria live in ever-changing conditions, so glucose is not always available. In *E. coli*, CRP activates when glucose is absent. This allows the bacteria to use other energy sources.

"I wonder how many other transcription factors are out there in other bacteria or eukaryotic cells whose activity is modulated by such a small protein," Storz said.

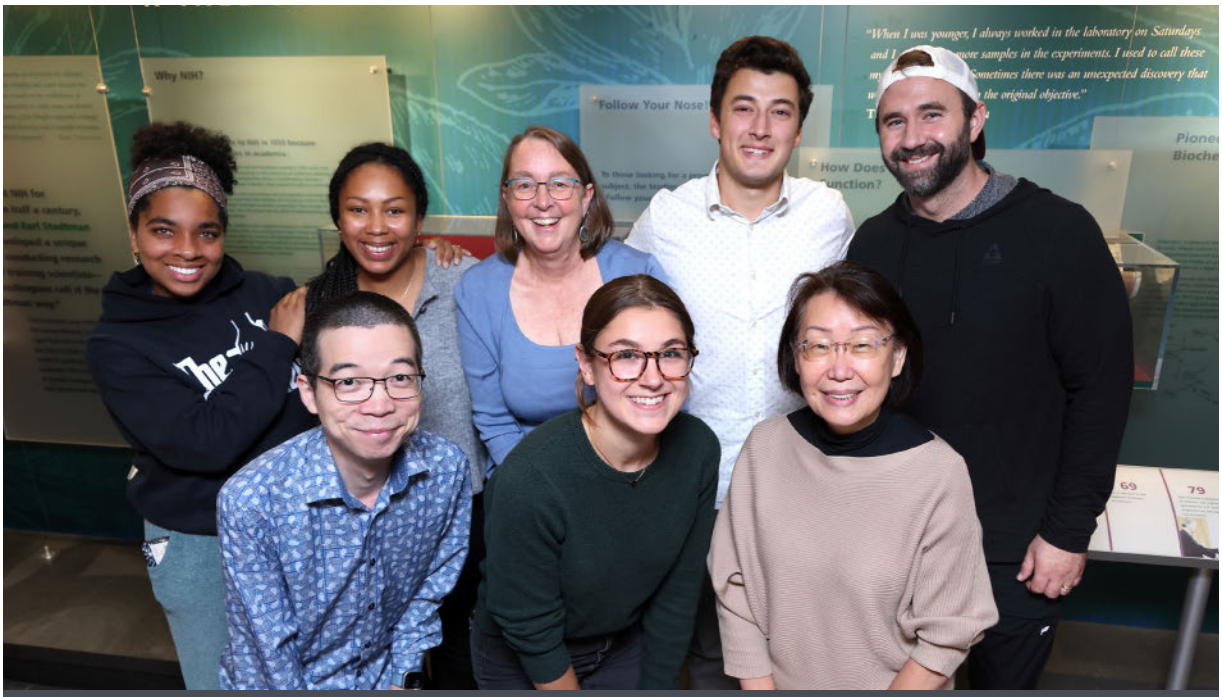
The majority of microproteins that have been discovered are located in cell membranes. One binds to glycerol 3-phosphate dehydrogenase, an enzyme that's located on the outer surface of a cell's inner membrane. It's crucial for lipid metabolism and energy production. "Interestingly, another small protein that binds a different dehydrogenase is specifically induced under conditions of heat shock," Storz said.

One microprotein that's 48 amino acids long is induced when cells are exposed to antibiotics or other harmful chemicals and modifies the specificity of a drug efflux pump, she said. Microproteins like this one could explain why bacteria are resistant to so many drugs. Further study might one day help scientists develop new therapies against antibiotic-resistant bacteria.

A microprotein that's 31 amino acids long binds to a larger protein that transports magnesium through an *E. coli* cell's membrane. Magnesium is important for many cellular functions. Storz thinks the smaller protein helps stabilize the transporter. Right now, her lab is searching for more microproteins that aid other proteins in transporting critical ions, including calcium and zinc.

There are many unanswered questions about the vast and largely unexplored potential of small proteins in cellular processes, Storz concluded. Further research is needed to understand how these proteins function.

The G. Burroughs Mider Lecture was established in 1968 in honor of the first NIH director of laboratories and clinics. It is presented by an NIH intramural scientist to recognize and appreciate outstanding contributions to biomedical research. This lecture, part of the NIH Research Festival, was the first Wednesday Afternoon Lecture of the 2025-2026 season.



Members of the Storz lab: (back row, from l) postdocs Chelsey Fontenot, Jo Schmidt, Storz, graduate student Zachary Rich and postdoc Rilee Zeinert; (front row, from l) postdocs Aoshu Zhong, Madi Jermain and biologist Aixia Zhang

PHOTO: CHIA-CHI CHARLIE CHANG

Mucins

CONTINUED FROM PAGE 1

for the yearly Anita B. Roberts lecture series. This lecture highlights the research achievements of women scientists at NIH. Its namesake was an exceptional mentor and scientist who served as a lab chief at NIH's National Cancer Institute (NCI).

At the NIH Research Festival, Ten Hagen shared her research and recounted her career journey. Ten Hagen, a senior investigator and chief of NIDCR's Developmental Glycobiology Section, was born and raised in western New York. She initially wanted to be a veterinarian when she entered Cornell University as an undergraduate.

As her interests evolved, she changed to a pre-med track before taking a research position in a *Drosophila* (fruit fly) laboratory that led her to pursue a Ph.D. She earned her doctorate in genetics at Stanford University and later returned to New York, where she became a research assistant professor in the lab of her future NIH colleague, Dr. Lawrence (Larry) Tabak at the University of Rochester. Her research in her own NIH lab studying mucin-type O-glycosylation stems from her work with Tabak.

Mucins and O-glycosylation, much like life, can take a researcher in many different directions. O-glycosylation describes a process in which a sugar molecule is attached to the oxygen atom in the hydroxyl (OH) group in a process called glycosylation. In mucin-type O-glycosylation, the sugar is attached to the hydroxyl group of a serine or threonine amino acid residue within the mucin protein. This process happens to all known mucins, which are the main component of mucus.

Mucus is "the first line of defense between your environment and your epithelial cells," Ten Hagen explained. "Diseases where mucins aren't made or are made improperly can have very severe consequences."

Her lab studies how mucins are synthesized, what glycosylates them and how the proteins' unique properties are conferred.

A family of enzymes called GalNAc transferases are responsible for transferring the sugar (GalNAc) from its donor molecule to a serine or threonine on a protein. Humans have 20 different GalNAc transferases. Ten Hagen's lab is studying how dysregulation of some of these enzymes can cause disease.

In one example, a GalNAc transferase abbreviated as GALNT11 was associated with kidney function decline in a GWAS [genome-wide association study] of people of European descent. As Ten Hagen dug deeper, she learned that GALNT11-deficient animals display a condition called proteinuria, in which proteins are lost into the urine because the animal can't properly reabsorb them. Interestingly, in a portion of the kidney dedicated to reabsorbing proteins, the main endocytic receptor responsible for nutrient reuptake (megalin) is normally glycosylated by GALNT11, allowing it to function properly.

Additionally, missing or mutated GALNT11 has downstream effects on mineral homeostasis and bone composition.

Another condition, hyperphosphatemic familial tumoral calcinosis (HFTC), is associated with mutations in the GALNT3 transferase. Patients experience dysregulation of blood phosphate levels, leading to painful calcified masses in their soft tissues and vasculature. There are no effective treatments. Ten Hagen collaborates with Drs. Michael Collins and Kelly Roszko at the NIH Clinical Center to treat these patients and understand the basis of disease.

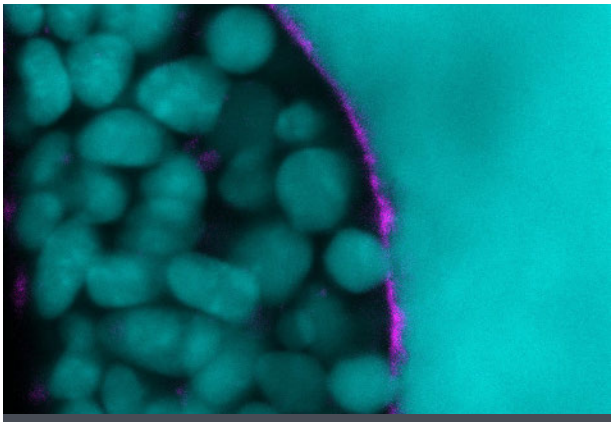
Dr. Liping Zhang, a staff scientist in Ten Hagen's lab, designed a cell culture system to study patients' individual mutations and develop targeted therapeutics.

With this cell culture system, Ten Hagen said, "We can design strategies to increase the activity of GALNT3 in situations where a mutation causes low levels of activity, or increase the stability of those that appear to be misfolded."

Mucin secretion is often disrupted in diseases of the oral cavity and digestive system. If Ten Hagen could image the mucin biosynthesis and secretion process in real time, then she could determine a healthy baseline to compare to the diseased state.

She conducted the imaging in an unlikely subject: *Drosophila* salivary glands, whose secretory granules (the "packaging" that holds the mucins) are 10 to 100 times larger than in mammals. The process of packaging the mucins is "one of the longstanding questions in this field," Ten Hagen said.

Her former postdoc Dr. Duy Tran set up this system to image mucin production, packaging and secretion in real time in a living organ. Another former postdoc, Dr. Zulfeqhar Syed, conducted imaging to show how mucins are restructured and compacted within secretory granules.



Salivary glands with mucin-containing secretory vesicles within them **IMAGE: DUY TRAN/NIDCR**

"A mature granule contains multiple distinct mucins that are restructured in a way to have intragranular segregation of the mucins, which may be a precaution, so the mucins don't 'gum up the works' when they are secreted," explained Ten Hagen.

But what about when the mucins are malformed? They cannot compact properly within the secretory granules, eventually causing them to rupture.

"We believe mucin compaction is important in terms of the stability of the granules and secretory cells," she said. Understanding how different mucins are packaged into and secreted from secretory granules may help researchers better understand diseases resulting from defects in mucin secretion.

Ultimately, Ten Hagen's lab seeks a mechanistic understanding of how aberrant O-glycosylation contributes to disease, in order to design novel therapeutic strategies.

In addition to recognizing her scientific accomplishments, the lecture also honored her contributions as a mentor.

"I feel incredibly fortunate to have been mentored by someone who exemplifies integrity, generosity and intellectual curiosity," said Dr. Alyssa Lee.

Dr. Carolyn May found a staunch advocate in Ten Hagen: "I was told to tone down my feminine voice during my process of applying to medical school, but Dr. Ten Hagen stood firmly by my side. Her unwavering support reaffirmed that my voice belonged in medicine, and Dr. Ten Hagen embodies the kind of mentor who not only trains scientists but shapes future leaders."

A recording of the lecture is available at https://videocast.nih.gov/watch=56707.

Repeated Head Impacts Cause Early Neuron Loss, Inflammation in Young Athletes

A doctor examines a college football player for signs of concussion.

PHOTO: ROCKETCLIPS.INC/SHUTTERSTOCK

New NIH-funded research shows repeated head impacts from contact sports can cause early and lasting changes in the brains of young- to middle-aged athletes. The findings show these changes may occur years before chronic traumatic encephalopathy (CTE) develops its hallmark disease features.

The research team analyzed postmortem brain tissue from athletes under age 51. Most of them had played American football. The team examined brain tissue from these athletes, using cutting-edge tools that track gene activity and images in individual cells. The researchers identified additional changes in brains beyond the usual molecular signature known to scientists: buildup of a protein called tau in nerve cells next to small blood vessels deep in the brain's folds.

For example, the researchers found a striking 56% loss of a specific type of neuron in that same brain area, which takes hard hits during impacts and also accumulates tau. This neuron loss was evident even in athletes who had no tau buildup. It also aligned with the number of years of exposure to repetitive head impacts. Thus, neuronal damage may occur much earlier than is visible. The team also observed that the brain's immune cells, called microglia, became increasingly activated in proportion to the number of years the athletes had played contact sports.

The brain's blood vessels also experience significant molecular changes. Some gene patterns could signal immune activity, like a reaction to lower oxygen levels in nearby brain tissue and thickening and growth of small blood vessels. From these findings, the researchers identified a new communication pathway between microglia and blood vessel cells. This crosstalk may help explain how early cellular problems set the stage for disease progression long before CTE becomes visible.

The study is one of the first to focus on younger athletes, shifting attention from advanced CTE in older people to the earliest cellular signatures of damage.

By revealing the earliest cellular warning signs, this work lays the foundation for new ways to detect brain effects of repetitive head injuries and potentially lead to interventions that could prevent devastating CTE neurodegeneration.

HHS to Increase Funding for Data-Centered Pediatric Cancer Research

The U.S. Department of Health and Human Services (HHS) announced a doubling of funding for its Childhood Cancer Data Initiative (CCDI) at NIH. The funding surge is designed to accelerate diagnostics, treatments and prevention strategies.

The CCDI was established in 2019 to collect, generate and analyze childhood cancer data. In addition to increased federal funding, the initiative will bring in private-sector partners to apply artificial intelligence to aid this effort.

"We are dedicated to using every innovative method and technology at our disposal in our fight against childhood cancer," said NIH Director Dr. Jay Bhattacharya. "By doubling down on this mission with AI, we are ensuring that state-of-the-art science is being leveraged to provide answers about these diseases that would otherwise be out of reach."

PHOTO: NEW AFRICA/SHUTTERSTOCK

"Our efforts have helped us learn from every child and better understand childhood cancer, reduce its risk, develop better treatments, and improve survivorship for children, teens and young adults with cancer," said NCI Director Dr. Anthony Letai. "I cannot think of a better way to begin my tenure at NCI than to redouble our efforts to support our youngest patients and their families facing rare leukemias and other cancers. We will not stop until childhood cancer is a thing of the past."

Pediatric cancer remains the leading cause of disease-related death for children in the United States, and its incidence has increased by more than 40% since 1975. HHS will use AI to maximize the potential for electronic health record and claims data to inform research and clinical trial design. Parents will remain in control of their child's health information as the data is used to benefit patients and researchers.

Acupuncture Provides Relief for Older Adults with Chronic Back Pain

More than a third of older adults nationwide suffer from chronic low back pain. Some turn to pain medications and heat or ice therapy for relief. Previous studies have shown acupuncture—a traditional Chinese medicine technique that uses thin needles inserted into the skin at specific points—also can help reduce or eliminate back pain.

PHOTO: TIGERCAT_LPG/SHUTTERSTOCK

To study the effectiveness of acupuncture in older adults, a team lead by Drs. Lynn DeBar and Andrea Cook at Kaiser Permanente launched a large randomized clinical trial called BackInAction. The team enrolled 800 adults ages 65 or older who had low back pain for at least three months. Participants were divided into three groups. One received usual medical care, which generally involved prescribed medications and physical therapy. Another received standard acupuncture of 8 to 15 sessions over 12 weeks in addition to their usual medical care. The third group received enhanced acupuncture, which entailed four to six additional acupuncture sessions over the 12 weeks.

Participants submitted self-assessed results, based on their back pain and physical limitations, at intervals of 3, 6, and 12 months. Results were published in *JAMA Network Open*.

The study showed that participants receiving standard or enhanced acupuncture fared better than those receiving usual medical care alone. At the six-month and 12-month assessments, both acupuncture groups had less disability from pain. The acupuncture groups also had reduced pain intensity and greater physical function after six months. Acupuncture treatment was associated with fewer anxiety symptoms as well. Adverse effects were few and similar between groups.

"Our clinical results suggest that acupuncture is working as well as many things that are more familiar to people," DeBar explains. We found that the size of this effect, while modest, was positive and sustained."

Cook added, "Acupuncture offers a less invasive option that has a better safety profile than a lot of the common treatments for back pain in older adults." —**by Yolanda Jones,** adapted from *NIH Research Matters*

NIH DDIR Schor Retires

BY ERIC BOCK

Dr. Nina Schor

Dr. Nina Schor stepped down from her role as NIH deputy director for intramural research (DDIR) on Sept. 30. She has served in the role since August 2022.

Schor plans to return to the University of Rochester, where she was a professor and chair of the Department of Pediatrics for 12 years before joining NIH's National Institute of Neurological Disorders and Stroke (NINDS) as deputy director in 2018.

"NIH is great because of the amazing people who work here. It's been a privilege to work among this incredible cohort of interesting and interested people," she said.

As DDIR, Schor led the NIH Office of Intramural Research (OIR) overseeing faculty recruitment and development, research regulatory affairs, technology transfer, training and education, and research integrity for the NIH Intramural Research Program (IRP), as well as the NIH Stetten Museum.

Schor worked to break down silos in the IRP. Before she left NIH, she was involved in drafting a strategic plan "that will move the IRP forward as one IRP, as opposed to 24 IRPs in each institute."

When she arrived at NIH in January 2018, she worked with NINDS Director Dr. Walter Koroshetz to plan, budget and guide the institute's scientific and administrative functions.

Born in Bayside, N.Y., Schor earned her undergraduate degree from Yale University, her Ph.D. in medical biochemistry from Rockefeller University and her medical degree from Weill Cornell Medicine.

Schor completed residency programs in neurology and pediatrics at Children's Hospital and Harvard Medical School in Boston. Following her residencies, she was a professor, chief of child neurology and associate dean for medical student research at the University of Pittsburgh.

She also served as the William H. Eilinger Chair of the Department of Pediatrics and Pediatrician-in-Chief of the University of Rochester's Golisano Children's Hospital. A pediatric neurologist by training, Schor conducted research on neuroblastoma, one of the most common childhood cancers.

"I received continuous NIH funding for 27 years," Schor said. "I came to NIH to pay back the system that supported me. I want to do the same for the next generation of scientists."

Schor has worked in many roles throughout her career. Wherever she was or whatever she was doing, she always made time to nurture the next generation of scientists. She has mentored more than 85 postdoctoral fellows and graduate, medical and undergraduate students. She's grateful for the opportunity to shape scientists of the future, she said. "It's the most wonderful part of my job."

When she was at NINDS, she wrote a handbook for trainees about how to transition into a career at an extramural institution. The guide featured information about the promotions, tenure process and grant writing.

During her time at NIH, Schor learned the importance of delegating important tasks to employees who could do the best possible job. "There just aren't enough hours in the day to do everything for which the Office of Intramural Research is responsible," she remarked.

Schor presiding over the 2025 Research Festival PHOTO: MALIK LONON

At the University of Rochester, she'll serve as the director of faculty and program development for the Intellectual and Developmental Disabilities Research Center. She'll be involved in workforce development and mentoring.

"I've spent most of my career on a college campus," she said. "While I've enjoyed my time in government, I've missed having English majors ask me questions about biochemistry during office hours, conversations with colleagues in the School of Music about the neural processing of auditory information, grant writing and serving on faculty committees."

NCI Radiation Biologist Retires

Dr. James (Jim) B. Mitchell, a radiation biologist at NIH's National Cancer Institute (NCI), retired after nearly 50 years. His research focused on evaluating agents in combination with radiation that either enhance tumor sensitivity or protect normal tissues. His work has been vital in helping physicians and researchers understand how to safely treat cancer with radiation therapy.

Dr. James Mitchell in the lab

Mitchell is originally from Tennessee. He completed his bachelor's degree at Austin Peay State University, master's degree at George Peabody College and a Ph.D. in cellular radiation biology from Colorado State University. Mitchell's earliest work on dose-rate effects of radiation-induced cell killing fulfilled a need for physicians to understand the sensitivity of human tumor cells to a variety of novel agents.

His work was centered on the radiobiology of low-dose radiation and differences in the cellular response to low-dose versus high-dose radiation. His findings over the years continue to be extremely relevant to modern-day brachytherapy (localized radiation therapy). Mitchell went on to spearhead efforts related to establishing dosage safety and administration schedules for radiation treatments. Many of these are still being employed in the clinic to treat patients today.

Shortly after earning his doctorate, Mitchell joined NCI's Radiation Oncology Branch and became a principal investigator. He eventually came to serve as chief of NCI's Radiation Biology Branch for more than 30 years.

Mitchell's laboratory was the first to identify nitroxides as catalytic antioxidants with protective properties against radiation damage. He was involved in developing photodynamic therapy for clinical cancer treatment at NCI, a program still active at the University of Pennsylvania. Recently, he published a study demonstrating that mice exposed to total body radiation of 3 Gy and rapamycin placed in their food after radiation results in less carcinogenesis.

"Dr. Mitchell has a strong track record of having multiple lab findings implemented in the clinic to improve the efficacy of radiotherapy in treating tumors as well as protection of normal tissue during radiotherapy," said Dr. Murali Krishna Cherukuri, senior investigator in the Radiation Biology Branch. "More than three decades ago, he recognized the importance of tumor microenvironment in the outcomes of cancer treatment and the critical need of molecular imaging techniques to profile the tumor physiology and metabolic status. His involvement in this field made the CCR Radiation Biology Branch one of a small group of labs in the world with unique preclinical imaging capabilities, some of which have been translated to clinic."

Mitchell has been a member of the American Society for Therapeutic Radiology and Oncology and the American Association for Cancer Research for almost 40 years.

Another noteworthy accomplishment, Mitchell and his colleague Dr. John Cook taught a full 30-hour radiation biology course to residents in the Radiation Oncology Branch. This was conducted from 1980 to 2020 for 95 residents.

"Dr. Mitchell is a true legend in the field of radiobiology," said Dr. Deborah Citrin, senior investigator at NCI and a longtime colleague.

"Beyond the scientific accolades and countless honors and awards, Dr. Mitchell is one of the most caring and dedicated mentors I have ever met…His career and contributions have been nothing short of remarkable."

NINDS Investigator Goldstein Retires

Dr. David S. Goldstein, a senior investigator and chief of the autonomic medicine section in the

Dr. David Goldstein at his retirement celebration

Clinical Neurosciences Program at NIH's National Institute of Neurological Disorders and Stroke (NINDS), recently retired after 47 years at NIH. For the past 14 years, he was also director of the Clinical Fellowship in Autonomic Disorders at NIH's Clinical Center.

Goldstein is renowned as a founder and thought leader in autonomic medicine. He has substantial experience and expertise in clinical catecholamine neurochemistry, sympathetic neuroimaging, autonomic pathophysiology, mechanisms of catecholaminergic neurodegeneration and stress and homeostasis as medical scientific ideas.

He received his bachelor's from Yale College and M.D.-Ph.D. in behavioral sciences from Johns Hopkins University. After his internal medical residency at the University of Washington, Goldstein came to NIH as a clinical associate in NIH's National Heart, Lung and Blood Institute (NHLBI) in 1978, obtaining tenure as a senior investigator in 1984.

Goldstein joined NINDS in 1990 to head the clinical neurochemistry section and founded the clinical neurocardiology section (name changed to autonomic medicine Section in 2019). He has received Yale's Angier Prize for Research in psychology, the

Goldstein (r) with Dr. Avindra Nath, clinical director, Division of Intramural Research, NINDS

Distinguished Investigator Award of the Society for Clinical and Translational Science, the NIH Distinguished Clinical Teacher Award, the Schatz Award of the American Academy of Neurology for research on autonomic disorders, and two NINDS Director's Awards for mentorship. He is a fellow of the American Heart Association and the American Autonomic Society and a member of the Association of American Physicians. He is the author of more than 650 research articles and several books.

NCI's Gail Retires

Dr. Mitchell H. Gail, senior investigator and former director of the Biostatistics Branch (BB) of NIH's National Cancer Institute (NCI) Division of Cancer Epidemiology and Genetics (DCEG), retired from NIH in August after more than 56 years of service.

Gail made seminal contributions to the development of statistical methods and their application to epidemiology and clinical medicine, particularly those for risk prediction, genetic epidemiology, and the design, execution and analysis of cancer treatment and prevention trials.

Dr. Mitchell Gail

Most notably, he developed the NCI Breast Cancer Risk Assessment Tool (BCRAT), widely known as the Gail Model, the first to estimate a woman's five-year and lifetime risk of developing invasive breast cancer using individual risk factors. An average of 50,000 users access the tool each month. BCRAT is widely used in counseling women across the country on their risk of breast cancer and to determine optimal screening intervals. It has been adapted and translated for populations around the world.

In the early days of the AIDS epidemic, Gail and Dr. Ronald Brookmeyer, a visitor from the Johns Hopkins School of Public Health in Baltimore, used "back-calculation" to estimate the size of the epidemic. Their conclusions provided critical insights into the future public health implications of HIV and AIDS and informed the Centers for Disease Control and Prevention on the evolution of the crisis.

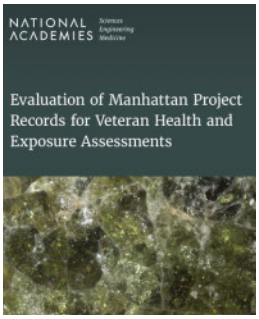
Throughout his career, Gail supported DCEG studies on cancer etiology. For the Shandong Intervention Trial, he and colleagues collaborated with the Beijing Institute of Cancer Research in China to explore the potential of three treatments to reduce gastric cancer incidence in a region with very high rates. They tested a two-week treatment for Helicobacter pylori or seven years' treatment with either garlic or vitamin E, vitamin C, and selenium supplementation. Surprisingly, all three reduced gastric cancer incidence and mortality, though the benefits of both supplementation interventions were only confirmed after 22 years of follow-up.

Gail has authored more than 400 scientific publications and several books, including *AIDS Epidemiology: A Quantitative Approach* co-authored with Brookmeyer, which summarized methods for surveillance of HIV and clinical management, and *Absolute Risk: Methods and Applications in Clinical Management and Public Health*, with BB Senior Investigator Dr. Ruth Pfeiffer.

Gail mentored dozens of fellows and junior faculty and has been honored with numerous achievement awards. He is a fellow and former president of the American Statistical Association, a fellow of the AAAS, and an elected member of the American Society for Clinical Investigation, and the National Academy of Medicine of the National Academy of Sciences. He received an M.D. from Harvard Medical School and a Ph.D. in statistics from George Washington University. In 1969, he joined NCI as part of the Public Health Service, from which he retired in 1999 with the rank of captain.

NLM's Reznick Served on National Academies Committee

As part of his public service, Dr. Jeffrey Reznick, senior historian at NIH's National Library of Medicine, recently completed his 18-month service on a committee of the National Academies of Sciences, Engineering, and Medicine. The committee was tasked with assessing the feasibility of an epidemiologic study of veterans who participated in the Manhattan Project from 1942-1947.



Reznick joined an interdisciplinary group of experts to evaluate whether an epidemiologic study could be conducted to assess the long-term health effects of radiological and chemical exposures among veterans who participated in a top-secret program to develop the world's first nuclear weapon at sites around the country. The report concluded such a study is feasible and provides alternative methods to examine associations between exposures and adverse health outcomes among this population of veterans.

The committee identified key challenges to conducting an epidemiological study, including the incomplete availability of military unit records and personnel files needed to construct a roster of exposed individuals; a lack of systematically collected exposure data—particularly for chemical exposures, which are only documented in high-dose accident reports; and the absence of critical health and demographic information. However, the committee concluded that with careful consideration of the strengths and weaknesses of the exposure and health outcome data, a risk assessment could be conducted to estimate the potential health risks to Manhattan Project military veterans.

To read the committee's full report, visit bit.ly/42JpebZ.

NIH Child Care Center Playground Reopens

BY ERIC BOCK

NIH celebrated the reopening of the Bldg. 64 NIH East Child Care Center playground during a ribbon-cutting ceremony earlier this fall.

"Today marks the exciting unveiling of a vibrant new space that will soon be filled with children's laughter and energy," said NIH Office of Research Services (ORS) Director Colleen McGowan at the ceremony. "We hope this new play yard will inspire creativity for the children who might work here tomorrow."

Construction on the project first began in March 2024. Improvements include new play equipment, low maintenance poured-in-place soft surfacing, a trike track and lawn area for open play, storage sheds and a variety of shaded seating areas.

Many of the facility improvement features are underground, said NIH Office of Research Facilities Director Dan Wheeland. Workers installed a new storm water management system to prevent erosion and eliminate stagnant water on the playground.

The playground first opened in 2000, but its infrastructure had deteriorated over time. Plans were drawn up to renovate the space in 2021. Construction began three years later.

"The new playground represents a significant achievement, and we extend our deepest gratitude to the individuals and teams whose dedication made it possible," said Susan Borst, Child and Family Programs Manager in the ORS Division of Amenities & Transportation Services.

The playground's renovations wouldn't have been possible without the dedication of many individuals throughout the entire process, from concept design to construction. Borst also thanked the construction team, child care center staff and the children and families for their patience during construction.

A few days before the ceremony, the Maryland State Department of Education Office of Child Care visited NIH to inspect the playground. During the inspection walk-through, a licensing supervisor told Borst the playground is an example of a space that meets many different developmental needs of children; it is well-designed, highlights the natural features and offers creative spaces where children will be engaged in play for decades to come.

Above, ORS Child and Family Programs Manager Susan Borst; below, ORS Director Colleen McGowan

At left, a child enjoys the new playground equipment. Above, ORF Director Dan Wheeland (c), surrounded by NIH and Child Care Center staff, cuts the ceremonial ribbon.

PHOTOS: MALIK LONON