

# Outlook

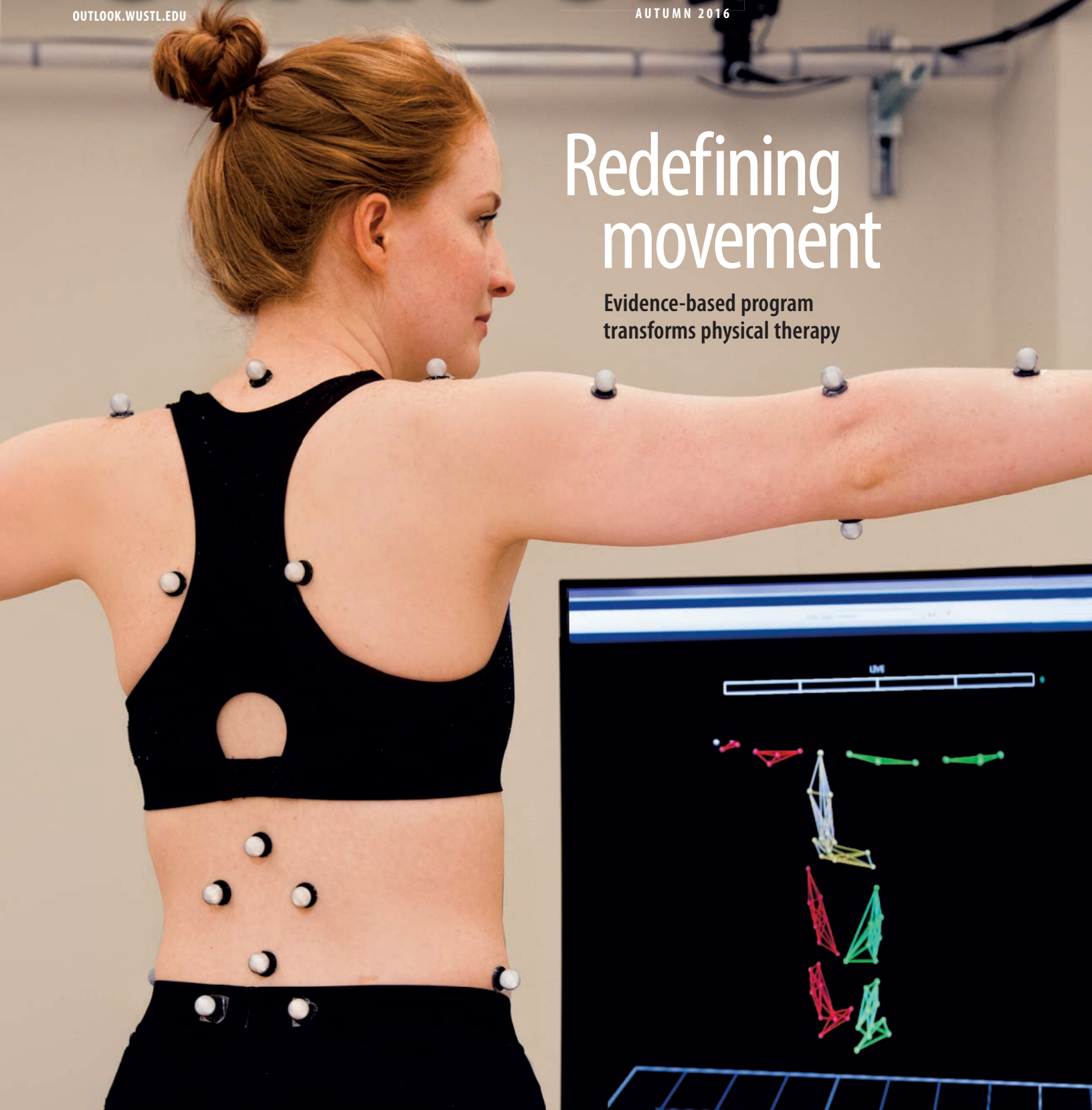
 Washington  
University in St. Louis  
SCHOOL OF MEDICINE

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AUTUMN 2016

## Redefining movement

Evidence-based program  
transforms physical therapy





**COVER** Physical therapy researchers use advanced technology to study movement in patients. More than three decades ago, the evidence-based Program in Physical Therapy adopted the movement system as a central tenet and has lobbied steadily for its national acceptance. Story on page 8.

## FEATURES

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No.1-ranked Program in Physical Therapy is changing how the profession is viewed and practiced.

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Proactive strategies can keep us one step ahead as bacteria mount new, clever defenses against antibiotics.

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A robust research environment primes medical students to become future leaders in academic medicine.

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New Dean David H. Perlmutter, MD, shares his vision for the medical school's future.

# Outlook

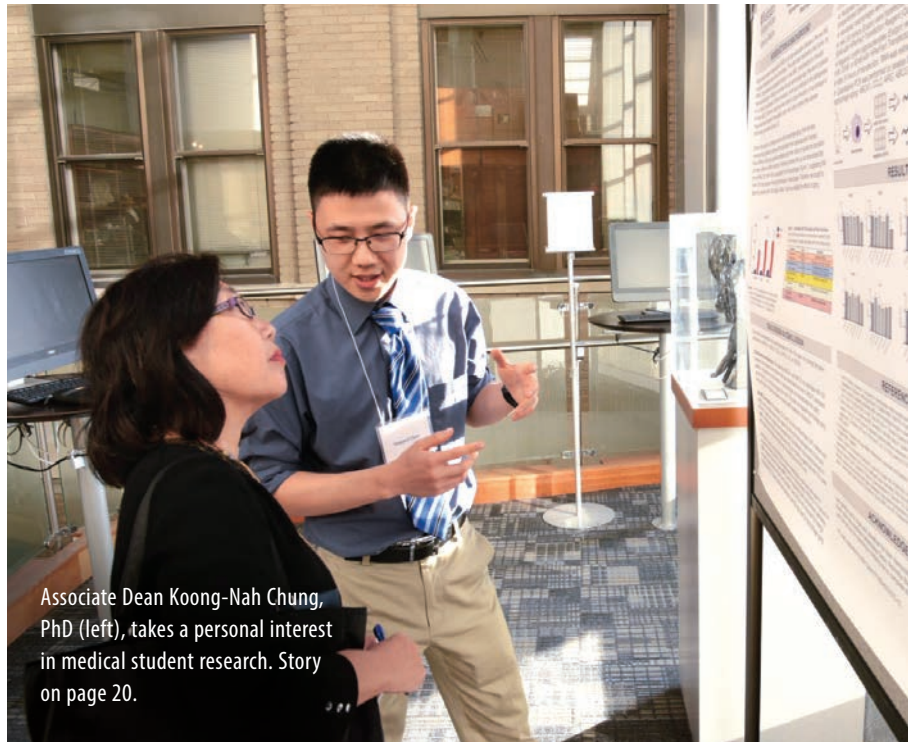
Washington University School of Medicine

OUTLOOK.WUSTL.EDU AUTUMN 2016



In 1963, Tom Hornbein, MD '56 (left), and fellow climber Willi Unsoeld completed the first successful ascent of Mount Everest via the West Ridge. Familiar with overcoming very big obstacles and achieving goals, Hornbein was uniquely qualified to address students at this year's MD Commencement. Story on page 31.

WILLI UNSOELD



Associate Dean Koong-Nah Chung, PhD (left), takes a personal interest in medical student research. Story on page 20.

## DEPARTMENTS

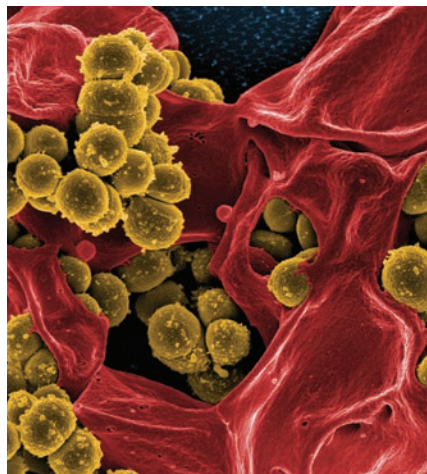
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A three-drug cocktail given in mice overwhelmed the defenses of the notorious methicillin-resistant *Staphylococcus aureus* (MRSA), shown above. Story on page 14.

## Outlook Autumn 2016

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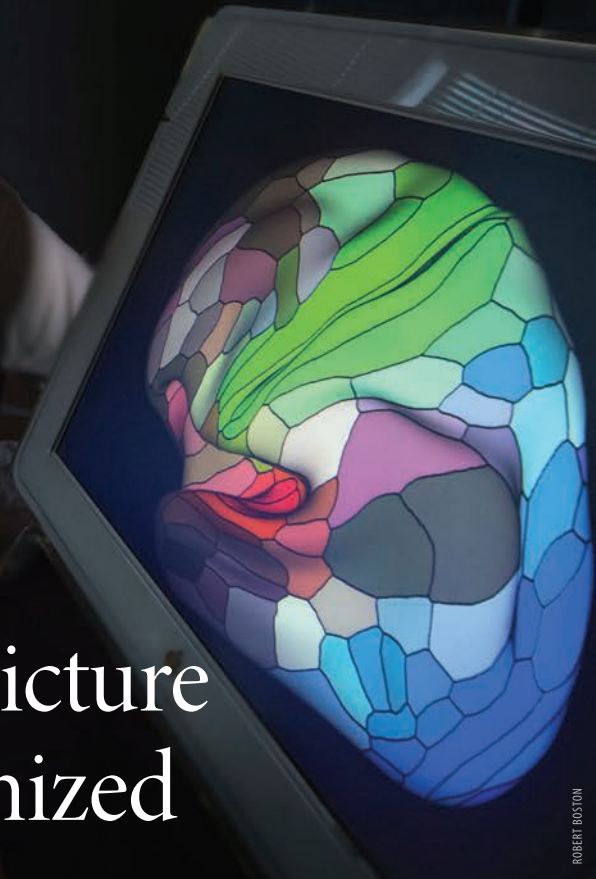
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# Map provides detailed picture of how the brain is organized



ROBERT BOSTON

**T**he human brain has remained largely uncharted, but a detailed new map by Washington University researchers lays out the landscape of the cerebral cortex — the dominant structure involved in sensory perception, attention, language, tool use and abstract thinking.

The map divides both the left and right cerebral hemispheres into 180 areas based on physical differences, functional distinctions and variations in the connections.

The researchers drew upon data and methods generated by the Human Connectome Project (HCP), a five-year, multimillion dollar study led by David Van Essen, PhD, the Alumni Endowed Professor of Neuroscience, and involving a consortium that includes the University of Minnesota and Oxford University. The HCP used a powerful, custom-built MRI machine to map the brains of 1,200 young adults.

To make this new map, the study's lead author Matthew Glasser, PhD, Van Essen

and colleagues pooled data from 210 healthy young adults. The researchers combined measures of the thickness of the cortex and the amount of insulation around neuronal cables, with MRI scans of the brain at rest and while performing simple tasks, such as listening to a story.

"We ended up with 180 areas in each hemisphere, but we don't expect that to be the final number," Glasser said. "In some cases, we identified a patch of cortex that probably could be subdivided, but we couldn't confidently draw borders with our current data and techniques. In the future, researchers with better methods will subdivide that area. We focused on borders we are confident will stand the test of time."

The researchers improved on previous maps by aligning the brains to a common

**The map divides both the left and right cerebral hemispheres into 180 areas.**

David Van Essen, PhD (left), and Matthew Glasser, PhD, are part of a team that mapped the human cerebral cortex in painstaking detail. The map will help researchers study brain disorders such as autism, schizophrenia, dementia and epilepsy.

coordinate system before analysis, using an algorithm developed by colleagues at Oxford University, and incorporating the highest-quality MRI data available.

The results are a precise map with crisp borders and an algorithm capable of locating the areas in individual brains, even though each individual is unique in terms of the pattern of cortical folds and in the size and shape of areas on the cortical map.

The work is available online in *Nature*, including 200 pages of detailed information on each of the 180 regions and algorithms used. "We think it will serve the scientific community best if they can dive down and get these maps onto their computer screens and explore as they see fit," Van Essen said.

# Insulin-secreting cells created from stem cells

Signaling a potential new approach to treating diabetes, researchers at the School of Medicine and Harvard University have produced insulin-secreting cells from stem cells derived from patients with type 1 diabetes.

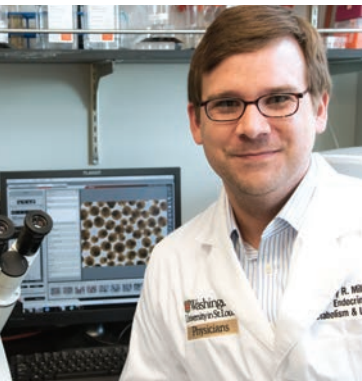
The discovery suggests a personalized treatment approach may be on the horizon — one that relies on the patients' own stem cells to manufacture new cells that make insulin.

The researchers showed that the new cells could produce insulin when they encountered sugar. The scientists tested the cells in culture and in mice, and in both cases found that the cells secreted insulin in response to glucose.

"In theory, if we could replace the damaged cells in these individuals with new pancreatic beta cells — whose primary function is to store and release insulin to control

blood glucose — patients with type 1 diabetes wouldn't need insulin shots anymore," said first author Jeffrey R. Millman, PhD, an assistant professor of medicine and of biomedical engineering at the School of Medicine.

Millman, whose laboratory is in the Division of



Jeffrey R. Millman, PhD

Endocrinology, Metabolism and Lipid Research, began his research in the laboratory of Douglas A. Melton, PhD, Howard Hughes Medical Institute investigator and a co-director of Harvard's Stem Cell Institute. There, Millman had used similar techniques to make beta cells from stem cells derived from people who did not have diabetes. In these new experiments, the beta cells came from tissue taken from the skin of diabetes patients.

More research is needed to make sure that the beta cells made from patient-derived stem cells don't cause tumors to develop — a problem that has surfaced in some stem cell research — but there has been no evidence of tumors in the mouse studies, even up to a year after the cells were implanted.

Stem cell-derived beta cells could be ready for human research in three to five years. At that time, Millman expects the cells would be implanted under the skin of diabetes patients in a minimally invasive surgical procedure that would allow the beta cells access to a patient's blood supply.

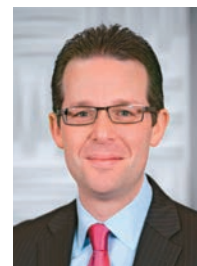


JOHN TWOMBLY

**DEVELOPMENTAL STUDY** Premies whose daily diets were at least 50 percent breast milk had more brain tissue and cortical surface area by their due dates than premature babies who consumed significantly less breast milk. Led by Cynthia Rogers, MD, assistant professor of child psychiatry, the researchers retrospectively studied how much breast milk 77 preterm babies received while in the Neonatal Intensive Care Unit (NICU) at St. Louis Children's Hospital, then conducted brain scans at about the time of their full-term due dates.

## New Institute for Informatics to coordinate big data efforts

From analyzing vast DNA sequences to handling electronic medical records, the importance of big data in medicine has increased dramatically in recent years. To support the need to manage and harness big data, the medical school has launched an Institute for Informatics, naming Philip R.O. Payne, PhD, as director.



Philip R.O. Payne, PhD

The school has a long history of strong informatics research, which has allowed Washington University to take important leadership roles in national bioinformatics efforts, including the Human Genome Project, the Human Connectome Project and the very recent efforts to understand the microbiome.

The institute will coordinate informatics efforts across the Medical Campus and partner with the School of Engineering and Applied Science, the Institute for Public Health, the Brown School, the Olin Business School, the Innovations Incubator at BJC HealthCare and the Cortex Innovation Community.

Payne, formerly chair of the Department of Biomedical Informatics at The Ohio State University, is an elected fellow of the American College of Medical Informatics. He has written more than 175 peer-reviewed articles, book chapters, abstracts, editorials and technical reports in his field.

# Master switches turn up immune cell activity

A person's genetic makeup plays a role in autoimmune diseases that develop when the body is attacked by its own immune system. But little is known about how genetic variations push immune cells into overdrive.

Now, School of Medicine researchers have identified genetic master switches that turn up — or down — the activity of specific types of immune cells. The study is available online in *Cell*.

Surprisingly, the DNA regions that make up these master switches include numerous genetic variants linked to a range of autoimmune diseases.

"In some cases, individual variations in a person's DNA probably tweak the settings of these switches upward, leading to over-activation of the immune cells and autoimmune disease," said Eugene Oltz, PhD, a professor of pathology and immunology and study co-senior author.

The researchers compared gene activity in two kinds of immune cells — innate lymphoid cells and T helper cells — that both serve as "control towers" for the immune response, sending out powerful molecular signals to other immune cells to start killing invading microbes and destroying infected human cells.

The researchers defined a set of super-enhancers — regions of DNA that serve as master control switches — for these immune cell types. The super-enhancers contain many genetic variants associated with autoimmune diseases such as diabetes, rheumatoid arthritis, Crohn's disease and ulcerative colitis.

"Geneticists have identified lots of DNA sequence variations associated with autoimmune diseases, but it wasn't clear how they were involved because they weren't in any genes known to be involved in the development of these diseases," said co-senior author Marco Colonna, MD, the Robert Rock Belliveau, MD, Professor of Pathology. "Now that we know where the master switches are, we can see that those variants are associated with autoimmune disease because they affect the regulation of these immune cells."

The discovery could lead to personalized therapies targeted to the genes regulated by each specific super-enhancer.



Super-enhancers found in DNA

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ROBERT BOSTON

**STUDENT PLEDGE** During orientation, the 124 incoming students collectively wrote a class oath representing their ethics, values and goals. The oath-building tradition began more than a decade ago and, with each class, a different focus emerges. This year, students emphasized the individual patient relationship. The class recited its oath at the White Coat Ceremony, a rite of passage in which new students receive their coats in front of family and friends.

*I pledge that my patient will always be my foremost consideration as I strive to promote health and quality of life through education, prevention and care.*

See the full oath at [wumnews.org/2016oath](http://wumnews.org/2016oath)



CATLIN CRANE - MLIS



ROBERT BOSTON



KATIE TAYLOR

## The Next Century

### A Becker Medical Library Photovoice Project

Share your (photo)voice: For more than 100 years, the people of Washington University School of Medicine and Barnes-Jewish and St. Louis Children's hospitals have worked together to advance medicine, educate the next generation, and care for patients in St. Louis and beyond. To celebrate a century of collaboration, Bernard Becker Medical Library has launched an online collection of inspirational stories and photos. Those with ties to Washington University Medical Center are invited to take part at [photovoice.wustl.edu](http://photovoice.wustl.edu).

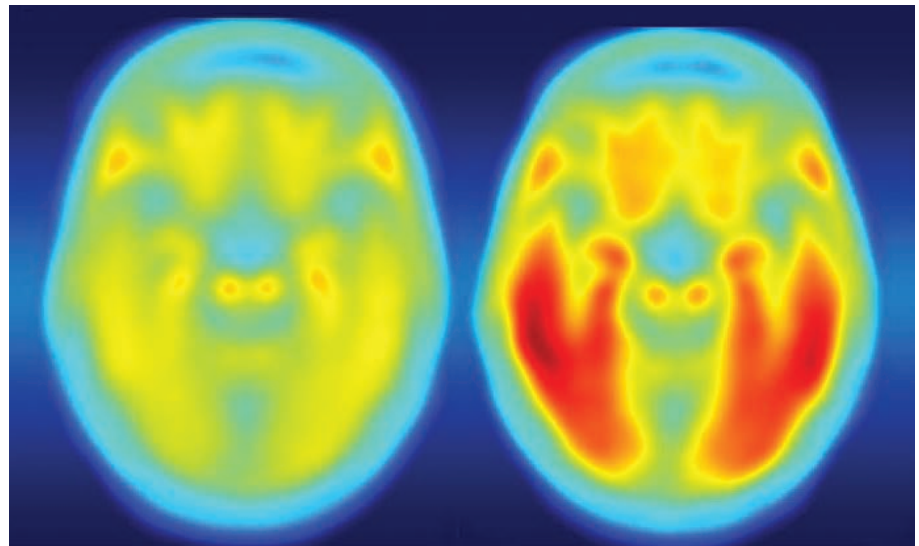
# Alzheimer's decline linked to tau protein

**A** buildup of plaque and dysfunctional proteins in the brain are hallmarks of Alzheimer's disease. While much Alzheimer's research has focused on accumulation of the protein amyloid beta, researchers have begun to pay closer attention to another protein, tau, long associated with this disease but not studied as thoroughly, in part, because scientists only recently have developed effective ways to image tau.

Using a new imaging agent that binds to tau protein and makes it visible in positron emission tomography (PET) scans, School of Medicine scientists have shown that measures of tau are better markers of the cognitive decline characteristic of Alzheimer's than measures of amyloid beta seen in PET scans.

A study comparing 36 control participants who were cognitively normal and 10 patients with mild Alzheimer's disease was published May 11 in the journal *Science Translational Medicine*.

"Our work and that of others has shown that elevated levels of amyloid beta are the earliest markers of developing Alzheimer's disease," said senior author Beau M. Ances, MD, PhD, an associate professor of neurology. "But in the earliest stages of Alzheimer's disease, even with amyloid buildup, many



MATTHEW R. BRIER

patients are cognitively normal, meaning their memory and thought processes are still intact. What we suspect is that amyloid changes first and then tau, and it's the combination of both that tips the patient from being asymptomatic to showing mild cognitive impairment."

While Ances called for larger follow-up studies, he said this analysis helped establish that the new tau agent, called T807, is an important tool for understanding the timeline of Alzheimer's progression and for defining which regions of the brain are involved. These findings could lead to earlier diagnoses and

PET scans show average tau accumulation in cognitively normal people (left) and in those with mild Alzheimer's symptoms.

clinical trials to test drugs against amyloid and tau buildup.

"While we currently cannot prevent or cure Alzheimer's disease, delaying the onset of symptoms by 10-15 years would make a huge difference to our patients, to their families and caregivers, and to the global economy," Ances said.

ROBERT BOSTON



**USE SPARINGLY** Prolonged use of drugs to treat heartburn, ulcers and acid reflux may lead to serious kidney damage, including kidney failure, according to a large five-year study at the School of Medicine and Veterans Affairs St. Louis Health Care System. More than 15 million Americans have prescriptions for so-called proton pump inhibitors (PPIs), which generally have been considered safe. The medications are sold under brand names Prevacid, Prilosec, Nexium and Protonix, among others. The epidemiological study is online in the Journal of the American Society of Nephrology. The researchers called for further study about the safety of PPIs.

## National Academy members elected



**Kenneth M. Murphy, MD, PhD**

Two scientists at the School of Medicine are among the 84 members and 21 foreign associates elected to the National Academy of Sciences this year. Election to the academy — which was announced May 3 — is considered one of the highest honors that can be awarded to a U.S. scientist or engineer.



**Herbert W. "Skip" Virgin IV, MD, PhD**

The university's newest academy members are: Kenneth M. Murphy, MD, PhD, the Eugene Opie Centennial Professor of Pathology and Immunology and a Howard Hughes Medical Institute investigator; and Herbert W. "Skip" Virgin IV, MD, PhD, the Edward Mallinckrodt Professor and head of the Department of Pathology and Immunology.

# 'Good cholesterol' may cause premature death

Commonly touted as "good cholesterol" for helping to reduce risk of stroke and heart attack, both high and low levels of high-density lipoprotein (HDL) cholesterol may increase a person's risk of premature death, according to new research at the School of Medicine and Veterans Affairs (VA) St. Louis Health Care System.

Conversely, intermediate HDL cholesterol levels may increase longevity, according to the research. The large-scale epidemiological study is published in the Clinical Journal of the American Society of Nephrology.

"The findings surprised us," said Ziyad Al-Aly, MD, an assistant professor of medicine and the study's senior author.

"The relationship between increased levels of HDL cholesterol and early death is unexpected and not fully clear yet. This will require further study."

For years, HDL cholesterol has been credited with helping to remove plaque-building "bad cholesterol" from arteries.

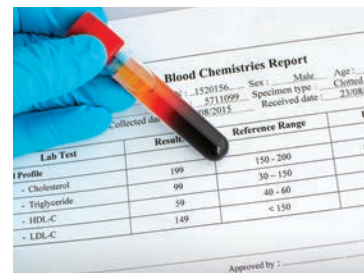
For this study, researchers studied kidney function and HDL cholesterol levels in more than 1.7 million male veterans from October 2003 through September 2004, and then followed participants until September 2013.

The study showed that both high and low HDL cholesterol levels were associated with an increased risk of dying among study participants with all levels of kidney function. Research data showed a relationship between HDL cholesterol levels and mortality as a U-shaped curve with the risk of death increased at both ends of the spectrum.

"The findings may explain why clinical trials aimed at increasing HDL cholesterol levels failed to show improved outcomes," said Al-Aly, who also is the VA's associate chief of staff for research and education and co-director of its Clinical Epidemiology Center in St. Louis.

Such findings regarding HDL cholesterol and premature death have not been reported in other large epidemiologic studies, Al-Aly said.

"However, the previous studies are limited in that the number of patients in those cohorts is relatively small compared with what a big data approach enabled us to see in our new research," he said. "Big data allow a more nuanced examination of the relationship between HDL cholesterol and risk of death across the full spectrum of HDL cholesterol levels."



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From left to right: Mary Danielson, Tiffany Quan, Tiffany Son, Ailis Powderly, Laura J. Bierut, MD, Foluso Ademuyiwa, MD, Tricia Salyer, Laura Muller and Karien Dixon.

## Overcoming disparities

**M**edical and undergraduate students are recruiting African-American breast cancer patients for a research project on genetic risks. Historically, African-American women are underrepresented in genetic studies of breast cancer. The study, led by Laura J. Bierut, MD, Alumni Endowed Professor of Psychiatry, and Foluso Ademuyiwa, MD, assistant professor of medicine, is examining the distribution of mutations in genes known to increase cancer risk. The hands-on experience is teaching students about genetic testing in clinical care.

# Mice offer new insights into human stuttering

**M**ice that vocalize in a repetitive, halting pattern similar to human stuttering may provide insight into a condition that has perplexed scientists for centuries, according to researchers at the School of Medicine and the National Institutes of Health (NIH).

Initially attributed to nervousness, stress or even bad parenting, stuttering is now recognized as primarily biological in origin, although anxiety can exacerbate the condition.

Some people who stutter have a mutation in a gene called *Gnptab* (for N-acetylglucosamine-1-phosphate transferase alpha and beta). With Dennis Drayna, PhD, and colleagues at the National Institute on Deafness and Other Communication Disorders, the researchers created mice with a corresponding mutation in the same gene.

These mice vocalized in an abnormal pattern characteristic of human stuttering. The animal model of stuttering can help scientists understand the molecular and

neurological basis of the disorder, and potentially develop treatments.

“Speech is obviously a unique human capacity, but the patterns of speech are built out of simpler building blocks,” said Tim Holy, PhD, an associate professor of neuroscience and the paper’s senior author.

A key characteristic of stuttering is the presence of hesitations. The researchers developed an algorithm to analyze the length of pauses in the spontaneous vocalizations of 3- to 8-day-old mouse pups. They found that mice carrying the mutation exhibited longer pauses than those without the mutation.

The researchers applied the same algorithm to recordings of people talking, some of whom stuttered and some of whom did not. The algorithm accurately distinguished the two groups.

Other than in their vocalizations, the mice with the mutation were normal. In this respect, the mice with the mutation are like people who stutter — indistinguishable from nonstutterers in all but speech.



Senior scientist Terra Barnes, PhD, and Tim Holy, PhD, associate professor of neuroscience, hold mouse pups.

It is not clear how the gene relates to speech. It is known to be involved in the pathway that degrades molecules inside the cell.

“It could be that the mutation very mildly compromises the function of the protein, but there’s a set of cells in the brain that is exquisitely sensitive, and if you ever so slightly compromise the function in those cells you get the observable behavioral deficit,” said Holy. “We just don’t know yet.”



Using advanced technology, physical therapy and orthopedic surgery researchers Michael Harris, PhD, and Marcie Harris-Hayes, PT, DPT, MSCI, study movement in 3D. Cameras with near-infrared light capture motion-reflective markers placed on patients with musculoskeletal and neuromuscular disorders.



# Movement *redefined*

**By adopting movement science as a central tenet, the Program in Physical Therapy has reshaped its profession.**

**BY GAIA REMEROWSKI**

Walking, rising from a chair, reaching for a book — all are simple, everyday movements that many of us take for granted. But for the faculty of Washington University’s Program in Physical Therapy, movement is not something to be taken lightly; it is a central tenet of health.

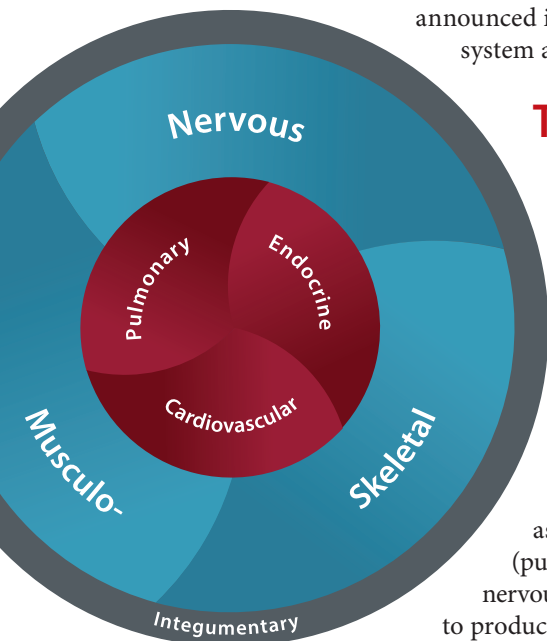
The physical therapy (PT) program is a national leader in the study of movement and how improper movement leads to injury and impairment. With an emphasis on diagnosing — rather than simply treating patients — the program is changing the way the profession is viewed.

More than three decades ago, faculty members implemented, and have continued to refine, the “movement system” as the basis for the program’s research, educational and patient care initiatives. “At Washington University the movement system really is at the core of all that we do,” said Program Director Gammon Earhart, PT, PhD. “That is unique relative to most other physical therapy programs.



“Our goal is to better understand how the movement system works in health and disease and to understand what we as physical therapists can do to intervene and optimize people’s function through movement,” she added.

In 2013, the American Physical Therapy Association (APTA), the leading PT organization, announced it also had adopted the movement system as the foundation for the profession.



## The human movement system

Just as neurologists are defined by their study of the nervous system or cardiologists by their focus on the heart, PT program leaders believe physical therapists should be defined by their study of the movement system. The program defines the human movement system as a collection of body systems (pulmonary, cardiovascular, endocrine, nervous and musculoskeletal) that interact to produce and support movement. Shirley Sahrman, PT, PhD, FAPTA, professor emerita

of physical therapy, has developed and promoted the human movement system both in Washington University’s program and in the profession.

As an active, athletic kid who grew up in the polio era, Sahrman was deeply affected by stories of people who couldn’t participate in sports or even walk. She has devoted her 50-year career to understanding movement and helping people stay as active as possible throughout their entire lives.

Early on, Sahrman realized she could reduce pain in patients with musculoskeletal issues by adjusting their movements. “I had to pay a lot more attention to why patients were not moving correctly,” Sahrman said. This prompted the need for standardized exams and more accurate methods to research and measure movement, which were lacking in the school’s PT program at the time.

So Sahrman literally wrote the book on the movement system — actually two books, both of which are used in the program’s classes and by health-care professionals worldwide. Sahrman and others have pushed the field to adopt and associate itself with the movement system.

With the help of her colleagues, she succeeded in getting a definition of the movement system into Steadman’s Medical Dictionary and continued to lobby for its implementation at conferences and in professional circles.



Over the years, the Washington University program has standardized ways to research and diagnose various movement impairment disorders outlined by Sahrman and others. Sahrman's textbooks, considered the gold standard for movement system impairment diagnoses, contain precise diagnostic terminology.

However, some of the more than 200,000 licensed PTs in the U.S. today are working within their own diagnostic frameworks, resulting in confusion. For example, universities that study movement might label their work as "biomechanics" or "pathokinesiology" (the study of abnormal movements), rather than Washington University's term "movement impairments." This is one reason why the profession needs a uniform classification system, said APTA President Sharon Dunn, PT, PhD, OCS.

Despite adoption by the APTA in 2013, there are still challenges in getting movement system diagnoses to the patient level and developing a nomenclature that is backed by science. Dunn noted that Washington University's program is leading the way and improving patient care.

## Diagnosis vs. treatment

With most injuries, patients must first see a medical doctor before consulting a physical therapist. The doctor makes a diagnosis such as "low back pain" and refers the patient for therapy services. Traditionally, PTs have used treatments such as massage, heat and exercise to help ease the patient's pain and restore mobility. In this longstanding scenario, PTs treat, rather than diagnose, their patients.

Faculty members at the School of Medicine are working to change this limited view of PTs as treatment technicians, advocating they instead should be seen as diagnosis-based practitioners with deep expertise in the field of movement science. The movement system provides the framework for PTs to establish themselves as movement impairment diagnosticians.

For example, Sahrman said, "low back pain" is not a diagnosis; it is a symptom. The underlying cause still must be determined. "You can make people feel better immediately," Sahrman said, "but they're going to come right back because relief doesn't last unless you really get to the root of the problem.

"Acute pain problems often are just the first warning of a more progressive issue."

Above left: Gammon Earhart, PT, PhD (left), director of the Program in Physical Therapy, and Jennifer Stith, PT, PhD, LCSW, director of education, meet in the recently renovated student lounge that moved from the basement to the top floor of the 4444 Forest Park Building.

Above: Recent PT graduate John Huang performs a practice exam on medical student Christine Averill, while Associate Professor Suzanne Cornbleet, PT, DPT, observes. The majority of faculty who teach clinical courses also are actively engaged in clinical care.

## *The program has ranked in the top 1 percent for two decades.*

Often the root of musculoskeletal pain stems from repeated incorrect movement in a patient's everyday activities such as sitting, lifting and walking. Proper diagnosis requires a thorough exam that takes into account a person's natural way of moving.

Following an exam, a physical therapist might change the "low back pain" diagnosis to "lumbar flexion syndrome," a condition in which the low back is more flexible than the hips, causing movement imbalances. "So we go through our well established movement diagnostic tests and we show the patient that if you bend in your hips and not in your back, you don't get symptoms," Sahrman said.

Upon understanding the cause of movement impairments, a trained PT can demonstrate the correct way to perform regular activities.

Washington University studies show that patients continue performing these types of everyday life exercises more often than ones that fall outside of normal routines. Patients are more likely to practice the proper way to get up from a chair — something they must do on a regular basis — than perform specific low back stretches requiring them to lie on a mat.



Professor Emerita of Physical Therapy Shirley Sahrman, PT, PhD, FAPTA (left), has written two textbooks on movement system impairments that are referenced worldwide. Former student Maiko Morotani, PT '05, translated one of the books from English to Japanese and recently traveled with Sahrman to Japan.

Sahrman also argues the physician referral requirement needs to change. Many states require physician referral for therapy, though some states, including Arizona, Iowa, Kentucky, Maryland, Massachusetts and Vermont, have moved toward a self-referral model. Missouri has yet to follow suit.

John Metzler, MD, an associate professor of orthopaedic surgery and of neurology who refers many patients to Washington University for physical therapy, wholeheartedly agrees that PTs are more than technicians. "Most physical therapists have a much broader knowledge of musculoskeletal problems than the average physician because that's their area of expertise," he said. "Washington University has excellent therapists who are methodical in how they approach patients. They have a very systematic way of evaluating how patients move, then trying to correct those movements and giving very directed exercises."

Metzler credits the program's strong research focus and evidence-based practices.

## **Moving research forward**

Movement science research is a key part of Washington University's program, which is one of the top-funded in the country. In 2015, the program received more than \$3.5 million in research funding, said Michael Mueller, PT, PhD, FAPTA, the program's director of research. According to the Web of Science, an industry index that compiles publication citation statistics, the program also had more papers cited than any other PT program in the U.S.

"All of our research relates in some way to movement," said Earhart, who, as president of the APTA section on research, helps translate the program's research results into practice. Program research ranges from basic studies of how movement occurs on a cellular level all the way to a systems level.

For example, researcher Todd Cade, PT, PhD, is looking at muscle metabolism and function in patients with Barth Syndrome, a genetic disorder that leaves sufferers weak and unable to exercise. Earhart is leading studies that examine the effects of dance and other exercise on improving Parkinson's disease symptoms. Other trials, such as a study led by Linda Van Dillen, PT, PhD, are exploring the effects of training people with low back pain to modify their movement during daily activities versus having them perform traditional strength and flexibility exercises.

## Educational benefits

This research focus is one of the many educational benefits for students, Earhart said. “We are able to attract outstanding students who are drawn to Washington University because of an environment that has a research-intensive focus with faculty who are internationally and nationally recognized for their contributions to the literature and the evidence base for physical therapy,” she added. Currently ranked No. 1 in the country by U.S. News & World Report, the program has been in the top 1 percent for two decades.

Today, all students in the program complete a doctorate in physical therapy (DPT). But this wasn’t always the case. Susan Deusinger, PT, PhD, FAPTA, who retired in 2014 after 26 years as program director, led Washington University’s progression from a baccalaureate-level educational program to a DPT track, which takes about three years and combines clinical, research and classroom learning. More recently, the APTA has mandated that all academic PT programs offer the DPT, a prerequisite to becoming a practicing therapist.

Another major draw for students is the program’s clinical practice, staffed primarily by faculty, said Beth Crowner, PT, DPT, NCS, MPPA, director of clinical practice. “The fact that the people who teach in our clinical courses are still actively engaged in clinical care is a big differentiator for us relative to many PT schools.” Students spend part- or full-time in the clinic with faculty during clinical rotations.

With such strengths in research and the clinic, students come away with a strong foundation in movement system diagnoses. “This program has a rich history of mentoring and developing leaders in the profession,” Dunn said.

The program also shares its research and clinical advances through continuing education initiatives such as an upcoming APTA movement system summit. The summit joins together representatives from U.S. physical therapy programs to think about the movement system and how it can be implemented in curricula, research and practice.

“I think Washington University’s program will continue to be a leader as the movement system becomes more prominent on a national scale,” Earhart said. “And we have a lot of opportunity to help the public better understand who we are and what we contribute.” ☐

## Diagnosing movement impairments



**P**hysical therapy clinic associate Jesse Civello, PT, DPT (right), uses standardized exams developed at Washington University to determine whether or not a patient has a movement impairment disorder.



ROBERT BOSTON PHOTOS



# Resistance is inevitable

**Nature can — and will — overcome any antibiotic.  
Researchers are working to ensure we stay one step ahead.**

BY JULIA EVANGELOU STRAIT

With increasing reports of superbugs that are resistant to virtually all antibiotics, experts warn of a return to the pre-antibiotic era. In that future, routine surgeries and minor conditions, such as a scraped knee or urinary tract infection, could more frequently result in serious infection or death. Those with impaired immune systems — including cancer and organ transplant patients — face the greatest risk.

Proposals to address the problem call for judicious use of antibiotics, both by doctors and in U.S. agricultural practices. While overuse of antibiotics is a significant contributing factor, experts say restrictive measures only will slow the problem. Bacteria, in a quest for survival, are continually adapting and mounting new, clever defenses against these drugs.





Microbiologist Gautam Dantas, PhD, is sequencing vast quantities of bacterial DNA in efforts to understand and thwart antibiotic resistance.

**M**icrobiologist Gautam Dantas, PhD, argues that the only sustainable solution is to nurture a robust drug discovery pipeline. Informing his view is his lab's extensive body of work documenting the genetics of antibiotic resistance in diverse environments, from hospital neonatal intensive care units, to rural farming villages, to urban slums, to an Amazonian tribe cut off from civilization. His overwhelming conclusion: Regardless of habitat, microbes are "chock-full" of DNA that gives them the capacity to survive chemical onslaught.

"Resistance is inevitable," said Dantas, associate professor of pathology and immunology. "No drug we design is going to permanently prevent resistance. The only way to fight resistance is to find new drugs. And we have to do it continually. Microbes thrive everywhere, including miles below the Earth's crust or surrounded by radioactive waste.

*Microbes thrive everywhere, including miles below the Earth's crust or surrounded by radioactive waste.*

"Their extreme versatility is a reminder that microbes can do incredible things," he added. "They have insanely large population sizes and can divide at incredible rates. What enables all this is incredible chemistry. Bacteria are the best chemists we know. We need to respect that ability."

Antibiotics destroy or weaken bacteria in several different ways, including breaking up the cell wall, restricting replication and inhibiting the production of needed proteins.

In an ever-escalating arms race, superbugs have accumulated genes that, in turn, interfere with antibiotics. These strategies include pumping the drugs out of bacterial cells, blocking the drug from its target, and breaking apart the antibiotic molecules themselves.

The notorious methicillin-resistant *Staphylococcus aureus* (MRSA), for example, destroys methicillin and similar drugs by breaking the drug's key chemical bonds. In destroying the drug, MRSA protects not only itself but other bacteria nearby that lack such defenses.

The concept of microbes as chemists is highlighted by the 1928 discovery of penicillin. Like penicillin, which is made by a type of mold, most antibiotics that people have harnessed to kill dangerous

bacteria are products of other microbes, usually harmless organisms that live in soil. To survive, bacteria must prevent harm via their own chemical arsenals. Over millennia, microbes have evolved the capacity to produce these chemicals as part of their self-protection and communication strategies.

"If you study old sources of soil bacteria that have no exposure to humans — microbes frozen in permafrost for millions of years, for example — some of these bacteria have genes that confer resistance to chemicals that we rely on as modern antibiotics," Dantas said.

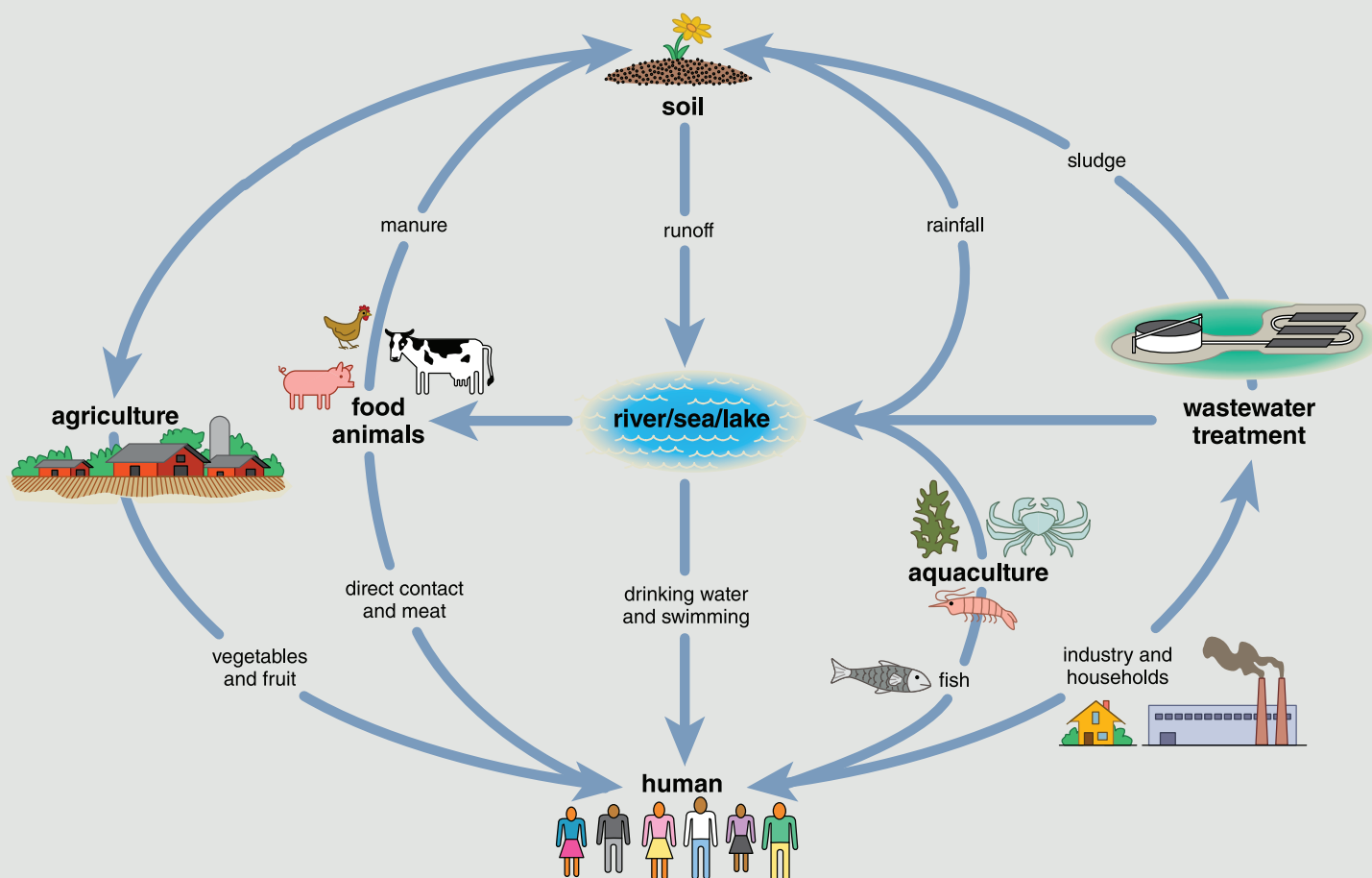
With this history in mind, Dantas and colleagues sought to understand the extent of antibiotic resistance in current soil bacteria. Studying 18 different soil samples from across the U.S., the researchers concluded that soil bacteria contain a massive biochemical capacity to resist even our most potent antibiotics. However, they found that most of these genes fortunately are not poised to jump into bacteria that cause disease.

Along with this presumably good news, the researchers made a worrisome discovery — a novel set of enzymes manufactured by soil bacteria that confer resistance to tetracyclines, a vitally important class of broad-spectrum antibiotics. The researchers also noted that these enzymes — which they dubbed tetracycline destructases — are coded into mobile parts of the bacterial genome that are easily shared, even between distantly related bacteria. It is mobile resistance genes that concern Dantas most.

"We know such genetic transfers have already happened and will continue to happen," Dantas said. "And we now have the tools to predict the chances that these bacteria will intermingle with microbes that cause disease, potentially transferring these resistance capabilities to the clinic."

Glimpsing the scope of microorganisms' genetic capacity to evade antibiotics may be alarming, but in these vast databases of bacterial DNA, Dantas sees the blueprints for the design and development of new antimicrobial drugs. In theory, if you can determine how bacteria evade a specific drug, you can develop ways to thwart them.

In one drug-development strategy, Dantas and associates are using genetic sequencing to identify and track the genes at highest risk of making disease-causing bacteria resistant to important antibiotics. The highest-risk genes — and Dantas puts the tetracycline destructases in this high-risk group — then become targets for the design of new compounds that inhibit these genes and their products.



# Interconnected habitats harbor — and spread — resistant bacteria

Interconnected ecological habitats make it easy for antibiotic resistance to spread. Resistant strains living in soil get passed on to humans through various routes. Gautam Dantas, PhD, and his team have studied diverse environments, including densely populated slums surrounding Lima, Peru, and a tiny subsistence farming village in El Salvador. They uncovered numerous “hotspots” of resistance gene transfer, including chicken coops and sewage treatment systems. El Salvadoran villagers have close interactions with their chickens, giving the birds freedom to roam into cooking areas (below left). In Lima, sewage is processed in a wastewater treatment plant (center), and then the semi-clean gray water is used for irrigation throughout the city (right).



GIORDANO SOUSA/ISTO



PABLO TSUKAYAMA



PABLO TSUKAYAMA

## Old drug, new tricks

Many approved antibiotics have been taken off the market because they are no longer effective. If new genomic strategies can be used to unravel the reasons an antibiotic has stopped working, compounds can be developed that target the resistance, rather than the bacteria. Once the resistance is knocked down, in theory, old drugs could work again.

Tetracyclines are old drugs that are widely used in medicine, veterinary care and agriculture, especially in fish and shrimp farming operations. With such indiscriminate use, tetracycline resistance already exists in the clinic. But unlike MRSA, which destroys methicillin, tetracycline-resistant bacteria in the clinic currently evade the drug without breaking it apart. Dantas worries that the prospect of bacteria carrying tetracycline destructases, which, as the name suggests, destroy tetracycline, may change that, elevating this type of resistance to MRSA-like status.

Indeed, tetracycline destructases' genetic mobility and ability to destroy a drug widely used in the clinic and in agricultural settings have led Dantas to predict a major resistance problem in the future. Such resistance also could compromise new tetracycline-based drugs that are being considered for imminent clinical use. While such data sounds ominous, it also presents an unprecedented opportunity: the chance to design strategies to fight this type of tetracycline resistance before it begins circulating in hospitals.

"We are exceptionally reactionary in our response to antibiotic resistance," Dantas said. "We only take action after people have died. Until recently, we did not have the tools to determine where this resistance was coming from. Now, we understand that we live in interconnected habitats that harbor different kinds of bacteria.

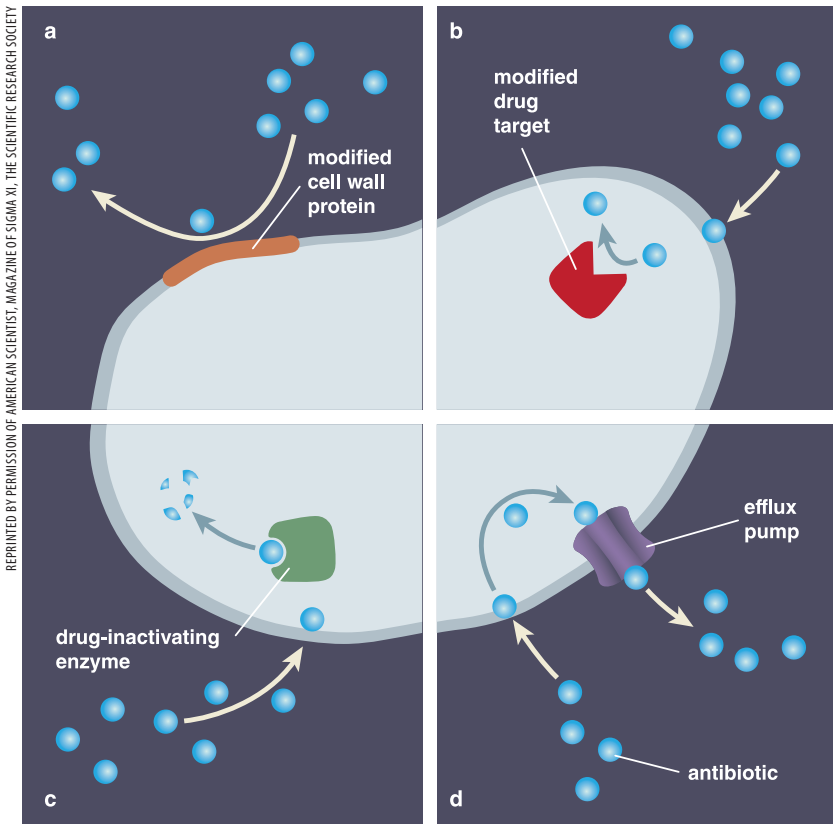
"We can track the genes that confer antibiotic resistance and begin to develop an understanding of how they move," he added. "With that information, we can calculate the risk that they may transfer to bacteria that cause disease. This new understanding has led us to predict that the tetracycline destructases are at high risk of transferring to the clinic in the future."

The researchers' argument was sufficient to convince the National Institutes of Health (NIH) that tetracycline destructases are worthy of further research. Earlier this year, the NIH awarded a \$3.6 million grant to Dantas and collaborators Niraj Tolia, PhD, associate professor of molecular microbiology, and Timothy Wencewicz, PhD, assistant professor of chemistry. They are working to develop inhibitors against tetracycline destructases. Such inhibitors could let tetracycline remain an effective antibiotic even if or (as Dantas argues) when bacteria carrying tetracycline destructases begin to emerge in health-care settings.

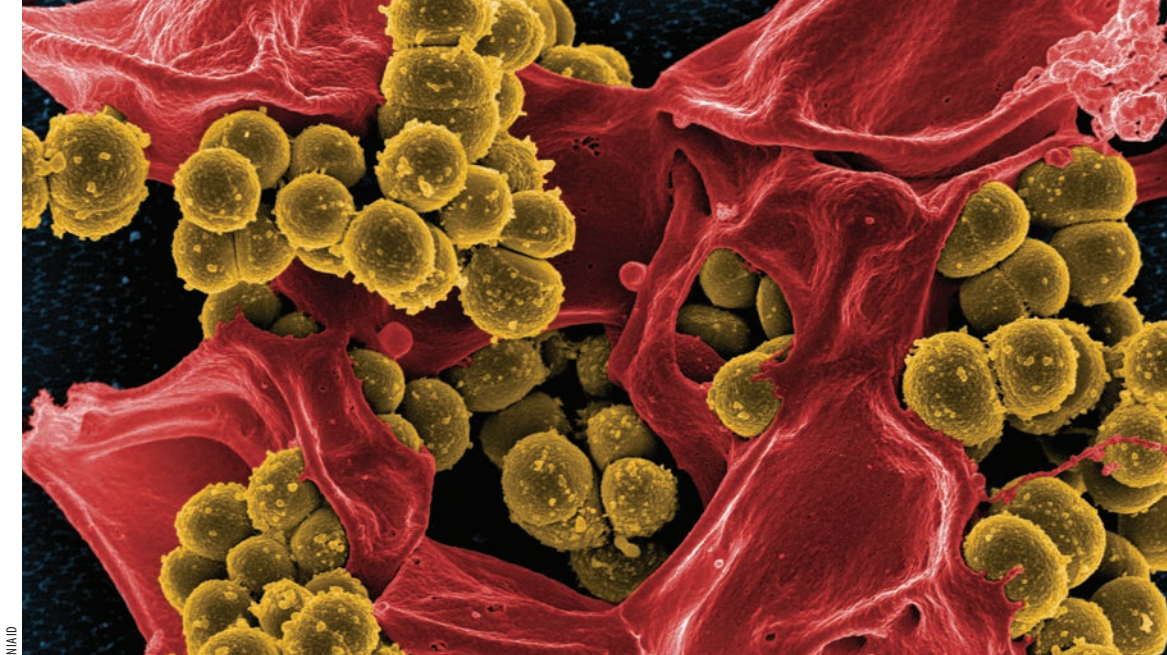
## Two are better than one

Because developing new inhibitors from scratch takes time, and patients are facing deadly antibiotic-resistant infections today, Dantas proposes a second strategy: high-throughput screening to test combinations of existing drugs. Attacking resistant bacteria using synergistic combinations of drugs can overwhelm defenses in ways that single drugs cannot.

Such "cocktails" that leverage drugs already approved by the Food and Drug Administration could, in theory, move more quickly into clinical use than novel compounds.



Superbugs accumulate genes that interfere with antibiotics. These genes give microbes the ability to: (a) make impermeable cell walls; (b) block drugs from their targets; (c) break apart the drug molecules; (d) pump drugs out; and, sometimes, all of the above.



Scanning electron micrograph of methicillin-resistant *Staphylococcus aureus* (MRSA).

Dantas' team found that a combination of three drugs — meropenem, piperacillin and tazobactam — cleared mice of MRSA infections that normally kill them in less than a day. All three drugs belong to a class of chemicals called beta-lactams, considered obsolete against MRSA for decades.

Dantas showed that the three drugs in tandem render the bacteria vulnerable to attack, making it difficult to resist the onslaught. If the bacteria become resistant to one component of the triple-drug cocktail, they are rendered more sensitive to one or both of the others.

"This is a parallel strategy to the tetracycline destructase story," Dantas said. "In the first case, we're talking about studying ecology and genetics to design new inhibitors. In the second, we're rescuing existing classes of antibiotics that are useless against certain bacteria when given separately. In both cases, we are anticipating the bacteria's resistance strategies. That is our theme: When you go after new treatments, think about resistance from the beginning."

## Lessons learned

Yearly in the U.S., antibiotic-resistant infections plague more than 2 million people, killing some 23,000, according to the CDC. Dantas said these hard-fought battles offer lessons in how bacteria evolve resistance.

In a third strategy, Dantas is working directly with hospital microbiology labs to sequence drug-resistant infections as they emerge and identify how they evade antibiotics. "There are a large number of emerging resistance strategies, and we just don't know how they work," Dantas said.

Carey-Ann Burnham, PhD, is medical director of the clinical microbiology lab at Barnes-Jewish Hospital. She and Dantas are studying one particularly puzzling case in which a heart patient developed an infection that, in less than three weeks, became totally resistant to an important antibiotic called daptomycin.

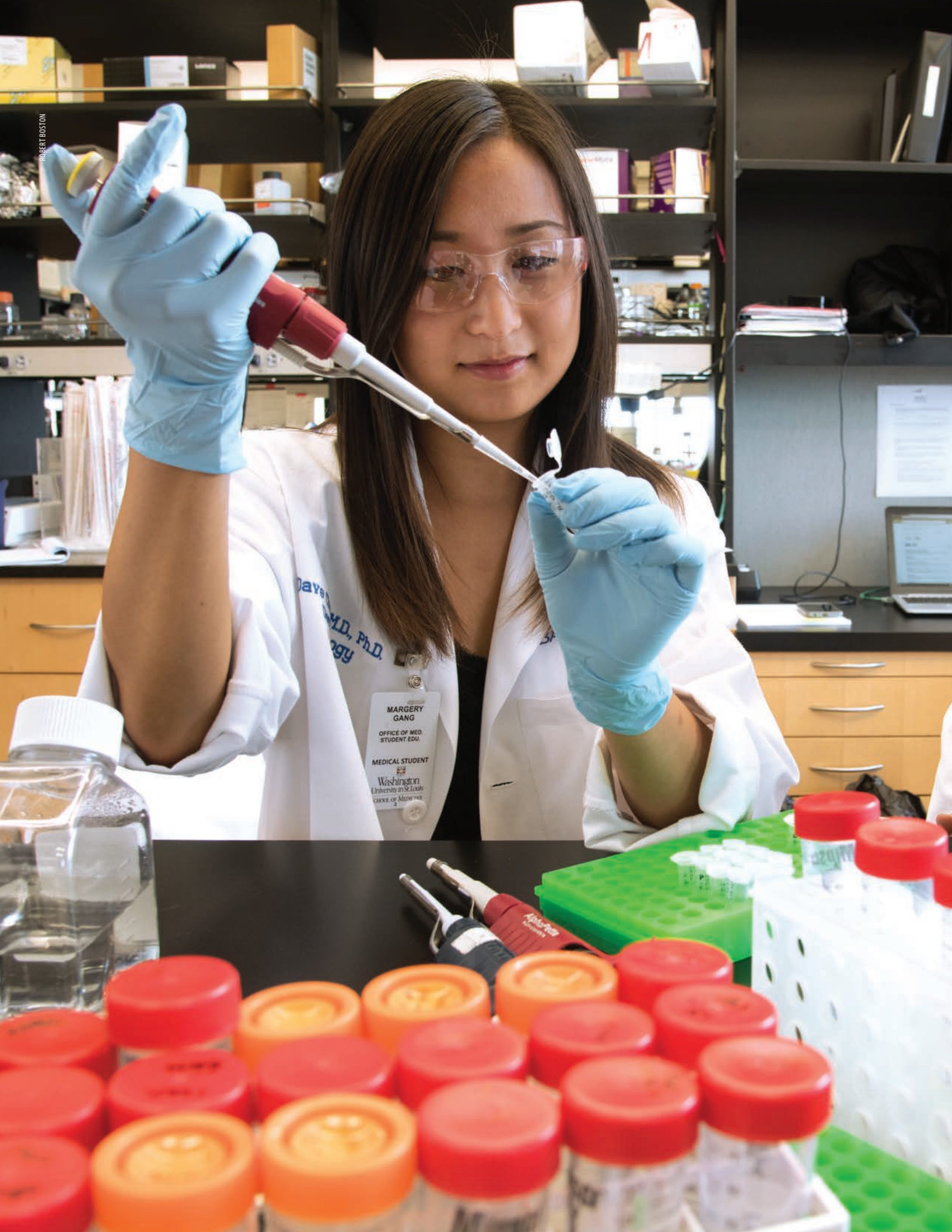
"The magnitude of the change in this bacteria's ability to resist daptomycin had never been reported before," Dantas said. "Typically, a bug might develop enough resistance that the dose would need to be increased two-fold or four-fold, for example. In this patient's case, the dose would have needed to increase 1,000-fold to kill the bacteria."

The patient survived, but only after six weeks of treatment with linezolid, a toxic antibiotic of last resort. Courses longer than one month can cause serious complications, including bleeding and vision loss.

To understand this particular superbug, Dantas and his colleagues are immersed in their molecular detective work.

"We are excited to apply our knowledge and tools to help patients," Dantas said. "We began by surveying bacteria in the environment, even though that work initially seemed far removed from any clinical application. But that research has helped us determine that resistance is everywhere.

"Rather than seeking irresistible antibiotics, perhaps the best strategy is to treat resistance as a given, use our tools to anticipate where it will come from, and develop proactive strategies to address it before it becomes a problem in patient care." □





# Learning labs

**For most medical students, there's a major obstacle to doing research: being in medical school.**

**Not at Washington University.**

BY DEB PARKER

On top of mastering enormous volumes of material, sitting for exams, going through clinical rotations and applying for residencies, medical students don't have a lot of spare time.

Yet health-care professionals recognize the importance of research experience, even for students headed into clinical practice. Strong research skills and strong clinical skills are inextricably linked.

Doctors must scrutinize an endless barrage of primary scientific literature; only by thinking critically can they determine the best course for individual patients.

At the School of Medicine, student research opportunities abound — in basic, clinical and translational science, global health, device and technology development, and in nearly every discipline. More than 2,100 faculty mentors stand ready to guide.

Orchestrating the dizzying array of options and playing master project matchmaker between student and faculty mentor is Koong-Nah Chung, PhD, associate dean for medical student research.

Medical student Margery Gang collaborates on an acute myeloid leukemia project with Timothy Ley, MD, the Lewis T. and Rosalind B. Apple Chair in Oncology.



**Researcher at heart:** Associate Dean Koong-Nah Chung, PhD, meets with every single student and tirelessly dedicates herself to finding and supporting research opportunities.

## An upswing in involvement

Although involvement is optional, more than 95 percent of students complete a research project during their time at the medical school.

“Research is an essential part of the MD curriculum,” said Michael M. Awad, MD, PhD, associate dean for medical student education and associate professor of surgery. “Here, they gain the ability to perform scientific discovery and begin a journey of lifelong learning, priming them to become future leaders in academic medicine.

“Very few schools with optional research programs have such a high student participation rate, a fact noted positively during our recent medical school accreditation site visit,” he added.

The school’s robust research environment plays a key role in recruiting and molding students. Via in-house surveys, applicants cite “research opportunities” as one of the top two reasons for selecting Washington University.

In surveys of U.S. medical students conducted by the Association of American Medical Colleges, Washington University respondents say they incorporate research into their studies at double the national rate. Further, they publish at twice the national rate. Sixty percent of Washington University medical graduates lands careers at academic medical centers versus 30 percent

nationally. “We truly are training future physician-scientists,” Chung said.

Fifteen years ago, just one-third of Washington University medical students participated in research, supported at the time by a small National Institutes of Health (NIH) grant. There wasn’t a dean of student research or a centralized office to coordinate project partnerships.

Chung — who was appointed research assistant professor in 1996 and assistant dean in 1999 — became that point person and began advocating for increased participation. Five years ago, she formed the Office of Medical Student Research.

Chung and her team members, including coordinator Rosalyn Bradshaw-Robinson, and administrative assistant Heather Bartels, work tirelessly to create an infrastructure that spawns hundreds of research projects. To-dos include: soliciting funding; tracking the work of 2,000-plus principal investigators; and meeting one-on-one with students. The office maintains comprehensive listings of trainees over the last 20 years and their funding sources and published works.

“She (Chung) is such a researcher at heart,” Bradshaw-Robinson said. “She attacks everything with such attention and detail.”

Thomas Baranski, MD, PhD, associate professor of medicine, agrees. “Dean Chung has been essential in fostering research opportunities for medical students. She has succeeded because of her own love of medical research and her passion to see our medical students get a chance to do their own research.”

In today’s competitive funding environment, only 7 percent of NIH grant submissions receive approval. However, Chung’s initial five-year NIH grant from 2001 has been renewed four times, cumulatively bringing in \$3 million for student research. As a result, every student participating in a summer research project has been fully funded for the past 16 years through this grant and financial support from the dean’s office.

This spring, Chung learned that the grant has been extended through 2021. The 1,200-page NIH grant application, which requires nine months of preparation, received a nearly perfect score.

Lengthier research projects are not fully covered, but Chung’s team leverages 20-plus funding mechanisms — including various foundations and private grants — and guides students in writing applications for financial support.



*'We truly are training future physician-scientists.'*

— Koong-Nah Chung, PhD

For Chung, it all comes down to customer service. Seamless experiences for mentee and mentor boost participation and enrich the institution. “Definitely the word has gotten out,” Chung said. “Any medical student who wants to participate can. That commitment is loud and clear to students. If you want to do research, we make it easy here and you can do significant research.”

To get the process started, Chung and Robinson meet personally with students. Because Chung also serves as admissions subcommittee chair, her mornings, October through February, are reserved for meeting prospective students. Her afternoons are spent helping current students better understand their interests as they seek meaningful projects.

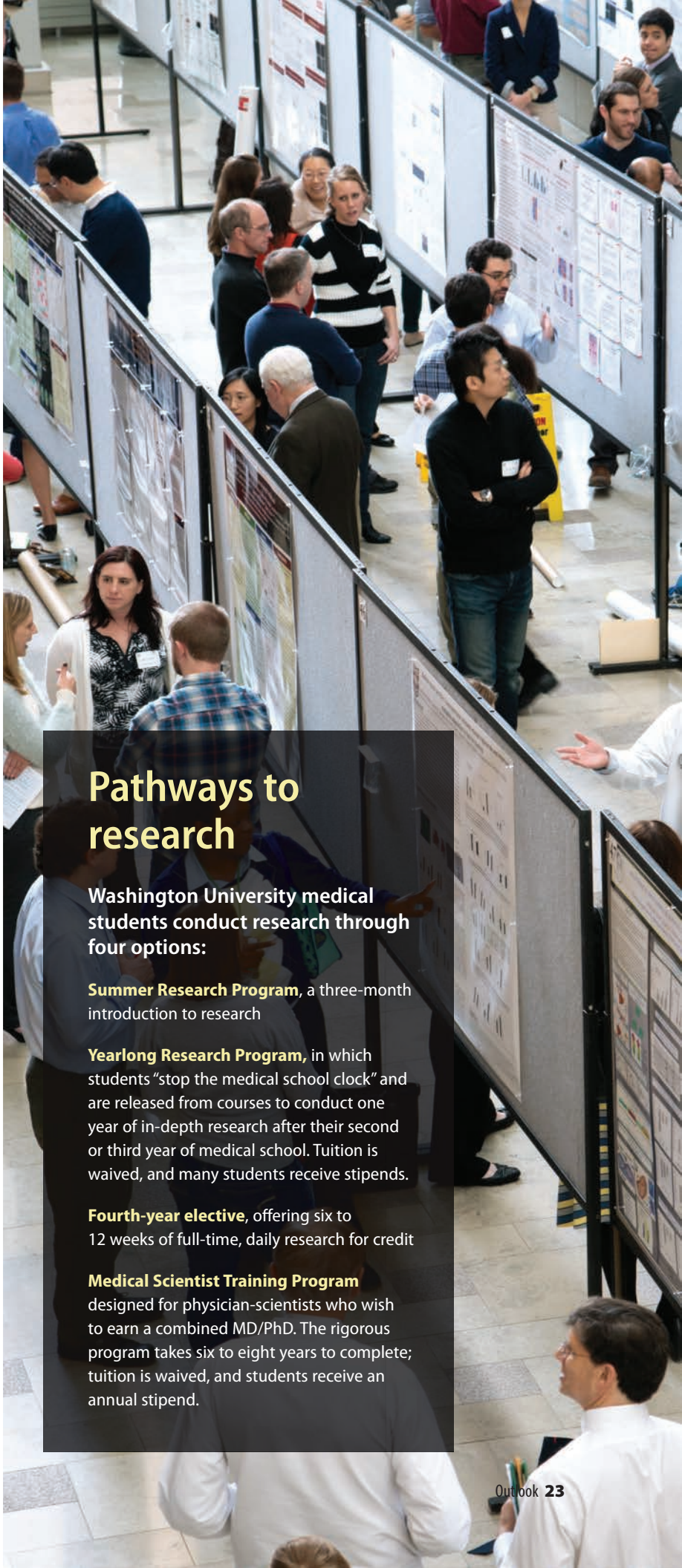
As someone who knows all of the students and many of the faculty members, Chung strives to match temperaments. Finding an ideally suited mentor can forever alter a student’s life aspirations.

Rachel Goldberg, now a third-year medical student, met Chung during the admissions process and later sought her help in securing an otolaryngology research project. She echoes the thoughts of many students who describe Chung as one of the medical center’s most beloved members.

“Dean Chung is amazing,” Goldberg said. “She is one of the warmest people I know. She is what I thought about when I thought about Washington University. I don’t know anybody in the country who does what she does.”

For students on a hectic training path, this support makes all the difference. “When I was looking at medical schools, I didn’t hear of another medical school that was able to provide that amount of funding to students,” Goldberg said. “I didn’t have to worry about finding funding for research. It definitely was a draw. I just needed to concentrate on my education.”

Medical students present their work at the annual poster session.



## Pathways to research

Washington University medical students conduct research through four options:

**Summer Research Program**, a three-month introduction to research

**Yearlong Research Program**, in which students “stop the medical school clock” and are released from courses to conduct one year of in-depth research after their second or third year of medical school. Tuition is waived, and many students receive stipends.

**Fourth-year elective**, offering six to 12 weeks of full-time, daily research for credit

**Medical Scientist Training Program** designed for physician-scientists who wish to earn a combined MD/PhD. The rigorous program takes six to eight years to complete; tuition is waived, and students receive an annual stipend.



Research opportunities extend from the bench to the bedside. Above, Alison G. Cahill, MD, MSCI (left), associate professor of obstetrics and gynecology, confers with medical student Fayola Fears about a research project focused on infant neurodevelopment.

## Lasting contributions

Faculty here — including some of the world’s experts in their respective fields — are eager to welcome the 500 MD and nearly 600 PhD students. “Over the years, I’ve not had one faculty member who didn’t want to host,” Chung said. “We are successful because faculty are willing to mentor. I’ve also had support from Deans William Peck, Larry Shapiro and David Perlmutter and my mentors Ed Dodson and Leslie Kahl.”

For faculty, it’s inspirational to have smart, creative, hard-working students in their labs. “Our faculty are drawn here and retained here because of the ability to work with great students,” Chung said.

Jay F. Piccirillo, MD, FACS, recalls the outstanding mentorship he received during fellowship training at Yale University from Alvan Feinstein, the grandfather of clinical epidemiology. Today, Piccirillo, a professor of otolaryngology-head and neck surgery, enjoys serving a similar role in trainees’ lives and hopes to inspire them to become “change agents” in medicine.

*Many of the mentor-mentee relationships evolve into decades-long collaborative partnerships.*

“The most important part of being a mentor is listening to mentees, supporting them through their situation, whether that is a research project or personal life challenge,” Piccirillo said. “Now that I have been at the medical center for more than 20 years and have interacted with so many students, I feel very confident that I have valuable information to share.

“I love to be available and help, when asked, for important decisions in our students’ lives, like specialty choice or whether to pursue an academic research career.”

Many such relationships evolve into decades-long collaborative partnerships. “The mentor has the reward of witnessing the intellectual growth and maturation of the mentee,” said Michael Avidan, MBCh, professor of anesthesiology and cardiothoracic surgery. “It is particularly rewarding when my students have advanced in their careers, developed their own research programs, and have demonstrated prowess as independent investigators.

“I believe that the most important contribution we make to society as faculty members is the mentorship and guidance we provide to our students.”

Stereotypes persist of the lonely scientist toiling away in a lab, performing repetitive tasks and interacting only with pipettes and test tubes. It’s Chung’s goal to dispel such notions and help students through their initial hesitation and self-doubt. Research, she said, is connected with independent thinking, creativity, teamwork and, most importantly, discovery.



ROBERT BOSTON

## Redefining medical practice

Katherine Santosa admits she found the idea of research intimidating as a fledgling medical student. This all changed following a mentorship with Susan Mackinnon, MD, the Shoenberg Professor of Plastic and Reconstructive Surgery and chief of the Division of Plastic and Reconstructive Surgery.

“The decision to spend one year in the laboratory under Dr. Mackinnon has undoubtedly been one of the most important decisions I have made in my career,” Santosa said.

“Dr. Mackinnon is a brilliant surgeon-scientist who generated research questions directly based on the challenges she encountered in the clinic and operating room,” she added. “Then, she would take the data and translate the work from the laboratory back to her patients in the clinic. As a medical student, I witnessed the tremendous impact research could have on improving outcomes for surgical patients.”

Following a surgical residency at the University of Michigan, Santosa, MD, has returned to Washington University as a plastic surgery resident and research fellow under plastic surgeon Alison K. Snyder-Warwick, MD.

Now, Santosa has new aspirations: to care for patients with facial paralysis and complex peripheral nerve injuries, and to have a laboratory that will improve understanding of neural regeneration.

Through research, abstract concepts taught in the classroom become less elusive. Students gain an appreciation for the vigor of research — how to create hypotheses and test them and to meticulously record their work. Perhaps, most dauntingly, they learn about failure.

“In science, it’s a natural thing to encounter failure; it’s normal to encounter failure nine out of 10 times,” said Brian Kim, MD, assistant professor of medicine and dermatology. “For many students, especially students at great institutions like Washington University — to their credit — they haven’t often encountered failure. It’s something all scientists have to tackle. I feel, as a PI, like much more of a coach than a teacher.

“It’s about having the right mentality and viewing science not as a sprint, but understanding that it’s a marathon and that we have to continuously put in the work,” he added.

Santosa said research quickly taught her humility and resilience. “Designing experiments, getting presentations and publications accepted, and obtaining grants are all essential components of the process but they are exceedingly difficult to do,” she said. “While caring for patients certainly teaches you similar lessons, I think failure in research is more common than it is in the clinics, and the only way to succeed is to persevere.”

As part of the program, students must explain and defend their work in a poster presentation. This fall, the research office will sponsor its 11th annual WUSM Research Symposium and Poster Session on campus. The event draws many inquiring minds from the medical center community. Students also are encouraged to travel and present at professional meetings.

Piccirillo said he was overjoyed to see the expression of personal pride and satisfaction on the face of one of his mentees — who suffered from social anxiety — after delivering a flawless research presentation at a national meeting.

According to Kathryn Diemer, MD, assistant dean for career counseling and associate professor of medicine, such polished, prepared Washington University students fare well in the fiercely competitive national residency match, earning coveted training spots. All of this leads to a generation of more knowledgeable, well-rounded physicians.

As Chung says, “When given the tools, our students can fly.” □



David H. Perlmutter, MD, executive vice chancellor for medical affairs and dean of the School of Medicine, talks with graduate research assistant Dolonchampa Maji in the new 4515 McKinley Research Building.



TIM PARKER PHOTOS


# Personalizing medicine

**A leadership vision for advancing human health by leveraging core strengths at the School of Medicine.**

David H. Perlmutter, MD, is closing in on his first year as executive vice chancellor for medical affairs and dean of the School of Medicine.

Originally from New York, Perlmutter has moved to St. Louis three times — first as a medical student at Saint Louis University, then as a faculty member in pediatrics at Washington University, and now as dean. Most recently, he served as the Vira I. Heinz Endowed Chair of the Department of Pediatrics at the University of Pittsburgh and as physician-in-chief and scientific director of Children’s Hospital of Pittsburgh.

Personalized medicine is No. 1 on his priority list, and he believes the School of Medicine is positioned to be a leader in the field.



## Tell us about your medical education at Saint Louis University.

I didn't realize my own potential for a long time. I thought I wanted to go to medical school and got into Saint Louis University, off the wait list. I didn't unpack for six months because I didn't think I would make it. But by the time I graduated, I had become a very different person. At graduation, I received so many awards that my family just couldn't get over it; they thought I was a totally different human being.

Basically, what had happened — and I didn't fully realize this until years later — was that I had developed a love of medicine and of learning. It was in medical school, here in St. Louis, where I found that I could work with unbelievable capacity, discipline and focus and that I had an insatiable desire to learn more about physiology, biology and the medical profession overall.

## In 1983, you joined the Harvard Medical School faculty, but left for a position at Washington University. Why?

At Harvard, I was extremely fortunate to work in Dr. Harvey Colten's lab. He was a phenomenal scientist and mentor, and it was while working with him that I truly realized that biology was a key to understanding human diseases. When he took over as head of the Department of Pediatrics at Washington University in 1986, he asked me to come along. It might have seemed an odd decision — I didn't have grant funding, my wife and I had

## *There's an uncommon level of support at the university for physician-scientists.*

a baby and another on the way, and I didn't expect to go back to St. Louis — but I couldn't say no, especially after talking with the amazing people here. I met with Phil Needleman, Philip Stahl, Stuart Kornfeld, Jeff Gordon, Stan Korsmeyer and on and on. It was one giant after another — and it wasn't just this feeling of being surrounded by intellectual horsepower, there was a very evident feeling of nurturing and community. You come here and you become part of the community. When I set up my lab, I interacted with every single department and with investigators throughout the school. I became friends and colleagues with so many people who reached out to me. I loved it here.

## After 30 years in medicine — first here and later at the University of Pittsburgh — what prompted you to return as dean?

More than just one thing. St. Louis is a wonderful city and is dear to my family. One of the reasons I believe Washington University has such an incredibly successful medical school is because of the deep sense of community here. But also, there's an uncommon level of support at the university for physician-scientists, and that was a major draw for me. The Medical Scientist Training Program here is the best in the world, and the physician-scientists

are treasured in a way you don't see anywhere else. Also, becoming dean meant I could play a role in making the changes and innovations that are so important to health care and biomedicine, and where better to be at the forefront of what is needed than Washington University? There is so much going on here — in advancing science and curing diseases, in educating future doctors and scientists, and in providing excellent health care to people who need us. The commitment, energy and devotion you see here every day are incredible.

## Why are you focused on personalized medicine?

Medicine treats many people in the same way, even though they have known differences in the course of their diseases. The promise of personalized medicine is that we can become more sophisticated in our understanding of each disease, identify personal variations and tailor therapy to those variations in a way that is likely to be more effective. Many opportunities have arisen as genomic sequencing and editing have become more affordable, from developing new targets for drugs to speeding the diagnosis of life-threatening illnesses. Simply put, the long-term objective is to give the right treatment to the right patient with the aim of saving and improving lives.

## How is Washington University positioned to be a leader in personalized medicine?

There are so many strengths at the university in the area of personalized medicine. We have centers for achieving different kinds of genetic sequencing here: a center that can help researchers reproduce a disease in a cell line or a mouse; a center where scientists can make induced stem cells; drug-focused centers that will help investigators zero in on therapeutics — the list goes on. Each of these many centers and the magnificent scientists who work in them are keys to tackling disease. I believe we need to continue focusing on the many areas where the university is an established leader and to develop core facilities that can rapidly incorporate new technology. Right now, for example, we have researchers working on personalized vaccines to treat breast cancer and melanoma. I believe we are at a tipping point for understanding human disease and improving patient care. Washington University is so well-positioned to advance knowledge and improve health and well-being. It is our responsibility to embrace this opportunity for the benefit of society.

*The way I look at it, the biggest shot we have at reducing health-care costs is through our research.*



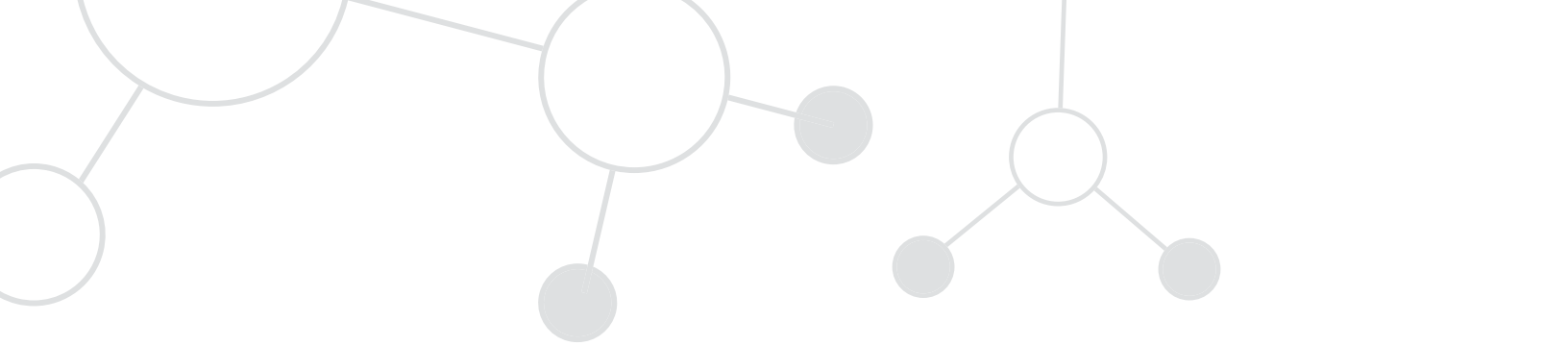
## How can personalized medicine improve the health-care system?

If we can realize at least some parts of the dream of personalized medicine, we will be treating people in a much different way than we treat them today. Personalized medicine would allow us to provide a particular therapy only to patients it would help, sparing others from unnecessary treatments and harsh side effects. Meanwhile, other patients would receive therapy specific to them. So if only 20 or 30 percent of patients

Dean Perlmutter with his wife, Barbara A. Cohan, MD, a professor in the Department of Pediatrics specializing in newborn medicine.

with, for example, breast cancer are receiving the most extensive and expensive therapy, that should reduce health-care costs and provide optimal care. The same approach could be applied to other diseases. And this is a great place to figure these things out because we have so much genomic expertise and tremendous investigators in cancer, immunology, the microbiome, Alzheimer's disease, age-dependent degenerative diseases and other major areas of emphasis.

The way I look at it, the biggest shot we have at improving medical care and reducing health-care costs is through our research. There are many incremental ways to reduce such costs through process and changing how we do things. But what will really transform health care will come from research, and, for me, personalized medicine will be key.



**What else would you like to see emphasized at the School of Medicine?**

I want to see discoveries benefit our patients sooner, and I believe this will require more attention to commercialization. The genomic revolution has positioned us to move this forward in a more timely way, and the university is working hard to facilitate entrepreneurship in a most conscientious way. This school has always been noted for its great collaborations, but I also want to explore potential industry partners for shared research programs.

Physician-scientist career development is also very important, particularly since the percentage of physicians nationally who are conducting research has been dropping in recent years. And another key emphasis for me will be diversity and inclusion throughout the Medical Campus, from students, to staff, to faculty.

*Nobody here is going to be satisfied doing the same thing tomorrow that he or she is doing today.*

We need to improve diversity in our workforce in particular and become more successful at developing the careers of minorities. It's so important to understand that we are richer as a whole with varying perspectives. Diversity and inclusion are imperative.

I also want to continue building on our excellent faculty practice and improving our ability to serve the community. It's an honor to provide exceptional health care to so many citizens throughout the St. Louis region and beyond. I've become very moved by how important our role is as a safety net.

**Now that you've been here nearly a year, what has surprised you most?**

I was surprised at some of the breathtaking science here. Even though I knew great things were going on at this school, I had no idea how extraordinary the breadth and the depth of the talent are and, likewise, how exciting the programs are. To a certain extent, it's daunting because I see myself as being responsible for that now. It's very humbling. But what's exhilarating is that nobody here is going to be satisfied doing the same thing tomorrow that he or she is doing today. Everybody here is interested, like I am, in pushing the envelope and being at the forefront of new discoveries that ultimately will benefit mankind. It's an amazing place to be, and I'm so excited and fortunate to be a part of it. ☐

*Interview conducted and compiled by writer Elizabeth Holland Durando.*



Tom Hornbein, MD '56, delivered the MD Commencement address May 20.



# Legend in climbing

Mountaineer-doctor shares wisdom gained from taking risks

**I**n 1963, Tom Hornbein and Willi Unsoeld, fellow American mountaineers, became the first climbers to summit the world’s highest peak — Mount Everest — via the dangerous West Ridge. Fifty years later, the climb is still hailed as one of the greatest achievements in mountaineering. Only 12 other climbers have ascended Everest by the West Ridge. Fourteen have died in the attempt. Hornbein, who was born in St. Louis and earned a medical degree from Washington University in 1956, addressed students at this year’s MD Commencement.

Mountains remain a powerful metaphor in Hornbein’s life; they are the foundation on which he has based most of his major decisions.

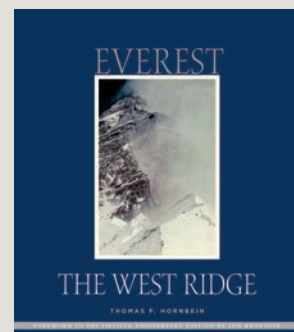
At age 13, Hornbein discovered the mountains during a summer camp in Colorado. He went on to major in pre-med at the University of Colorado and became involved in mountain rescue activities. After earning a medical degree back in St. Louis, Hornbein completed an anesthesiology residency at Barnes Hospital and a fellowship in the lab of pulmonary researcher Albert Roos (who died in 2007). Hornbein’s research focused on control of breathing by hypoxia, as at high altitude, and

**‘Accept risk, savor it as an essential seasoning to becoming a good doctor, a good parent, a good you.’ — Tom Hornbein, MD '56**

other physiological stimuli (CO<sub>2</sub>, pH) on peripheral and brainstem chemoreceptors.

Following the Everest climb, Hornbein joined the faculty at the University of Washington School of Medicine in Seattle and served as chair of the Department of Anesthesiology from 1978 to 1993. Now a professor emeritus, Hornbein and his wife, Kathy, live in Estes Park, Colorado. At 85, he still climbs the mountains around his home.

Hornbein advised students to view change and risk as essential ingredients for professional and personal growth. “As an anesthesiologist, most of the time I had great control,” Hornbein said. “Every now and then, things would bust loose. The ability to stand still, to think clearly in the middle of an emergency, to be a risk-accepter and not risk-averse is critical. ... I wish you all grand adventures seasoned with a decent dose of uncertainty,” he said.



Hornbein recounted his adventures in “Everest: The West Ridge.” A recently released 50th-anniversary edition includes photos by expedition members and a foreword by best-selling author Jon Krakauer.



# Harnessing immunity

**A \$10 million gift  
establishes Bursky  
Center for Human  
Immunology and  
Immunotherapy**

BY JULIA EVANGELOU STRAIT

**W**ashington University School of Medicine has received a \$10 million gift in support of the Andrew M. and Jane M. Bursky Center for Human Immunology and Immunotherapy Programs. Previously known as the Center for Human Immunology and Immunotherapy Programs (CHiIPs), the center is dedicated to understanding the immune system and its potential for treating cancer, fighting infection and providing novel treatments for autoimmune disorders and immune deficiencies.

The gift from Andrew M. and Jane M. Bursky also supports an endowed distinguished professorship for the center's director, Robert D. Schreiber, PhD, the inaugural Andrew M. and Jane M. Bursky Distinguished Professor.

**Michael S. Diamond, MD, PhD, Robert D. Schreiber, PhD, and Wayne M. Yokoyama, MD, lead a team of investigators working to develop immune-based therapeutics.**

“Andy and Jane’s generous gift will be used not only to support the innovative work of Dr. Robert Schreiber, but also to benefit the distinguished team of researchers and physicians who are members of the center,” said Chancellor Mark S. Wrighton. “These scientists are making incredible advances in the field of human immunology.”

Schreiber has led the center since its establishment in 2014 with a focus on nurturing the translation of basic discoveries in the lab into new therapies for patients. Long known for its role in fighting infectious disease, the immune system has more recently been implicated in cancer and for its overactive role in autoimmune conditions such as rheumatoid arthritis, type 1 diabetes and multiple sclerosis.

“With the strength of the immunotherapy programs at the School of Medicine combined with the sequencing power of the McDonnell Genome Institute, this new gift will help jumpstart major research initiatives in understanding and developing new immune-based therapeutics for a broad array of diseases,” Schreiber said.

## New therapeutic strategies

Schreiber is well-known for his research in tumor immunology and cell signaling. His work has been instrumental in helping distinguish the conflicting roles that the immune system can play in cancer, whether protective when preventing tumor growth or detrimental when unable to recognize and attack cancer cells. Fifteen years ago, Schreiber and his colleagues introduced the three-phase concept of cancer immunoediting. In the first phase, dubbed elimination, early cancer cells are destroyed by the immune system. Those cells that survive the initial onslaught then enter the second phase, termed equilibrium, characterized by a state of tumor dormancy. The final phase — escape — occurs when the surviving tumor cells, now adept at evading the immune system’s defenses, escape the dormant state and begin to grow. New cancer immune therapies may focus on priming and retraining the immune system to once again attack these evasive cancer cells.

Schreiber and collaborators at Washington University pioneered the use of genomics approaches to identify mutant proteins uniquely expressed in a patient’s tumor that can target the individual’s cancer cells for immune destruction. This approach has formed the basis for major ongoing translational programs at the School of Medicine and elsewhere to test the therapeutic efficacy of personalized vaccines in patients with cancers of the breast, brain, lung, pancreas, prostate, melanoma and certain forms

of lymphoma. Beyond cancer research, other leading center investigators are studying important and emerging infectious diseases and viruses, including Zika, Ebola, West Nile and Chikungunya.

The gift will enable an ongoing, coordinated effort to preserve blood and tissue from patients with various diseases that display immune system involvement. With patients’ permission, researchers will have access to blood and tissue samples before, during and after treatment to study a patient’s native immunity and how it might respond to various therapeutic strategies. Such a resource could help doctors understand the reasons a specific immune therapy is effective in some patients but not others.

“Jane and I are both honored and humbled that we have the opportunity to attach our names to the center, which we believe has enormous potential for scientific discovery and for improving the health, directly or indirectly, of the global community,” Andrew Bursky said. “The speed at which the center is translating ground-breaking discovery into new modalities of personalized treatment is incredibly exciting. We are very fortunate to be in a position to make a gift that can have a meaningful impact on the growth and impact of the center.”

## Alumni give back

Andrew Bursky is founder and chief executive officer of Atlas Holdings LLC, an industrial holding company based in Connecticut. Bursky also serves as chairman of the company, which employs more than 23,000 people worldwide and operates in a variety of industries, including aluminum, automotive, building materials, construction, distribution, energy, paper and packaging.

The Burskys have deep connections to Washington University, where Andrew earned bachelor’s and master’s degrees in economics and engineering and Jane earned a bachelor’s degree in French and education. Andrew Bursky serves as a university trustee and has received the School of Engineering’s Young Alumni and Alumni Achievement Awards and the School of Arts & Sciences Alumni Achievement Award. Together, they have provided scholarships for students, including establishing the Spirit of Washington University Scholarship.



**Andrew M. and Jane M. Bursky**



ROBERT BOSTON

As they transition to the next stage of their careers, graduating students reflect back on their medical journey.

# Almost Alumni

BY HILARY DAVIDSON

**Graduating students dispense friendly advice to entering medical classes**

**P**rior to Commencement, graduating students in medicine, occupational therapy (OT) and physical therapy (PT) took time out to reflect on their graduate education and write notes of friendly advice to incoming students.

Sponsored annually by the Office of Medical Alumni and Development, these “Almost Alumni” luncheon events give graduating students a chance to contemplate their new relationship with the medical school and dispense a little hard-won wisdom.

Entering medical and physical therapy students found the notecards tucked inside their new white coats, presented during the white coat ceremonies in August. Occupational therapy students will receive their hand-written messages in the fall.

Here, six students share their thoughts as they transition to the next stage of their careers.



### Lawrence Benjamin

MD 16

Benjamin is headed to Massachusetts General Hospital for an internal medicine residency. He advises new students to make time for friends and for themselves. "There will always be something you must study. However, you will not always have time to spend with friends. Prioritize your 'me time,' whether that is social or personal, and your four years will be so much more enjoyable."



### Tina Zhu

MD 16

Zhu is happy to be staying at Washington University for her internal medicine residency. "It's exhilarating, seeing the results of my hard work," she said. "I'm ready to move on to caring for my patients." Zhu illustrated her welcome message with playful drawings of physicians holding stethoscopes, and encouraged new students to "work hard and stay focused, but make time to have fun."



### Salma Hussain

OTD 16

Weeks before Commencement, Hussain could hardly believe that school was coming to an end. "I feel like the time went by very quickly," she said. Hussain, who soon would begin her occupational therapy fieldwork at the Kennedy Krieger Institute in Baltimore, welcomed new medical school students, wishing them luck and "a wonderful first year."



### Max Lustick

MSOT 16

Although excited to soon be doing fieldwork at a cancer rehabilitation institute in Salt Lake City, Lustick said he would miss friends, mentors and colleagues at Washington University. He advised: "Make as many connections as you can while you are here. You'll never be around so many amazing people."



### Amanda Smith

DPT 16

Smith is returning to her native Indiana as a pediatric physical therapist, and said she would miss all the friends she found in St. Louis. She described graduation as "surreal." "You make lifelong friends here, and you'll never all be in the same city again, so it's a good idea to spend time together and make some memories."



### Rachael Humber

DPT 16

Humber's next challenge: helping patients with movement impairment due to neurological events such as traumatic brain injury, spinal cord injury and stroke. "I get so excited seeing the recovery of patients. This is exactly what I wanted to do!" Humber told new students to take full advantage of the opportunities they have been given: "Enjoy your time here, study hard, and have a great experience!"

## 1940s

**Robert Gibb, MD 48**, received the Dr. J. Richard Czajkowski Service Award from Puget Sound Blood Center and is president of the Western Pathologists Quality Assurance Association.

## 1950s

**Lowell Gess, MD 51**, an ophthalmologist, recently returned from Sierra Leone, in West Africa, where he worked with Ebola responders and researchers on the virus's effects on eyesight. For 20 years, Gess and his family lived in Sierra Leone, opening an ophthalmology clinic, which is now known as the Lowell and Ruth Gess UMC Eye Hospital.

**Max Heeb, MD 53**, republished his autobiography "Max the Knife: The Life and Times of a Country Surgeon," with three additional chapters.

**Albert Diddams, MD 56**, has retired from the U.S. Army and medical practice. He enjoys gardening, golf and spending time with his family.

**Robert Froelich, MD 56**, built and solo-flew a Lancair IV 300 mph carbon fiber aircraft. He enjoys flying and being a member of the Experimental Aircraft Association, United Flying Octogenarians and Aircraft Owners & Pilots Association.

## 1960s

**Dale Heisinger, MD 66**, is chairman of the San Juan County (Washington) Board of Health. He is also a proud husband, father and grandfather.

**Emily Smith, MD 68**, stepped down at the end of the 2015-16 fiscal year after 21 years of dedicated service as the School of Medicine's Annual Fund volunteer chair.

## 1970s

**Laura Wexler, MD 71**, recently left her position as senior associate dean to concentrate on clinical care at the Cincinnati Veterans Affairs Medical Center and medical student teaching at the University of Cincinnati College of Medicine.

**Linda Hershey, MD 76**, has served as director of the dementia program at the University of Oklahoma Health Sciences Center since 2010. She planned to retire in June 2016.

## 1980s

**David "Dave" Baltzer, HA 81**, has been elected to a two-year term as president of the 963-member Missouri chapter of the American College of Healthcare Executives.

## 1990s

**Madeleine De Reding Kraus, MD 91**, moved to Orlando, Fla., to direct and expand the section of hematology and hematopathology at Nemours Children's Hospital.

**Maral Kibarian Skelsey, MD 91**, is president of the Washington, D.C., Dermatologic Society and enjoys volunteering on the board of The Washington Ballet.

## 2000s

**Kathryn Lindley, HS 11**, a cardiologist at Washington University, has a keen interest in heart disease in pregnant women. She joined the faculty in mid-2014 and is working to establish a Women's Heart Center, which, she envisions, will encompass services from before pregnancy to end of life.

## Alumni assume new posts

**H**usband and wife Kevin A. Roth, MD/PhD, HS '89, and Robinna G. Lorenz, MD/PhD '90, HS, have made numerous contributions to neuropathology, immunology and medical education. With new positions, Roth and Lorenz are broadening their spheres of influence. In late 2015, Roth was

named chair of the Department of Pathology and Cell Biology at Columbia University College of Physicians & Surgeons and pathologist-in-chief at New York-Presbyterian/Columbia University Medical Center. Before going to Columbia, Roth served as chair of the Department of Pathology at the University of Alabama at Birmingham (UAB) School of Medicine.

In early 2016, Lorenz was promoted to associate dean for physician scientist development at UAB School of Medicine, where she is also a professor of pathology and directs the UAB Medical Scientist Training Program and the Summer in Biomedical Sciences Undergraduate Research Program.



## IN MEMORY

### ALUMNI

#### Virgil R. Bleisch, MD 48

Virgil R. Bleisch, a retired pathologist in St. Louis, died Saturday, Feb. 13, 2016. He was 92. Bleisch is remembered as a physician, scholar, researcher, teacher, soldier, mentor, adventurer, naturalist, gardener, musician, conversationalist and world traveler. He is survived by his wife, Nadya; sister, Grace; children and their



## Tape named American College of Physicians Chair

**T**homas G. Tape, MD '81, FACP, has been named chair of the Board of

Regents of the American College of Physicians (ACP). With more than 143,000 internist members, the ACP is the largest medical specialty organization in the U.S. The Board of Regents serves as its main policy-making body and manages ACP business and affairs.

Tape also is division chief of general internal medicine, vice chair for clinical affairs in internal medicine and professor of internal medicine at the University

of Nebraska. His research focuses on health policy, physician judgment and decision making. As a member of a medical center task force, he provides health policy expertise to the Nebraska region.

Tape has served the ACP in many leadership capacities. His surveys of ACP physician members have been published in the *Annals of Internal Medicine* and the *American Journal of Respiratory and Critical Care Medicine*, and he co-edited the ACP book "Diagnostic Strategies for Common Medical Problems."

spouses William and Yunhua, Barbara and Dennis, Pamela and Timothy; grandchildren Ivan, Misha, Nicholas, Emily, Reva and AK; and nieces, nephews, great and great-great nieces and nephews and cousins.

### **Jeffrey Peter Cichon, MD 79**

Jeffrey Cichon, an orthopedic surgeon in Las Vegas, died Wednesday, March 30, after a hard-fought battle with pancreatic cancer. He was 62. Cichon graduated summa cum laude from Saint Louis University, completing a bachelor's degree in chemistry in just three years. He earned a medical degree from WUSM and later completed a residency at Los Angeles County+University of Southern California Medical Center. Cichon became an associate professor at the University of Nevada School of Medicine, as well as an adjunct professor at Touro University. He trained and mentored many students who remember his commitment to treating patients not just with expert care, but with respect and compassion. Cichon is survived by his wife of 35 years, Vicki Lynn; children Jamie, Danielle and Nickolas; siblings John Cichon and Janelyn Wise; and his mother, Helen Cichon.

### **John Harsch, MD 83, HS 86**

John Harsch, an internist in Henry County, Ga., died Wednesday, April 6, 2016, when he was struck by a car while cycling. He was 59. Harsch received bachelor's and master's degrees in physics from the University of North Carolina-Chapel Hill and a medical degree from WUSM. He went on to co-found Southeastern Primary Care Specialists. An avid soccer player, he transferred his passions to cycling and became an active member of Southern Crescent Cycling Club. Harsch is survived by his wife, Mary Carol; mother, Cecilia Jean; siblings, Donna Harsch and George Loewenstein, Dr. Alan and Wendy Harsch, Cecily and Paul Harsch-Kinnane, Douglas and Eden Harsch and Dr. Richard and Jennifer Harsch; and many nieces and nephews.

### **William Henry Martin, MD 58**

William Henry Martin, a retired physician in Red Bluff, Calif., died Tuesday, March 29, 2016. He grew up in hard times that included living in an orphanage for two years and developing an ear infection that resulted in hearing loss in one ear. Martin served in the military for four years after

high school and was recalled during the Korean War. He would go on to complete a bachelor's degree in three years from Arizona State University and a medical degree at WUSM. Martin was active at church and helped found the annual Kiwanis summer camp serving disadvantaged youth. He is survived by his wife of 61 years, JoAnne, along with their four children, Gary, Judy, Linda and Karen; 12 grandchildren; and brother David.

### **David Leon Rosenbaum, MD 60**

David Rosenbaum died Wednesday, Dec. 23, 2015. He is survived by his wife, Sandra, three children and six grandchildren.

### **Willard Daniel Rowland, MD 40**

Willard Rowland, a pioneer in Oregon plastic and reconstructive surgery, died Tuesday, March 29, 2016, at his home in Lake Oswego, Ore. He was 101. Rowland completed undergraduate and medical degrees at Washington University, became a fellow at the Mayo Clinic in Rochester, Minn., and then served in the burns and reconstructive surgery division of the U.S. Naval Hospital in Bethesda, Md., during World War II. After the war, he helped open the plastic surgery unit at the Ochsner Clinic in New Orleans, La., developing new emphases in children's reconstruction. Rowland moved to Portland, Ore., to establish one of the first plastic surgery practices in the Pacific Northwest, where his work focused increasingly on children with congenital deformities, burns and other traumas. Later, he opened a second practice at the Eisenhower Medical Center in Palm Springs, Calif. He was predeceased by his parents; brother, James; and wives, Mary and Elynda. He is survived by his children, Willard D. Rowland Jr. (Susan Tannenbaum), Martha S. Rowland (Neil Marquis), Charles Rowland (Cathy), Anthony T. Rowland (Dolores) and Thomas H. Rowland (Pat Harada); and 10 grandchildren and 10 great grandchildren.

### **Maxine Scheibe, NU 66**

Maxine Scheibe died Thursday, June 18, 2015. Beloved wife of Robert Scheibe, HS, MD 64, LA 60, and friend of and scholarship donor to Washington University School of Medicine.

#### **H. Richard Tyler, MD 51, HS**

H. Richard Tyler, a Harvard emeritus professor in neurology, died Sunday, May 8, 2016. He was 88. After graduating from Syracuse University in 1947, Tyler volunteered for the U.S. Army and served at the Los Alamos National Laboratory. He earned an MD from WUSM and completed a medical internship at the Peter Bent Brigham Hospital, now known as Brigham and Women's, and a neurology residency at Boston City Hospital. After completing neurology fellowships at the Neurological Institute at Queen Square in London, the Salpetriere in Paris, and Johns Hopkins in Baltimore, he returned to Boston to join the faculty at Harvard Medical School, where he became the first full-time neurologist at the Peter Bent Brigham Hospital and led the neurology division from 1956-1988. He was appointed professor of neurology at Harvard Medical School in 1974 and became emeritus in 1999. His renowned collection of rare medical books was donated to the American Academy of Neurology Book Collection at Washington University. The 7,000-volume collection includes many landmark books in neurology and neuroscience. He is survived by his wife of 64 years, Joyce; four children, Kenneth (Lisa), Karen, Douglas (Donna) and Lori Spisak (Ken); grandchildren Maxwell, Eric, Jason (Diane), Tanya (Matthew), Nathan (Katie), Elaine, Britta, Colby, Courtney, Hannah, Samantha, and Joe; eight great grandchildren and nephews.

## **F A C U L T Y**

#### **Hugh Chaplin Jr., MD**

Hugh Chaplin Jr., a hematologist, research scientist and professor of medicine, died Friday, April 29, 2016. He was 93. Chaplin graduated from Princeton University and the Columbia University College of Physicians and Surgeons. While in college and medical school, he served in the U.S. Navy during the final months of World War II. He performed his internal medicine residency at Massachusetts General Hospital and became chief resident. He entered an academic career through a research fellowship in the U.S. Public Health Service at the National Institutes of

Health (NIH) and pursued additional training at the Medical Research Council Blood Transfusion Research Unit in London. He joined the WUSM faculty in 1955 and held several leadership roles, including as associate dean, director of the Irene Walter Johnson Rehabilitation Institute and director of the Barnes Hospital Blood Bank. Chaplin authored more than 140 scientific articles and was recognized internationally for his work on sickle cell anemia, autoimmune hemolytic anemia, transfusion reactions and blood banking. In 2003, in honor of his longest-living sickle cell patient and research colleague, Chaplin self-published "Lenabell: A Doctor's Memoir of a Remarkable Woman's 80-Year Battle With Sickle Cell Disease." In his retirement, Chaplin worked extensively for BJC Hospice in St. Louis, both as a volunteer visitor with the dying and as the organization's pain management consultant. Chaplin is survived by his four children and their spouses, Kate and Roger Woodward, David and Jane Chaplin, Monique Chaplin and Mary McCartney, and John Chaplin and Jill Adams; and eight grandchildren and three great grandchildren. Chaplin was preceded in death by two beloved spouses, Alice Dougherty Chaplin, after 52 years of marriage, and Lee Nelken Robins, PhD, with whom he enjoyed 11 years of marriage.

#### **Mokhtar H. Gado, MD**

Mokhtar H. Gado, for decades a leading researcher at Mallinckrodt Institute of Radiology (MIR) at WUSM, died Thursday, April 28, 2016. He was 84. Gado, a professor emeritus of radiology, was noted for his work with neurological diseases and conducted extensive research involving magnetic resonance imaging (MRI) of the brain and spine. He was recognized for his work regarding the radiological manifestations of Alzheimer's disease and brain changes in the elderly, and in the correlation of physical principles of magnetic resonance to the pathologic changes in the disease processes of the central nervous system. Over the years, Gado trained many of the nation's top neuroradiologists. Gado was born in Monoufiah, Egypt. He earned bachelor's and medi-

cal degrees from Cairo University and completed internships and residencies at Cairo University Hospital, Addenbrooke's Hospital in Cambridge, England, and what was then the National Hospital for Nervous Diseases, in Queen Square, London. He is survived by his longtime wife, Sonja Gado; children, Karim, Yasmine, Soraya and Ameer; brother, Kamel Hishmat Gado; and two grandchildren.

#### **Morvarid Karimi, MD**

Morvarid Karimi, a tenacious researcher, committed teacher and compassionate clinician in the Department of Neurology, died Saturday, May 21, 2016, of a brain hemorrhage. She was 44. An assistant professor in the department's Movement Disorders Section, Karimi also had a joint appointment at Mallinckrodt Institute of Radiology. As a physician, she specialized in movement disorders, including dystonia and Parkinson's and Huntington's diseases, among other conditions, and conducted research in Mallinckrodt's Neuroimaging Laboratories. In the lab, Karimi's most recent research focused on dystonia and neuroimaging of dopamine pathways in the brain. Karimi also was respected for her attention to women's rights, especially in the workplace. Born in Tehran, Iran, Karimi earned a medical degree in 1999 from the University of Münster in Germany. She moved to the U.S., where she worked for a year at the Marshfield Clinic in Marshfield, Wis. Karimi completed a neurology residency through the University of Iowa in Iowa City, and landed at WUSM for a three-year movement disorders fellowship. In 2007, she became an instructor of neurology and, in 2010, an assistant professor of neurology. Karimi is survived by her husband, Eric Johnson, MD, a hospitalist at Barnes-Jewish Hospital; son, Kian; daughter, Suri; parents, Ebrahim Karimi and Shahla Shahrokh; and brother, Ali Karimi.

#### **Marvin E. Levin, MD 51**

Marvin Levin, a renowned endocrinologist and teacher for many years at WUSM, died Saturday, April 30, 2016. He was 91. Levin, a professor emeritus of clinical medicine, was an advocate for patients with diabetes. He specialized in the treatment of the



diabetic foot and helped start WUSM's foot clinic. His goal was the prevention of lower leg and foot amputations in people with diabetes. He co-edited "The Diabetic Foot," currently titled "Levin and O'Neal's: The Diabetic Foot," with Lawrence O'Neal, MD. The classic textbook has been published in several languages. Levin became professor emeritus in 1995, but continued serving the university through teaching and committee service. He earned bachelor's and medical degrees from Washington University. Levin then completed a residency in medicine at Barnes Hospital and an endocrinology and metabolism fellowship at WUSM before joining the clinical faculty in 1955. He is survived by his wife of 40 years, Barbara; children, Lynn, Judy and Michael; and three grandchildren. His former wife, Gloria, is deceased.

#### **Philip W. Majerus, MD 61**

Philip W. Majerus, a renowned hematologist and professor emeritus of medicine at WUSM, died Wednesday, June 8, 2016. He was 79. Majerus is best known for research showing that low-dose aspirin prevents blood clots, reducing risk of heart attack and stroke. The discovery is credited with saving thousands of lives each year. Over a career spanning more than four decades, Majerus led research that describes the way blood clots. His work studying aspirin demonstrated that platelets play an active role in clotting, overturning the long-held idea that platelets were simply passive components of blood clots. The work on clotting led Majerus down additional pathways, resulting in an extensive body of work understanding the inositol system, which is involved in blood clotting but also has far-reaching roles in many other cellular functions. Majerus joined the WUSM faculty in 1966 as an assistant professor of biochemistry and of medicine. He became a professor of medicine in 1971 and a professor of biochemistry in 1976 and served on the medical school faculty until 2014, when he was named a professor emeritus of medicine. He earned a bachelor's degree in science in 1958 from Notre Dame University and his medical degree in 1961 from Washington

University. He completed his internship and residency at Massachusetts General Hospital and then served as a research associate at what was then the National Heart Institute. Majerus was a member of the National Academy of Sciences, the Institute of Medicine, the American Academy of Arts and Sciences and the American Society for Clinical Investigation. He is survived by his wife, Elaine Majerus, MD, PhD, an associate professor of medicine at WUSM; sisters Diane (Brick) Brewer and Kathy (Roby) Burke; daughters, Suzanne (Rodney) Thompson, Julie Del Valle and Karen Majerus; son, David (Cecily) Majerus; and four grandchildren.

#### **Benjamin "Bud" Milder, MD 29**

Benjamin Milder, a former faculty member in ophthalmology, died Monday, May 16, 2016. Milder attended Washington University as an undergraduate and entered WUSM at age 19. He did an ophthalmology residency at the University of Chicago's Billings Hospital, and worked at Hines VA Hospital during World War II as a major in the Army Medical Corps. After the war, Milder joined the ophthalmology faculty at WUSM and entered a private practice. He authored or co-authored numerous articles and medical texts, including the award-winning "The Fine Art of Prescribing Glasses Without Making a Spectacle of Yourself." Milder was a frequent lecturer at medical conferences around the globe. He is survived by his wife, Jeanne Schieber; children, Michael (Sarajane) Milder, MD 70, Barry (Shelly Tobin) Milder, MD 73, Morton Milder, and Rabbi Laurence (Janet Elis) Milder; grandchildren, Jonathan (Marlene), Daniel, Kelly (Chad) Baldwin, Rabbi Rebecca (Ethan Bueno de Mesquita), Rachel (Adam) Lubchansky, Jacob (Julie, LA 03) Milder, LA 03, Miriam, Avi, and Alex; and 10 great grandchildren.

#### **Robert Charles Strunk, MD**

Robert Strunk, a beloved and acclaimed pediatric allergist at WUSM, died Thursday, April 28, 2016. He was 73. For almost three decades, Strunk, the Donald B. Strominger Professor of Pediatrics, worked in his lab, developing a productive clinical and research program for

childhood asthma that significantly enhanced the understanding of the natural history of the disease and what triggers it. During those years, Strunk treated patients at St. Louis Children's Hospital, where he was the inaugural director of the Division of Pediatric Allergy and Pulmonary Medicine. His research findings reflect the association between emotional well-being and chronic asthma. Additionally, Strunk's research focused on a long-term interest in fatal asthma, including the disease's role in children with sickle cell disease. For decades, Strunk followed children with asthma into adulthood as part of the Childhood Asthma Management Program, for which he was a director. Strunk also had active roles within the Pediatric Asthma Clinical Research Network and the Childhood Asthma Research and Education Network. Strunk earned a bachelor's degree in chemistry, a medical degree and a master's in biochemistry, all from Northwestern University. He completed a pediatric internship and residency at Cincinnati Children's Hospital and then was drafted into the military. During the Vietnam War, he was a pediatrician at a naval hospital in Newport, R.I. Afterward, Strunk concurrently completed two fellowships in 1974, at Harvard Medical School and Boston Children's Hospital. Besides clinical research and treating patients, Strunk proved pivotal in enlisting the National Institutes of Health (NIH) to support several national pediatric asthma initiatives. Improving the health of asthmatic children in economically disadvantaged neighborhoods was deeply important to him. Strunk was instrumental in establishing the Healthy Kids Express, a fully equipped and staffed mobile clinic that provides asthma care for children in underserved communities in Missouri. He is survived by his wife of 18 years, Juanita Strunk; two children, Chris Strunk and Alix Strunk; two stepchildren, Rick Macivor and Ellen Royal; and nine grandchildren.

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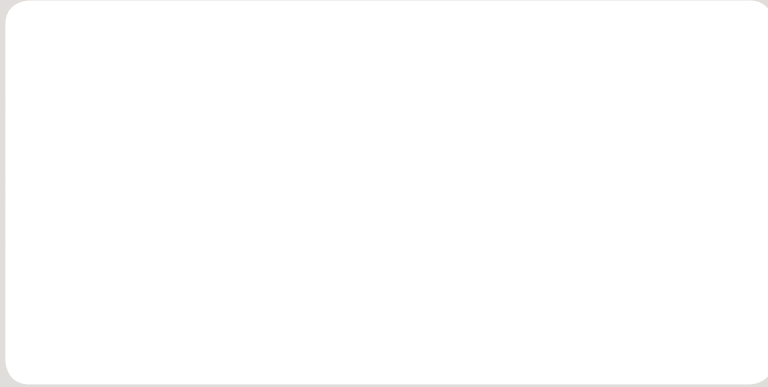
The Campaign for Washington University





## Key moment

John Harley, MD '66, vividly recalls the “topping out” of the Gateway Arch on Oct. 28, 1965. Harley, then a fourth-year medical student, had heard that the 10-ton keystone — the final piece of the Arch — would be hoisted into place that day. He and several classmates looked for a high place on campus to watch the action. Queeny Tower was under construction, and the young men found an unattended service elevator. “We got out on the roof,” Harley said. “We could see the Arch with two giant cranes next to it. The cranes came in and put in the last piece.” Harley graduated in 1966, and chose radiology as his specialty. He settled down in the Pacific Northwest, but he never forgot that moment. “We knew that we were witnessing a piece of history,” he said. Harley returned to the School of Medicine this May to celebrate his 50th Reunion. While here, he visited the Arch, which turned 50 in October 2015.



## Alumni advice

This past spring, soon-to-be graduates took time to reflect and write some notes of friendly advice. Entering students found the notecards tucked inside the pockets of their new white coats, which they received during the White Coat ceremonies in August. See story, page 34.

