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# Outlook

OUTLOOK.WUSTL.EDU

WINTER 2012



Washington  
University in St. Louis  
SCHOOL OF MEDICINE



## LEADING *Together*

How the Campaign for Washington University  
will advance human health



## Proliferation

The new Center for Global Health and Infectious Disease at Washington University serves as a hub for numerous initiatives. For example, because urinary tract infections cause significant suffering and medical care costs worldwide, researchers are working to better understand, treat and prevent their recurrence. This image shows the colorfully stained tissue of an infected bladder and its dark interior cavity, called the lumen. The bladder lining, light blue, is expelling *E. coli* bacteria, green, into the lumen. Proliferating cell nuclei, red, reveal the organ's attempt to restore a protective barrier.

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### Outlook Winter 2012

Published by Washington University School of Medicine  
Office of Medical Public Affairs, Campus Box 8508,  
4444 Forest Park Ave., St. Louis, MO 63108 © 2012

EDITOR **HOLLY EDMISTON** ART DIRECTOR **ERIC YOUNG**

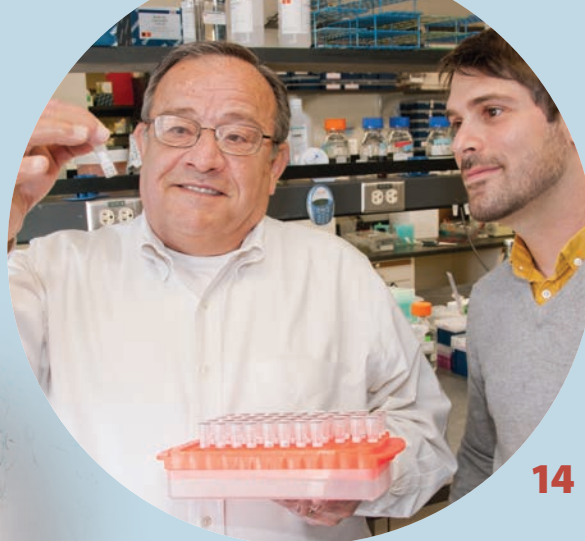
PHOTOGRAPHER **ROBERT BOSTON** CIRCULATION **KATHI LAW**

phone: (314) 286-0100 fax: (314) 286-0101  
email: [hollyedmiston@wustl.edu](mailto:hollyedmiston@wustl.edu)

# Outlook

Washington University School of Medicine

OUTLOOK.WUSTL.EDU WINTER 2012



**14** Heroin research

## Medical Centerpiece

**8** The Ellen S. Clark Hope Plaza at the heart of the Washington University Medical Campus offers a respite for all who visit.

## Switched to Heroin

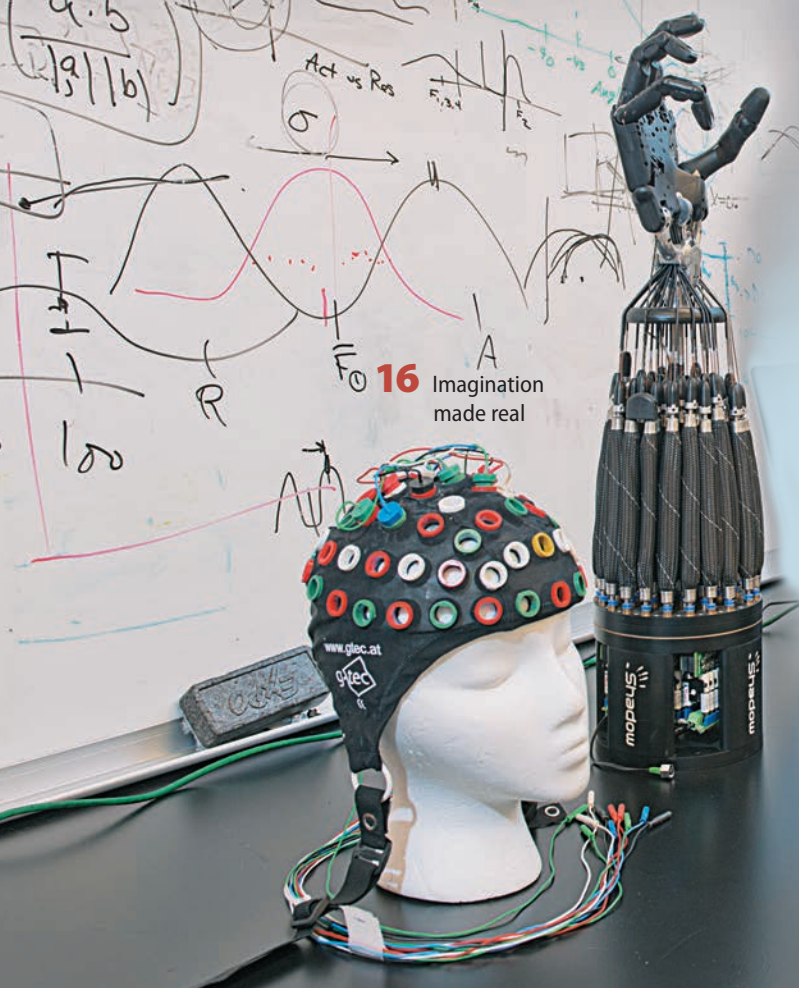
**14** Not only has heroin changed, in strength and purity, over the years — so has the demographic of the people who use it.

## Promise the Future

**16** Researchers expand the boundaries of science in an effort to improve human health through technological innovation.

## Pitch Perfect

**21** Innovators from diverse backgrounds come together to share ideas and boost the university's spirit of entrepreneurship.



**16** Imagination made real

**COVER** *Leading Together* — The Campaign for Washington University is a united effort by the university community to provide a strong foundation for the future. To learn more about how the School of Medicine plans to meet the challenges of medicine in the 21st century, please turn to page 24.

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**24** Campaign priorities



# Genetic portraits

A global search for the underlying roots of disease

**B**y decoding the genomes of more than 1,000 people whose homelands stretch from Africa and Asia to Europe and the Americas, scientists have compiled the largest and most detailed catalog yet of human genetic variation.

The 1000 Genomes Project involved some 200 scientists at Washington University School of Medicine and other institutions. Results detailing DNA variations of individuals from 14 ethnic groups were published Oct. 31 in the journal *Nature*. Eventually, the initiative will involve 2,500 individuals from 26 populations.

"With this resource, researchers have a road map to search for the genetic origins of diseases in populations around the globe," says one of the study's co-principal investigators, Elaine R. Mardis, PhD, co-director of The Genome Institute at Washington University. "We estimate that each person carries up to several hundred rare DNA variants that could potentially contribute to disease."

During the pilot phase of the effort, the researchers found that most rare variants differed from one population to another, and that they developed recently in human evolutionary history, after populations in Europe, Africa, Asia and the Americas diverged from a single group. The current study bears this out.

"This information is crucial and will improve our interpretation of individual genomes," says another of the study's co-principal investigators, Richard K. Wilson, PhD, director of The Genome Institute and a pioneer in cancer genome sequencing.

**New data may explain an individual's susceptibility to disease, response to drugs or reactions to environmental factors.**

At the genetic level, any two people are more than 99 percent alike. But rare variants — those that occur with a frequency of 1 percent or less in a population — are thought to contribute to rare diseases as well as common conditions like cancer and heart disease.

All study participants submitted anonymous DNA samples and agreed to have their genetic data included in an online database. The researchers first sequenced the entire genome — all the DNA — of each individual. To find the rare variants, they sequenced the small portion of the genome that contains genes — about 80 times for each participant to ensure accuracy — and they looked closely for single letter changes in the DNA sequence called SNPs (single-nucleotide polymorphisms).

The researchers discovered 38 million SNPs and numerous structural variations, both of which can help explain an individual's susceptibility to disease, response to drugs or reaction to environmental factors.

"This tremendous resource builds on the knowledge of the Human Genome Project," says co-author George M. Weinstock, PhD, associate director of The Genome Institute. "Scientists and, ultimately, patients worldwide will benefit from the extensive effort to understand the shared features and geographic diversity of the human genome."

# Translational research moves findings to medical practice

## Grant to speed discoveries for patients

Washington University School of Medicine has received a \$50 million grant to help speed the translation of scientific discoveries into improvements in human health.

The grant, from the National Institutes of Health (NIH), supports the school's Institute of Clinical and Translational Sciences (ICTS), one of 60 such centers in the United States.

"We're working to advance clinical and translational research throughout the university," says ICTS director Bradley A. Evanoff, MD, assistant dean for clinical and translational research. "The ICTS is not built around one specific disease or clinical specialty. We are charged with speeding the application of research findings in prevention, diagnosis and treatment across a wide spectrum of health conditions and research disciplines."

The grant is a renewal of a Clinical and Translational Science Award (CTSA), funded through the new National Center for Advancing Translational Sciences (NCATS),

The Institute of Clinical and Translational Sciences serves as a bridge between basic and clinical science.

which is a part of the NIH.

Evanoff says the ICTS will support Washington University's strengths and, in doing so, help pursue the goals of the BioMed 21 initiative to encourage cross-

disciplinary and translational research. Over the next five years, the ICTS will increasingly focus on promoting three areas: translating research in genetics and genomics into patient care, developing and evaluating new therapeutics, and improving ways to disseminate and implement research findings so they become part of regular medical practice.

Other major goals of the ICTS include providing financial support and training for new investigators in clinical and translational research, building new research support infrastructure, encouraging collaborations among faculty across disciplines, and creating pathways for investigators to find and utilize existing research resources.

Evanoff also emphasizes that the ICTS is a regional consortium that includes important partnerships with BJC HealthCare, Barnes-Jewish Hospital, St. Louis Children's Hospital, Saint Louis University, the St. Louis College of Pharmacy, the Goldfarb School of Nursing, and the nursing schools at the University of Missouri-St. Louis and Southern Illinois University-Edwardsville.

"Together with our regional and national partners, our mission is to connect research findings to their eventual application in improving the health of the public," Evanoff says. "That's the exciting part of translational research."



ROBERT BOSTON

**Listen, talk, read** Andrea Martin, a teacher at CID—Central Institute for the Deaf, works with children who are deaf or hard of hearing to help them “listen, talk, read and succeed.” CID partners with the School of Medicine’s Program in Audiology and Communication Sciences (PACS) as a training site for its graduate education programs, which include a Doctor of Audiology (AuD), a Master of Science in Deaf Education (MSDE), and a Doctor of Philosophy (PhD), as well as the new minor in Speech and Hearing Sciences for undergraduates. PACS is part of a consortium of programs known as CID at Washington University School of Medicine, which also includes hearing research programs and adult audiology clinics.

## Fraser heads Department of Medicine

Victoria J. Fraser, MD, has been named head of the school's Department of Medicine. With more than 400 faculty members, the department is the largest of the School of Medicine's departments. It receives more grant funding than any other research enterprise at the school and is the largest clinical service at Barnes-Jewish Hospital.

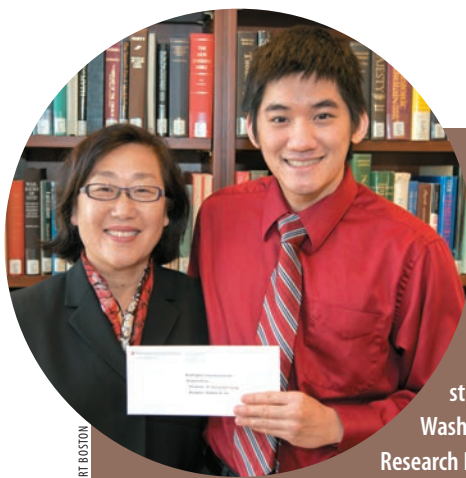
Fraser, the Adolphus Busch Professor of Medicine and co-director of the Division of Infectious Diseases, had been interim head of the department since August 2010.

"I am honored to get the opportunity to serve in the same position as some of the key physician-scientists who built the School of Medicine into a world leader in research and clinical services," Fraser says. "I look forward to the challenge of maintaining the department's excellence and building upon that foundation as we face future challenges."

Fraser also is co-principal investigator of the Washington University Institute of Clinical and Translational Sciences and is principal investigator of the research, education, training and clinical development arm. She also serves as physician-in-chief at Barnes-Jewish Hospital.



Victoria J. Fraser, MD



ROBERT BOSTON

### With honors

Second-year medical student Stephen W. Chi, shown here with Koong-Nah Chung, PhD, associate dean for medical student research, received the Washington University Summer Research Prize at the annual student awards luncheon held in November. Chi, under the guidance of David C. Beebe, PhD, is studying the proliferation of corneal epithelial stem cells, which has implications in corneal repair and transplants. Second-year medical student Nicholas S. Yozamp, working with Steven L. Brody, MD, also won a summer research prize.

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## Physical therapy grant funds training

The Program in Physical Therapy at Washington University School of Medicine has received a five-year, \$4.6 million grant to continue an interdisciplinary training program for occupational and physical therapists that began in 2007.

Michael J. Mueller, PhD, professor of physical therapy, is principal investigator of the Washington University-based multicenter grant, called the Comprehensive Opportunities for Rehabilitation Research Training (CORRT).

Supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health (NIH), CORRT helps new physical and occupational therapists acquire the necessary

The renewed grant helps new physical and occupational therapists acquire the necessary skills to become independent researchers.

skills to become independent researchers. Successful applicants train with at least two senior mentors: a physical or occupational therapist and another researcher from a different discipline. Twenty Washington University faculty from diverse areas are available to serve

as mentors along with more than 40 other researchers from partner sites across the country.

"We're very excited about the program's progress," says Mueller. "So far, six of the 17 scholars have earned individual NIH grants. We look forward to our scholars' continued success with the ultimate goal of helping them launch research that will improve the lives of people with disabilities."

The new funding allows the program to develop a communication network, headed by M. Carolyn Baum, PhD, director of the Program in Occupational Therapy, and add three new training sites: Boston University, Colorado State University and the University of Colorado, Denver. Current sites include Emory University, Johns Hopkins School of Medicine, University of Delaware, University of Iowa and the University of Pittsburgh.

## Two faculty members elected to NAS' Institute of Medicine

### Medical science contributions honored

Wayne M. Yokoyama, MD, and Charles F. Zorumski, MD, have been elected to the Institute of Medicine, a part of the National Academy of Sciences. The two were among 70 members so honored based on their contributions to advancing public health, health care and medical science.

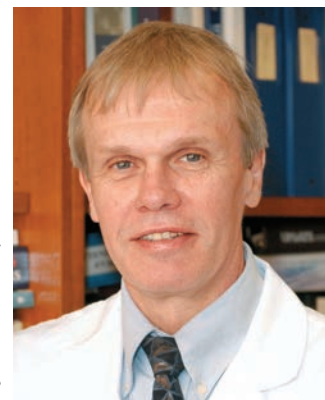
Yokoyama is the Sam J. Levin and Audrey Loew Levin Professor of Research in Arthritis and professor of medicine and of pathology and immunology. In 2007, he became director of the Medical Scientist Training Program at Washington University.

Also an investigator of the Howard Hughes Medical Institute and a rheumatologist at Barnes-Jewish Hospital, Yokoyama is known internationally for his research on the immune system, especially into the workings of natural killer (NK) cells. NK cells monitor the "credentials" of cells in the body, targeting for elimination those that lack the proper identification, such as tumor cells and those infected with viruses.



Wayne M. Yokoyama, MD

Zorumski is the Samuel B. Guze Professor of Psychiatry and Neurobiology and head of the Department of Psychiatry. He also serves as psychiatrist-in-chief at Barnes-Jewish Hospital and director of the McDonnell Center for Cellular and Molecular Neurobiology. His work focuses on neuron communication in the brain, especially in the hippocampus, and on understanding how neurotransmitters and neuro-modulators facilitate learning and memory.



Charles F. Zorumski, MD

His work studying anesthetic drugs led to the recent formation of the Taylor Family Institute for Innovative Psychiatric Research. Under Zorumski's leadership, the goal of the institute is to understand the roles of natural and synthetic neurosteroid molecules in psychiatric illnesses like depression and schizophrenia, and to identify neurosteroid targets that could lead to new therapies.



ROBERT BOSTON



**The best start** A study led by Roberta G. Pineda, PhD, research assistant professor of occupational therapy and of pediatrics, far left, has documented developmental differences between premature babies in the NICU and full-term babies. Pineda's work with premature babies, observed by students from the school's Program in Occupational Therapy, points to intervention in the NICU to improve preemies' long-term outcomes. Terrie E. Inder, MD, professor of pediatrics, is the principal investigator for the study, which is funded by the National Institutes of Health (NIH).

NIH R01 HD 057098, NIH/NICHD P30 HD062171

## PEDIATRICS

# Do asthma steroids measure up?

**C**hildren who use inhaled steroids for asthma end up slightly shorter at their full adult height than children who don't use the drugs, new results from a comprehensive asthma study show.

The findings were published online on Sept. 3, 2012, in the *New England Journal of Medicine*. The study's senior author is Robert C. Strunk, MD, the Donald Strominger Professor of Pediatrics.

The study involved more than 1,000 children ages five to 12 who were treated for mild to moderate asthma as part of the Childhood Asthma Management Program (CAMP) clinical trial. The children received treatment for more than four years at eight centers, including Washington University School of Medicine.

Study participants were divided into three groups: one received twice-daily budesonide, an inhaled corticosteroid medication; a second group received nedocromil, an inhaled non-steroid medication; and a third group received a placebo. All children received

albuterol, a fast-acting drug for relief of acute asthma symptoms, and oral corticosteroids as needed for asthma symptoms.

The researchers followed 943 participants at regular intervals until they reached adult height (females, age 18; males, age 20). The mean adult height was about one-half inch, or 1.2 centimeters, shorter in the group that received budesonide than in the patients who received nedocromil or a placebo. The patients who experienced the slower growth were primarily between five to 11 years old when they began using budesonide.

The slower growth took place only in the first two years of the four-year study. As the study progressed, the children who took the budesonide remained one-half inch shorter through adulthood than those who did not.

"This was surprising because in previous studies, we found that the slower growth was temporary, not affecting adult height," says Strunk, who treats children with asthma at St. Louis Children's Hospital. "But none of those studies followed patients from the



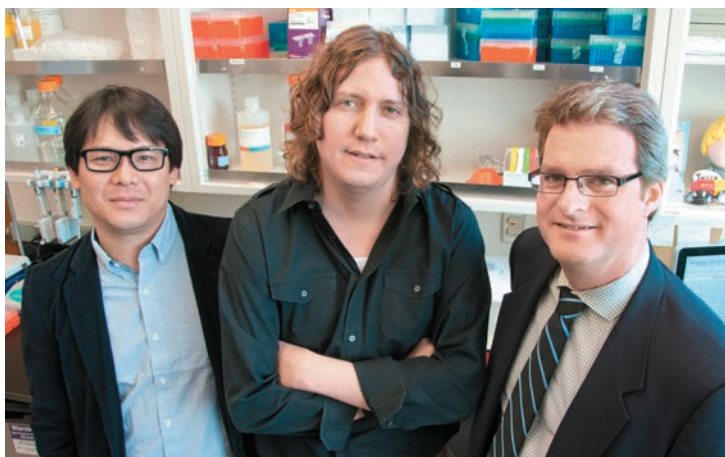
Pediatric asthma specialists at St. Louis Children's Hospital keep a close watch on the growth of their patients.

time they entered the study until they had reached adult height."

Strunk, the CAMP study chair, says researchers considered other factors that also might have contributed to the slower growth rate, but found these to have no impact.

"If a child is not growing as they should, we may reduce their steroid dose," he says. "But that half-inch of lowered adult height must be balanced against the well-established benefit of inhaled corticosteroids in controlling persistent asthma."

NIH/NHLBI/GCRC MDI-HR-10044, ET AL



ROBERT BOSTON

**Visionary research** Andrew Yoo, PhD, Robert W. Gereau IV, PhD, and Michael R. Bruchas, PhD, have been awarded grants from the National Institutes of Health (NIH) Common Fund to pursue innovative ideas that have the potential to transform science and improve public health. The awards are part of a High Risk-High Reward program that provides opportunities for innovative investigators in any area of health research to take risks when the potential impact in biomedical and behavioral science is high. To learn more about their individual research, visit [outlook.wustl.edu](http://outlook.wustl.edu).

## NFL funds brain concussion study

Neurologists at the School of Medicine have received funding to study the brain following repeat concussions. The project is one of 15 nationally selected by NFL Charities, the charitable foundation of the National Football League Owners.

“We are excited about investigating what happens to the brain’s wiring system following concussions,” says David L. Brody, MD, PhD, associate professor of neurology. “We’re honored that the NFL has given us the opportunity to contribute to a greater understanding of the aftereffects of repetitive concussive brain injuries. We hope that this will lead to better ways to prevent and treat them.”

The NFL-funded project will use a type of magnetic resonance imaging (MRI) to measure damage in the brain’s white matter after repetitive concussive brain injury. The white matter consists primarily of long nerve cell extensions called axons that serve as the brain’s wiring system.

Last year, Brody’s group published a paper in the *New England Journal of Medicine* describing how they used the same MRI method to analyze the wiring in the brains of U.S. military personnel who had suffered blast-related injuries.

“There are a number of differences between blast-related injuries and repetitive sports-related concussions,” Brody says. “So it will be critical to validate the MRI method in a model of repetitive concussion to help us understand the meaning of any findings we may observe.”



## New center to study bleeding disorders and clot formation

### Research, core resources to benefit

Researchers at Washington University School of Medicine have received a \$9 million grant to investigate blood-clotting disorders. From heart attacks and strokes to uncontrolled bleeding, clotting disorders cause more deaths each year in the United States than all types of cancer combined.

“Blood clots in veins and arteries remain one of the great killers,” says principal investigator J. Evan Sadler, MD, PhD, professor of medicine and chief of the Division of Hematology. “The goal of this grant is to shorten the time between a new discovery in blood clotting or bleeding disorders and the application of that knowledge to help patients.”

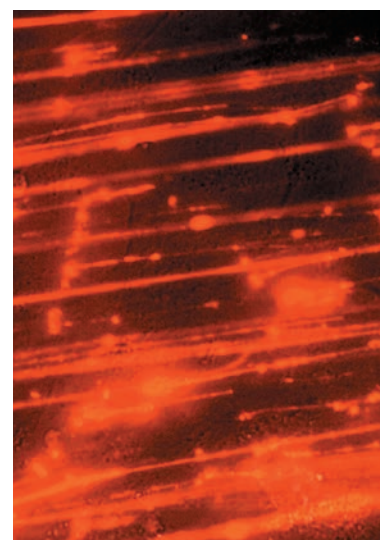
Washington University is one of only five universities across the country receiving funding from the National Heart, Lung, and Blood Institute (NHLBI) to support a new Translational Research Center in Thrombotic and Hemostatic Disorders.

At Washington University, researchers are focusing on five projects that look at bleeding disorders, including some that are rare, and clot formation in both large and small blood vessels. Sadler emphasizes the value of studying uncommon bleeding disorders.

“Many discoveries in this field have been made by the careful investigation of unique patients with inherited disorders that are quite rare,” Sadler says. “But the knowledge gained from studying those patients has provided a foothold into understanding thrombosis or bleeding in humans generally.”

The five initial projects will be led by Sadler, John P. Atkinson, MD, the Samuel Grant Professor of Medicine, Enrico Di Cera, MD, professor and chairman of biochemistry at Saint Louis University, George J. Broze, MD, professor of medicine, and Samuel A. Wickline, MD, professor of medicine.

The grant also supports several core resources, such as a tissue banking core, and an educational component.



BLOOM

Strands of a protein called von Willebrand Factor (orange) play a key role in blood clotting. Secreted by cells lining the blood vessels, the strands capture platelets and initiate the formation of blood clots.



ROBERT BOSTON

**Posted!** Attendance was high at the seventh annual Research Training Symposium and Poster Session held at the School of Medicine's Farrell Learning and Teaching Center in October. The event, which showcases basic, clinical and translational projects by junior faculty, fellows, residents and training program students, also featured keynote speaker Curtis L. Lowery Jr., MD, director of Maternal Fetal Medicine and chair and director of the Department of Obstetrics and Gynecology at the University of Arkansas for Medical Sciences. The symposium is sponsored by the Clinical Research Training Center of the Institute of Clinical and Translational Sciences and the Office of Medical Student Research.

## ONCOLOGY AND GENETICS

# Big impacts on smokers' genes

**L**ung cancer patients with a history of smoking have 10 times more genetic mutations in their tumors than those with the disease who have never smoked, according to a new study from Washington University School of Medicine.

"None of us were surprised that the genomes of smokers had more mutations than the genomes of never-smokers with lung cancer," says senior author Richard K. Wilson, PhD, director of the university's Genome Institute. "But it was surprising to see 10-fold more mutations. It does reinforce the old message — don't smoke."

The study appeared online Sept. 13 in the journal *Cell*.

Overall, the analysis identified about 3,700 mutations across all 17 patients with non-small cell lung cancer. Twelve patients had a history of smoking and five did not. In each patient who never smoked, the researchers found at least one mutated gene that can be targeted with drugs currently on the market for other diseases or

available through clinical trials. Across all patients, they identified 54 mutated genes already associated with existing drugs.

"Whether these drugs will actually work in patients with these DNA alterations still needs to be studied," says first author Ramaswamy Govindan, MD, an oncologist at the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. "But papers like this open up the landscape to understand what's happening. Now we need to drill deeper to understand how these mutations cause and promote cancer, and how they can be targeted for therapy."

Lung cancer is divided into two types — small cell and non-small cell, the latter accounting for about 85 percent of all cases. Within non-small cell lung cancer are three further classifications. This current analysis included two: sixteen patients had adenocarcinoma; one had large-cell carcinoma.

Govindan and Wilson also were involved in a larger genomic study of 178 patients



Compared to other lung cancer patients, smokers have 10 times more genetic damage in their tumors.

with the third type, squamous cell carcinoma, recently reported in *Nature*. That study was part of The Cancer Genome Atlas project, a national effort to describe the genetics of common cancers. According to Govindan, research is moving toward clinical trials that will focus on the specific molecular biology of a patient's cancer.

Based on this emerging body of genetic research demonstrating common mutations across disparate cancer types, Wilson speculates that the field may reach a point where doctors can label and treat a tumor based on the genes that are mutated rather than the affected organ.

PURPLE CONEFLOWER

YELLOW FOX SEDGE

YELLOW WINGSTEM

CREEK OATS

OAK SEDGE

PALM SEDGE

COLUMBINE

ASTER

ANEMONE

JACK-IN-THE-PULPIT

ROSE TURTLEHEAD

MISTFLOWER

GARDEN PHLOX

SKULLCAP

GROUNDSEL

MUSCLEWOOD

REDBUD

SWAMP WHITE OAK

GOLDEN CURRANT

WILD GERANIUM

GOLDEN ALEXANDER

FRINGED SEDGE

BOTTLE GENTIAN

OSTRICH FERN

PHLOX PANICULATA

INDIAN PINK

SHINING BLUESTAR

HORNBEAM

PRAIRIE ALUMROOT

AND MORE...



# Washington University's Medical CENTER PIECE

*Outdoor gathering place  
has a growing reputation*

A plan for all seasons — that was the intent behind the Ellen S. Clark Hope Plaza and its surrounding landscaping. This expansive and welcoming green space in the middle of Washington University Medical Center has been a point of convergence for the School of Medicine community and its visitors for the past two years.

Native greenery — including canopy trees consisting of swamp white oak, Kentucky coffee tree and willow, with understory plantings of large drifts of riparian sedges, grasses and flowering perennials — are alive and in tune with nature, as evidenced by birds nesting in the area, goldfinches eating the plentiful coneflower seed heads, and butterflies sipping nectar from the flowers. Flora that grew throughout the Midwest centuries ago have returned to reinvigorate the campus.

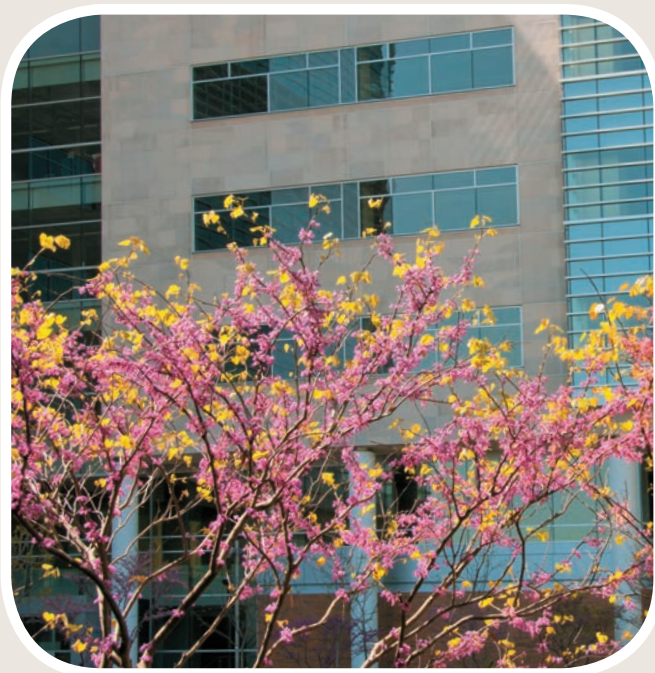


PHOTO ESSAY BY  
ROBERT BOSTON

The Ellen S. Clark Hope Plaza  
was designed by artist Maya Lin  
with landscape architect Michael  
Van Valkenburgh Associates, Inc.

**R**elatively common in and of themselves, what makes the plants surrounding the fountain unique is their combination. As a group, they represent a natural river bottom plant community. The diversity of this landscape can be seen nowhere else in the region at this scale.

FROM LEFT: ostrich fern, purple coneflower, yellow wingstem, aromatic astor, garden phlox and creek oats

BACKGROUND: water lilies

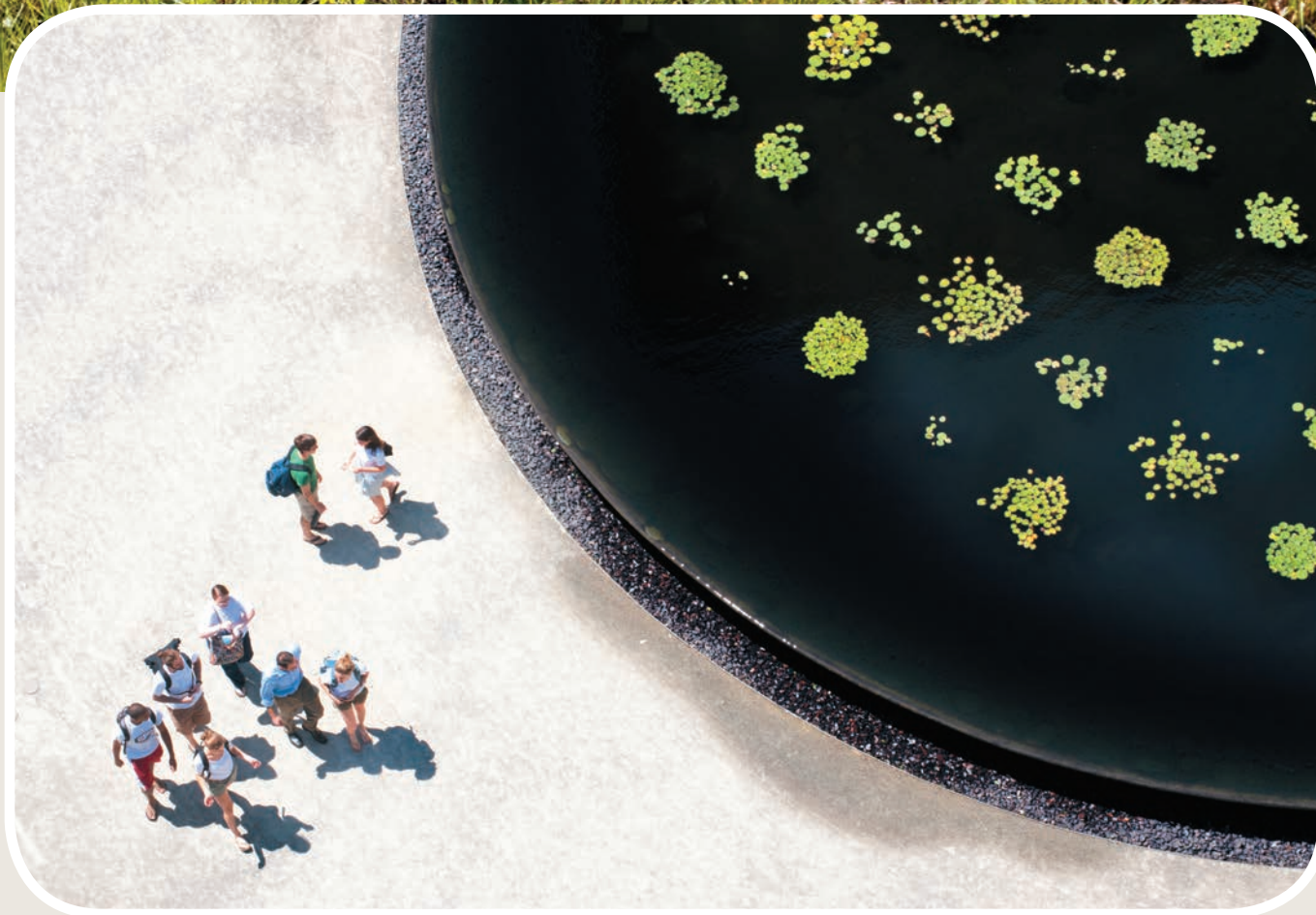






**A**s part of a larger picture that includes brush strokes from local history, wildlife, ecology, education and evolving thoughts about the planned landscape, these plants belong here — as do the people who come to enjoy the respite provided by this verdant oasis.







# SWITCHER

## to heroin

CREATED IN THE LATE 19<sup>TH</sup> CENTURY, HEROIN — an opiate analgesic first formulated to treat severe pain — has had a long and not-so-pristine existence. As other drugs go in and out of fashion, heroin remains a staple of the illegal drug trade, a favorite of users for its easy availability and the euphoric “high” it produces.

### How fixing one drug problem inadvertently boosted another

BY JIM DRYDEN

The continuing “popularity” of heroin has never been lost on Theodore J. Cicero, PhD, who has been studying the drug and its abuse for the past four decades.

But even he admits surprise at the latest wrinkle in the heroin game: A reformulation of OxyContin — a prescription painkiller widely abused in the 1990s — has made it harder for users to alter that drug for inhalation or injection. As a result, they are switching from OxyContin to other drugs, including heroin.

And although only about 10 percent of former OxyContin users have turned to heroin (the other 90 percent use other opiates, such as Vicodin or fentanyl), that statistic may be misleading.

“It sounds like a small number,” says Cicero, “but it’s a huge number relative to heroin users in this country. What’s more, we’re now seeing a migration of heroin and other dangerous drugs from the inner cities to the suburbs and rural areas.”





For the past three years, Cicero and colleagues have collected information from patients entering treatment for drug abuse.

More than 2,500 patients from 150 treatment centers in 39 states have answered survey questions about their drug use, with a focus on the reformulation of OxyContin. Results from those surveys were published in the July 12, 2012 issue of the *New England Journal of Medicine*.

The widely prescribed pain-killing drug originally was thought to be part of the solution to the abuse of opioid drugs because OxyContin (the brand name for the generic drug oxycodone) was designed to be released into the system slowly, thus not contributing to an immediate “high.”

But creative drug abusers quickly figured out how to evade that mechanism by crushing the pills and inhaling the powder, or by dissolving the pills in water and injecting the solution, thereby getting an immediate rush as large amounts of the drug entered the system all at once.

Unlike “street” heroin, which varies in purity and is often laced with dangerous fillers by drug dealers, OxyContin came as advertised: Users knew the exact dosage they were getting and, in its slow-release form, that was a lot — as much as 15 to 20 times more oxycodone than what comprised the normal immediate-release capsules.

In addition, from a psychological standpoint, many OxyContin abusers felt it wasn’t such a bad thing; after all, it was legal with a prescription and carried none of the stigma of heroin usage.

To combat these issues, the drug’s manufacturer introduced a new formulation of OxyContin in 2010. The new pills were much more difficult to crush and dissolved more slowly. The idea, according to Cicero, was to make the drug less attractive to illicit users who wanted to experience an immediate high. And it worked — sort of.

“Our data show that OxyContin use by inhalation or intravenous administration has dropped significantly since the abuse-deterrent formulation came onto the market,” says Cicero, professor of neuropharmacology in psychiatry. “In that sense, the new formulation was very successful.”

However, although many users stopped using OxyContin, they didn’t stop using drugs.

“The most unexpected, and probably detrimental, effect of the new formulation was that it contributed to a huge surge in the use of heroin, which is like OxyContin in that it also is inhaled or injected,” Cicero says. “We’re now seeing reports from across the country of large quantities of heroin appearing in suburbs and rural areas.”

**Cicero’s research into heroin** began in the 1970s, when he and colleagues were studying the drug’s effects using animal models. They found — and later confirmed in human studies — that morphine (to which heroin converts in the brain), depresses testosterone, the male sex hormone, leading to hypogonadism, a now well-recognized side effect of chronic opioid abuse.

So for 20 years, the investigators dealt mainly with young men from urban minority populations in their study of heroin, which at that time was essentially the only opiate available for purchase on the street. In the 1990s, with the emerging popularity of OxyContin, known as “hillbilly heroin” by its rural and suburban users, heroin suddenly had a director competitor.

Now Oxycontin’s formula change has left users in need of a substitute, and heroin has once again made tremendous inroads.

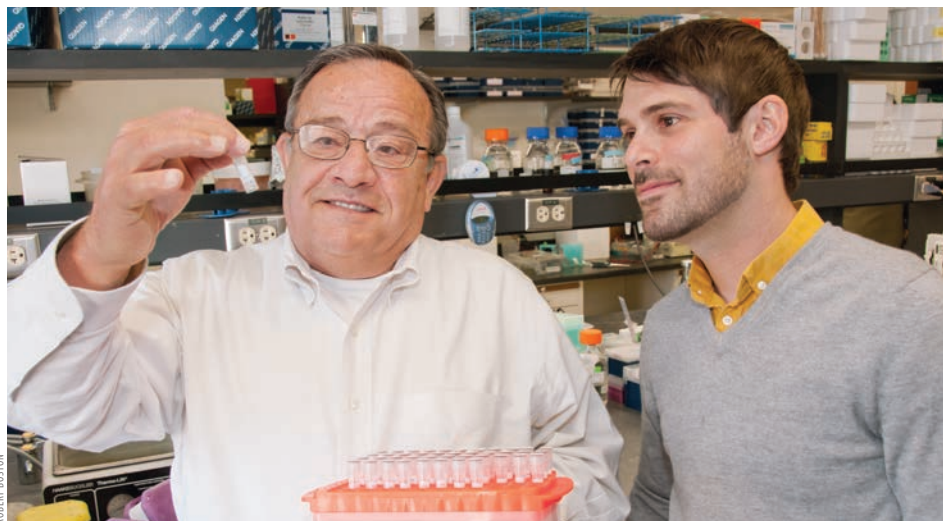
And although heroin abuse is a complicated issue, Cicero is frustrated by the government’s focus only on shutting down the supply of illegal drugs. Instead, he is more interested in the “why” of drug use, and current studies in his laboratory are examining risk factors for heroin and other opioid abuse to decrease the demand side of the supply-and-demand economic model.

“This trend toward increases in heroin use is important,” says Cicero. “As users switch to heroin, overdoses may become more common. We want to get the word out to physicians, regulatory officials and the public.” □

we’re now seeing reports from  
across the country of large  
quantities of **heroin**  
appearing in suburbs and rural areas

— THEODORE J. CICERO, MD

Examining samples in the  
lab: Neuropharmacologist  
Theodore J. Cicero, PhD, and  
senior research coordinator  
Matthew S. Ellis, MPE



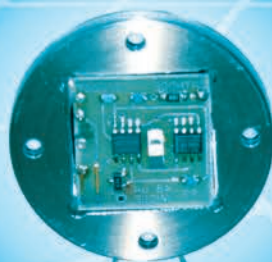
# *Promise the FUTURE*

***New hope for tomorrow — designed, built,  
and tested one piece at a time.*** BY HOLLY EDMISTON

**ROBOTIC  
ARM** can be  
controlled  
directly by  
the brain

**ADVANCED BRAIN  
RETRACTOR**  
for safer surgeries

**BONE GROWTH  
STIMULATOR**  
to speed healing



**IMAGINATION** may seem like a childhood dream, a mere glimpse of a gossamer vision of some wished-for reality.

But neurosurgeon Eric C. Leuthardt, MD, defines imagination somewhat differently. For him, imagination is where reality begins.

Leuthardt, associate professor of neurological surgery and neurobiology, is the director of the Center for Innovation in Neuroscience and Technology (CINT), a cross-disciplinary group within the Department of Neurosurgery that brings together experts from across Washington University to foster creativity and innovation.

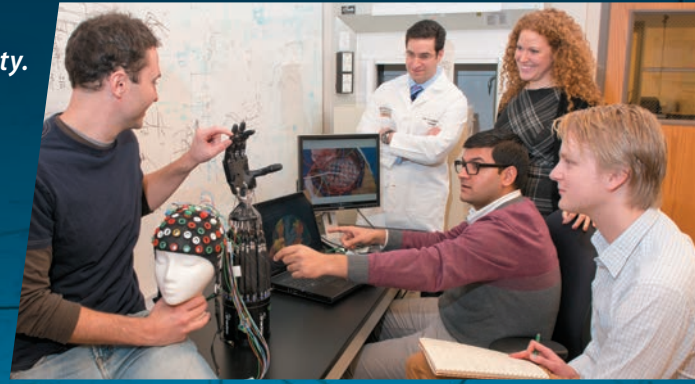
That effort has proved fruitful. In the three years since its inception, CINT has engaged 32 clinical and non-clinical inventors, resulting in 47 ideas, 16 fellowships and 12 patents — for which seven have been licensed to industry.

Cross-connections — validating the science, demonstrating that a new medical procedure brings value to patients, accessing new markets in industry, and resonating with the zeitgeist of humanity — are vital to the success of any invention.

The CINT provides an effective, ethical framework for these considerations. But for Leuthardt, everything circles back to envisioning the future.

"Anything that can be imagined can be done," he asserts. "The challenge is to imagine how the world can be different, and then the world figures out a way to make that happen."

CONTINUED ON PAGE 20 »



A CINT team meets regularly to discuss testing results.

**NON-INVASIVE  
BRAIN SIGNALS**  
facilitate stroke rehab



**BRAIN-CONTROLLED  
HAND ORTHOTICS**  
to speed stroke recovery



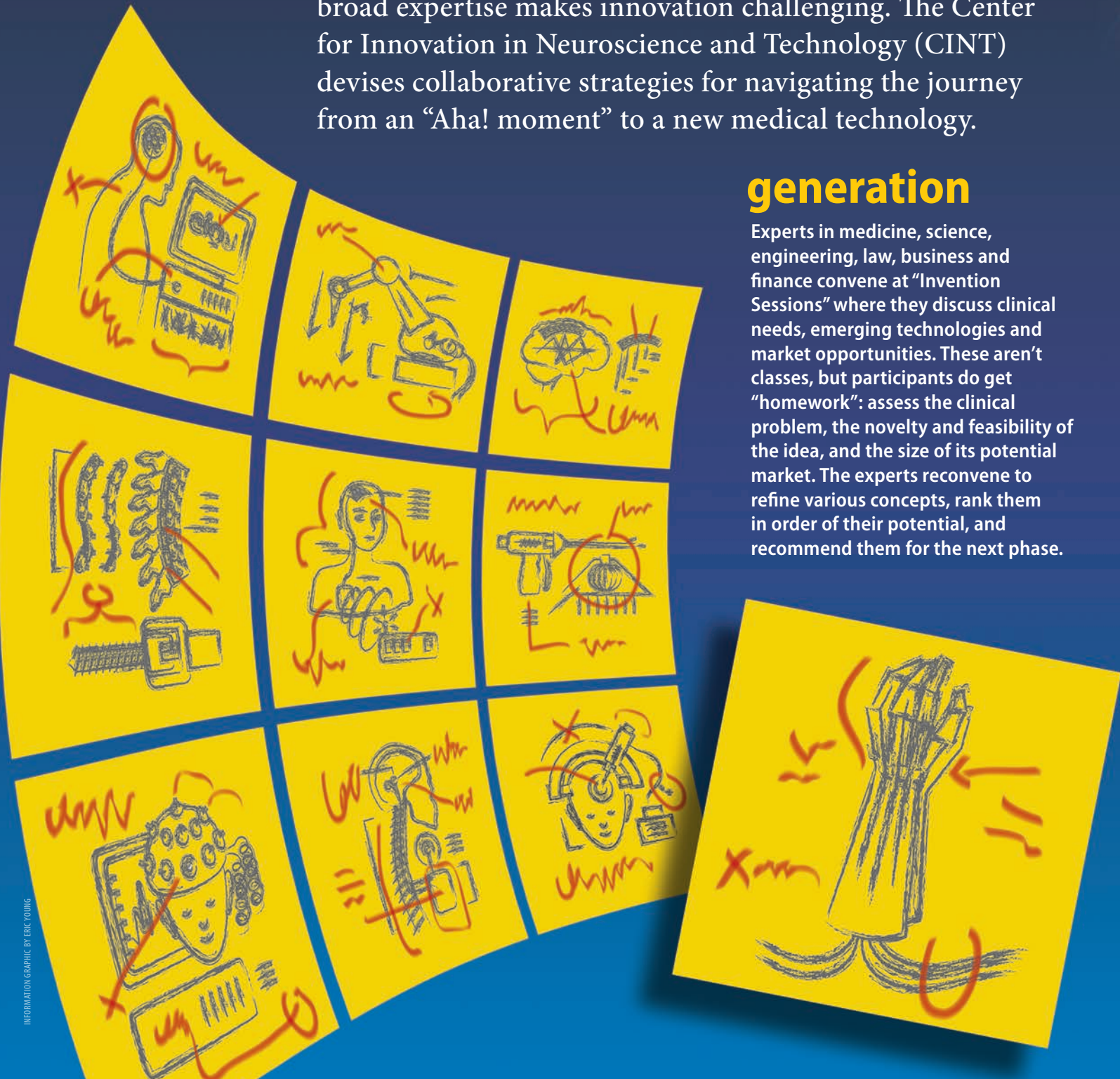
# Effective Creativity

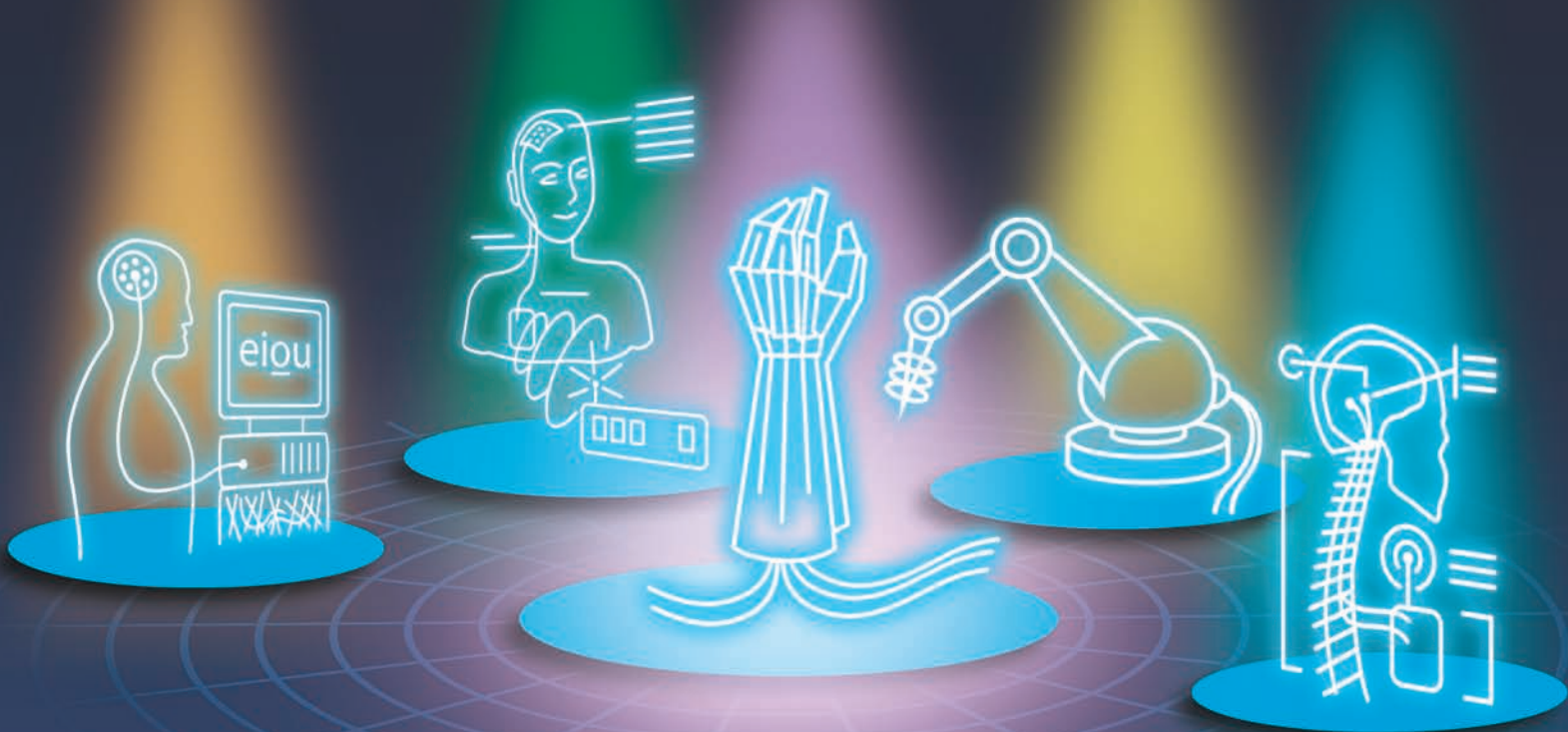
## Building ideas into medical breakthroughs

**N**ever has there been such potential to improve human health through technological innovation. However, financing, regulations and the need for broad expertise makes innovation challenging. The Center for Innovation in Neuroscience and Technology (CINT) devises collaborative strategies for navigating the journey from an “Aha! moment” to a new medical technology.

### generation

Experts in medicine, science, engineering, law, business and finance convene at “Invention Sessions” where they discuss clinical needs, emerging technologies and market opportunities. These aren’t classes, but participants do get “homework”: assess the clinical problem, the novelty and feasibility of the idea, and the size of its potential market. The experts reconvene to refine various concepts, rank them in order of their potential, and recommend them for the next phase.





## evaluation

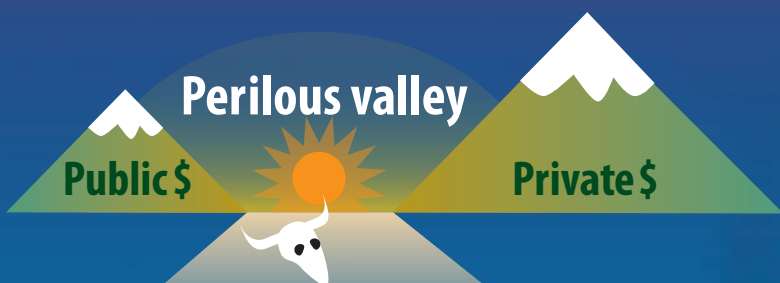
Each idea earns a chance to shine in the spotlight under the scrutiny of the CINT's executive committee as it considers a range of real-world questions. Does research support the merits of an idea? Is it really better than any new or existing technologies? Is it novel enough for licensing? Would the market adopt it? How long, difficult and costly will the regulatory approval be? Some ideas are rejected; some are modified. The top ideas are assigned to innovation teams.

## validation

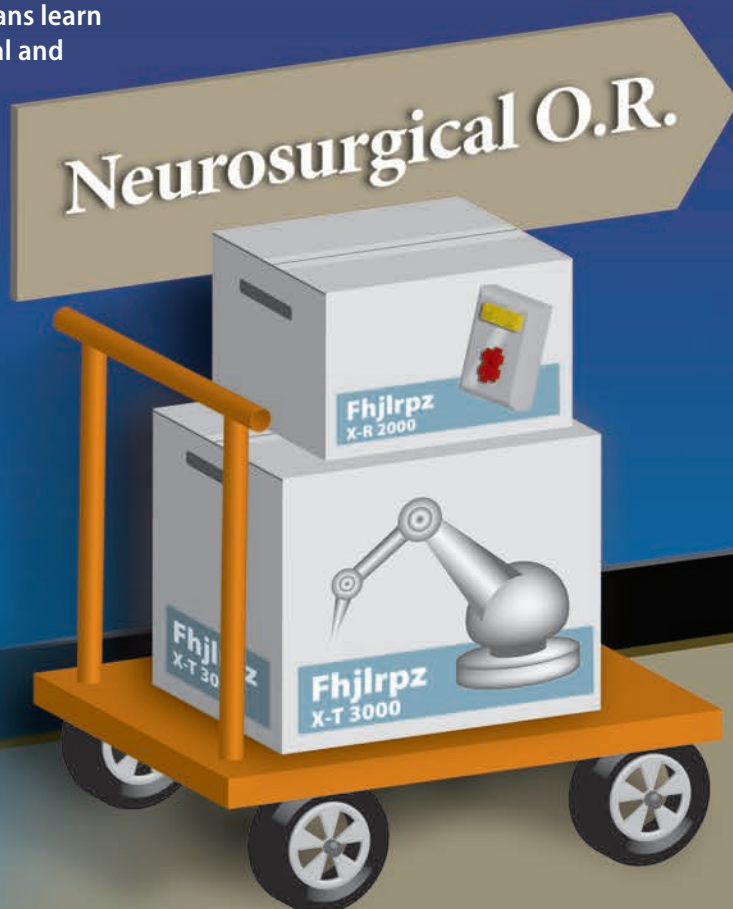
Innovation fellowship teams, composed of faculty and students from neurosurgery and engineering, develop rough concepts into working prototypes. Teams establish clinical and medical specifications, draft engineering designs, and create working physical prototypes. Along the way, physicians learn about mechanical, legal and industry-related issues; engineers gain an understanding of clinical nuance.

## translation

CINT embodies a transformation of academic culture, fostering experimental creativity, entrepreneurial activity and collaborative enterprise. Thinking "outside the box" will deliver more advanced biomedical technology in the foreseeable future.



A "Death Valley" gap between public and private support for costly device research discourages inventors. CINT bridges this gap by working with investors to target worthy ideas — speeding the process, improving results and controlling costs.





Electrodes monitor brain activity (red) as a patient responds during “awake” surgery. By comparison, new technology will allow neurosurgeons to monitor the brain while a patient is under general anesthesia, providing a more efficient and safer way to identify and preserve critical areas of the brain.

**The past 100 years** has created an impressive track record of how imaging can lead to new realities, says Leuthardt, who also is an associate professor of biomedical engineering and of mechanical engineering and materials science.

From commonly used technologies such as instant messaging and Skype to more esoteric military applications such as Lockheed Martin’s HULC (human universal load carrier), imagination is the catalyst of invention.

At the CINT, Leuthardt and colleagues focus on creating new technology to serve neurosurgery. By formalizing relationships among the School of Medicine’s Department of Neurosurgery, the School of Engineering and the Office of Technology Management, collaborators at the center hope to foster creativity and streamline the process of scientific and technical innovation and real-world application.

Much of the work being done at the CINT is focused on technologies that can impact care of patients with neurologic disease. This ranges from the creation of specialized devices to the more fundamental fields of neuroprosthetics, motor physiology, speech physiology, epilepsy and stroke rehabilitation. The technologies that have emerged have encompassed a broad range, including implantable sensors to treat hydrocephalus, novel coatings of orthopedic hardware to facilitate bone growth, and engineering solutions for stroke.

The idea of a brain-computer interface has been a flagship technology and scientific endeavor of the CINT. Indeed, many of the inventions developed or under consideration are related to issues of restoration, enabling people with spinal cord injuries or who have had a stroke to regain function.

“That’s where we begin, but it’s not where we end,” says Leuthardt. “As a physician, it’s critical to restore function to people with motor disabilities — that’s absolutely vital. But that is Chapter 1 of how we see ourselves, what we think our limitations are. Maybe our ability to interact with the world no longer stops with our fingertips and bodies, in a real way.”

Fundamentally, Leuthardt hopes to change how humans interact with machines. Although that might sound like science fiction, neuroprosthetics — devices linked to the brain that allow patients to move a robotic arm or a cursor on a screen simply by thinking about doing so — already exist. According to Leuthardt, this type of technology will one day be as commonplace as the video games of today.

“My job is to make it boring,” he says. “We may get excited about the new iPhone 5, but we don’t get excited by

our DVD players anymore. Similarly, neuroprosthetics, body modulation and cognitive capability will one day no longer inspire awe at the magnitude of the technical accomplishment; they will just be a part of everyday life.”

Another key area of study at the CINT is brain mapping. Leuthardt and his colleagues are developing advanced techniques to locate and preserve critical areas of brain function.

During any neurological surgery, a key concern is not doing any harm to the brain while fixing a problem, such as operating on tumors or areas affected by epilepsy. Currently, neurosurgeons are able to watch the brain “light up” in real time during surgery as participants perform tasks such as talking or moving their hands. However, this process occurs during “awake” surgeries, something Leuthardt would like to change. New technology in development will allow neurosurgeons to assess critical brain areas — such as those devoted to speech and motor function — by monitoring the specific electrical signatures of various brain networks while the patient is anesthetized.

This type of breakthrough, which benefits patients by removing a risk for serious injury, is an example of the type of inventiveness the CINT hopes to foster. By providing an institutional structure that brings together people from diverse backgrounds — medicine, engineering, computer science, physics, chemistry, mathematics, nanotechnology, law and business — the CINT promotes collaboration, allowing innovation teams to generate ideas that none of the individuals would have been able to create by themselves.

**“The world’s become a more complex place,”** Leuthardt explains. “All of these fields have become very subspecialized. The benefit is that it gives us expertise in that subspecialty, but it’s also a worldview that can stymie creativity.”

However, he says, if a neurosurgeon and an engineer sit down to talk, it’s likely the interaction will lead to non-linear, unexpected conclusions. A physician may learn about an existing technology — something that is very exciting to the engineer — that would solve a particular medical problem.

“Eric has been successful in creating a wonderful collaborative research environment within the Department of Neurosurgery,” says Ralph G. Dacey Jr., the Henry G. and Edith R. Schwartz Professor and head of neurological surgery. “The Center for Innovation in Neuroscience and Technology has facilitated the development of several breakthrough neuromedical technologies.”

Finally, Leuthardt emphasizes that the academic and medical cultures can be inhospitable to creativity in that they often do not allow for trial-and-error thinking. In the creative process, he asserts, it is acceptable, and perhaps even desirable, to make and learn from mistakes.

“Education and expertise can be limiting,” says Leuthardt. “We need to be humble about our knowledge so that we can learn from other people. Innovation, more than ever, comes out of good relationships with other people.” □

# Pitch *Perfect*

Introducing good people  
and their *great* ideas

BY STEPHANIE STEMMLER



120  
SECONDS

## No notes, no props, no polished PowerPoint presentation. Just two minutes — 120 seconds — of passion and persuasion.

That's the idea behind IdeaBounce, a campus-wide initiative founded in 2003 to support student, faculty and community interest in commercial, social, global, technological, legal, artistic and intellectual entrepreneurship.

IdeaBounce is the brainchild of Washington University's Skandalaris Center for Entrepreneurial Studies. This past October, for the first time, an IdeaBounce was held at the School of Medicine.

"The time went so fast, and you're so nervous," says Dana M. Watt, a graduate student in anatomy and neurobiology in the Division of Biology and Biomedical Sciences. "But I think the judges liked my idea, and maybe someone will help me take it to the next level."

They did. Watt and four others among the 13 people who made pitches were named the event's five winners (see WINNING PITCHES, page 23). As a reward, the winners each received a check for \$50 and the opportunity to spend one-on-one time with the judges at a dinner after the event.

Credit for bringing the IdeaBounce competition to the School of Medicine goes to members of the BioEntrepreneurship Core (BEC), a group of the school's graduate and medical students, post-doctoral researchers and faculty who share an interest in entrepreneurship.

"The university is working hard at emphasizing entrepreneurship," says Hugh Bender, a fourth-year doctoral student in developmental, regenerative and stem cell biology and president of the BEC. "On the medical school campus, the National Institutes of Health invests millions of dollars in research. But what's the output of that?"

"In academia, it's typically peer-reviewed, published papers," he says. "A lot of that research could also be commercialized; ideas are getting lost because we don't think in terms of intellectual and translational property. We want to focus on the fact that researchers are creating value, which should be recognized beyond publications alone."

Started in 2004, the BEC now boasts a mailing list of more than 300. The group fosters conversations and idea-sharing through a series of events throughout the year, including panel presentations by community entrepreneurs and Washington University faculty and staff.

The BEC also holds casual morning coffee lectures and get-togethers, all with the goal of creating interest in entrepreneurship.

"The BEC represents an opportunity to network and meet different people in industry," says Rachael A. Hansel, a postdoctoral researcher in radiation oncology. "As a student or postdoc, you are highly focused on science and that millimeter slice of the world. I'm looking for jobs, so here you can meet creative people, bounce ideas and open up your view of the world and your career possibilities."

The BEC is a "cohesive nucleus of energy" that contributes to the culture of entrepreneurship now blossoming at the medical school, says Kenneth A. Harrington, managing director of the university's Skandalaris Center for Entrepreneurial Studies.

"You don't know if an idea is viable until you act entrepreneurially," says Harrington. "The reason IdeaBounce is so important is that it helps people with ideas meet other people who can help move their ideas forward. In that process, we develop the idea-makers into entrepreneurs. Once they learn that, they have that skill for life."

IdeaBounce offers participants a "speed-dating" style of competition in which they have just two minutes to pitch a creative, innovative idea to a panel of judges. The medical school's IdeaBounce

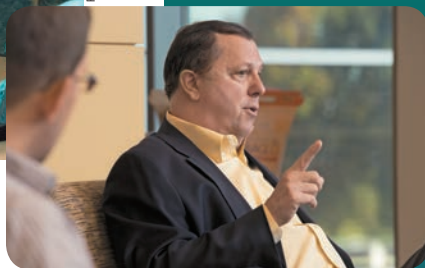
Student leaders of the School of Medicine's BioEntrepreneurship Core, clockwise from lower left: Dana M. Watt, secretary; Hugh Bender, president; Matthew C. Hibberd, vice president; Sriram Devanathan, vice president; Aswin J. Mathews, treasurer; and Elizabeth A. Germino, marketing director.



ROBERT BOSTON



FAY MARLIN



Students met at a recent coffee lecture to talk with Kenneth A. Harrington, managing director of the university's Skandalaris Center for Entrepreneurial Studies.

participants, who could present medical, life sciences or unrelated ideas, were judged on three essential criteria: clarity of the idea, the passion of the presenter, and whether they clearly requested help. Within 45 minutes after IdeaBounce started, the judges had identified the top five competitors.

"I thought all of the ideas were good," says judge Pete Peters, executive director of Innovate Venture Mentoring Service, a local organization that provides free, team-based mentoring of new ventures by business and entrepreneurial leaders. Peters, who teaches an annual course, Origins of Bioentrepreneurship, at the medical school, says becoming an entrepreneur is a learned skill.

"We really need to foster this spirit of entrepreneurship," he says, "so that people feel comfortable about pursuing ideas and creating a viable business or product. There are so many resources at Washington University and around St. Louis that can help people bring an idea to reality."

The university already has delved into large-scale bioentrepreneurial collaboration around St. Louis. It is a founding member, along with other area universities, of the Center of Research, Technology and Entrepreneurial Exchange (CORTEX), which strives to establish the region as an international biosciences powerhouse. In another effort, BioSTL, the university — with BJC HealthCare and the St. Louis

Life Sciences Project — is working to spur bioscience company creation and drive economic growth.

"Washington University recognizes the need and opportunity to expand its research culture, to foster research innovation and entrepreneurship in addition to knowledge creation and publication," says Evan D. Kharasch, MD, PhD, vice chancellor for research. "Turning research discoveries into products and services, so that the public can benefit from our research, is a major institutional goal."

The BEC is aggressively expanding its presence, co-hosting interdisciplinary discussions on entrepreneurial topics with Washington University's other schools, such as law and business.

"It's a culture that is shifting toward innovation and bringing ideas to a practical endpoint," says Elizabeth A. Germino, an MD/PhD student in the university's Medical Scientist Training Program. "In medicine and science, you need collaborations and expertise. One of the strengths here is the collaborative atmosphere, but, as students, we're so focused on what we need to do to learn our jobs that we may miss essential skills, such as how to clearly present an idea, pursue it, and ask for help and resources. The BEC is a way to learn that from like-minded people. IdeaBounce makes it fun." □

## WINNING PITCHES

### IDEA

A new spirometer design

### PRESENTER

Andrew J. Brimer, graduate student in engineering

### PITCH

Spirometers measure lung function, but are expensive, ranging from several hundred to thousands of dollars each. A new, award-winning prototype would cut the production cost to less than \$10.

### NEEDS

Mentors, investors, product development

### IDEA

Using miRNAs (micro RNAs) to diagnose lung cancer

### PRESENTER

Thomas L. Cohen, postdoctoral research scholar in genetics

### PITCH

By developing an assay using miRNAs, lung cancer can be diagnosed more accurately and cheaply than current methods.

### NEEDS

Team members, mentors, investors, and legal, financial and accounting advice

### IDEA

Mobile drug database app

### PRESENTER

Paul G. Gamble, first-year medical student

### PITCH

A mobile app will enable patients to determine out-of-pocket costs for various drugs and then identify comparable cheaper medications. This will aid in making value-based treatment decisions.

### NEEDS

Mentors, legal advice, advisors, investors

### IDEA

Genotyping to determine compatibility on dating website

### PRESENTER

Masatoshi Kaneko, graduate student in biomedical engineering and business

### PITCH

Adding geno-typing could enhance a suitable match based on intelligence and personality in addition to subjective preferences.

### NEEDS

Mentors, legal advice, strategic development

### IDEA

Online expert database for scientists

### PRESENTER

Dana M. Watt, graduate student in anatomy and neurobiology

### PITCH

To more cost-effectively allocate limited research dollars, an online database will share scientific expertise and experiments.

### NEEDS

Team members, advisors, IT, legal advice, operations and management

## Promising ideas from the School of Medicine's IdeaBounce

# *Together.*

*Together, we learn.*

*Together, we discover.*

*Together, we create.*

*Together, we heal.*

*Together, we innovate.*

*Together, we lead.*

*In the 20th century*, we changed the understanding of medicine.

*In the 21st century*, we are transforming the very meaning of medicine.

The urgent need to discover the causes of the most common diseases and to apply this knowledge to successful treatments has never been greater. An aging population in America — and a growing underserved population worldwide — have pushed traditional health care delivery to a breaking point.

The solutions are complex, and yet for Washington University School of Medicine, the action is straightforward. Our mission is to lead in the advancement of human health. We must train the next generation of medical leaders. We must marshal our extraordinary scientific resources to eliminate entire diseases and find treatments that improve and prolong lives. And, ultimately, we must take major steps to improve our efficiency in streamlining health care delivery, reducing unnecessary costs, and serving populations in need.

**Advancing human health through the  
Campaign for Washington University**

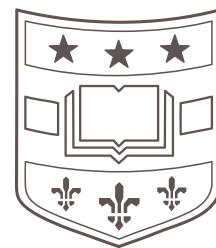
Fortunately, our School of Medicine is one of the few institutions — anywhere — with the vision, depth of experience, and combined intellect required to do what can and must be

done to advance human health. Through innovative research, outstanding clinical care, and the forward-thinking education of tomorrow's leaders in medicine, we have achieved international prominence.

Yet, the task is great — so great, in fact, that it is easy for us to question how an individual can have the ability to make a significant difference. However, there is no question that every gift matters.

**We invite you to be a part of a historic endeavor:**

***Leading Together — The Campaign for Washington University***



# LEADING *Together*



A major, multi-year fundraising initiative, *Leading Together: The Campaign for Washington University*, has been announced by Washington University in St. Louis to build on its strong history and further evolve the university's global leadership.

At the School of Medicine, that translates to leveraging our strengths throughout the university to develop techniques and treatments necessary to help ever-greater numbers of people throughout the world to live better and longer than previously thought possible.

"From helping our neighbors take control of their health to providing cures in countries where people are still dying from easily treatable diseases, the faculty, students, and alumni of our School of Medicine will continue to pursue new ways to save and improve lives," says Chancellor Mark S. Wrighton. "With the support of our alumni, parents, friends, corporations, and foundations, we can build upon the accomplishments of recent decades and contribute even more significantly to our communities, our nation, and the world."

## Medical school campaign priorities

The campaign's four themes — preparing the leaders of tomorrow, advancing human health, inspiring innovation and entrepreneurship, and enhancing the quality of life — will be the focus of School of Medicine efforts during the campaign.

To succeed in each of these areas, fundraising targets for five priorities have been identified:

- to attract and retain outstanding faculty: \$240 million
- to attract a talented and diverse student body: \$40 million
- to advance the scholarship, research, and creative potential of students and faculty: \$750 million
- to further strengthen an exceptional teaching, research, and working environment: \$40 million
- to enhance excellence throughout the school by increasing unrestricted annual support: \$30 million

"Our overarching vision is to use our resources as a top-tier institution to make significant and lasting contributions to advancing human health," says Larry J. Shapiro, MD, executive vice chancellor for medical affairs and dean. "To meet these challenges, we must gather resources and make broad changes to integrate our missions and strategically focus our efforts."

Groundbreaking scientific discoveries over the past century have established the School of Medicine's reputation as one of the great medical centers in America and throughout the world. The depth and breadth of scientific inquiry addressed by its researchers has a national and global impact, and its multi-pronged approach to research holds tremendous promise for rapid advances in deciphering fundamental causes of diseases. Ultimately, research conducted at the School of Medicine is transforming medicine, leading to better therapies and therapeutics.

### Attracting the best students and faculty

For the past 14 years, Washington University has recruited the top class of entering medical students in the country, and scholarships are critical to this success. The School of Medicine's Programs in Occupational Therapy, Physical Therapy, and Audiology and Communication Sciences rank among the top three programs in each of their respective fields nationally. Signature graduate education programs in the Division of Biology and Biomedical Sciences and the Medical Scientist Training Program set the bar for peers. Likewise, residents and fellows at the school and our affiliated hospitals are among the best in the world.

Central to our continuing success is one of the world's great medical faculties. In an increasingly competitive environment for engaging the best academicians, endowed professorships play an important role in recruiting and retaining the most important resource of the School of Medicine: the extraordinary people who lead the field in teaching and research. Increasing our number of endowed professorships is essential to our leadership position in the field.

### Recognizing our clinical physicians

Most importantly, School of Medicine physicians save lives — and directly work to improve the quality of life for tens of thousands of patients each year. With its hospital partners on the Washington University Medical Center campus — Barnes-Jewish Hospital and St. Louis Children's Hospital — the School of Medicine is committed to providing the greatest level of healing in the world. From the most fragile infants to individuals with extremely rare diseases, physicians provide each patient with medical expertise that is grounded in the finest training possible. Working together, medical teams are skilled in innovative techniques and fully immersed in compassion for humankind.

### Local and global community outreach

Actively engaged in neighborhood clinics, schools, and community organizations that promote wellness, the faculty, students, and staff of the School of Medicine regularly volunteer clinical services in underserved areas of St. Louis, the United States, and at a growing number of international locations. Through these efforts, Washington University has demonstrated an unwavering commitment to the discovery of knowledge and the advancement of medical research and patient care.

### Partnering for success

Washington University School of Medicine is a leading center for teaching, research, and patient care and is well-known for its tremendous innovation in genomics, neuroscience, imaging, infectious diseases, cardiology, and biomedical engineering, consistently ranking among the world's finest medical institutions.

Yet our potential for even greater leadership is much stronger than previously imagined, and we have never been more committed to expanding upon these great strengths. To this end, we view the School of Medicine's prospects for the advancement of medicine to be virtually limitless.

With the generous support of the alumni and friends who share our aspirations, our ideals, and our spirit, we can forge a stronger foundation for the future. Please join us as we educate and inspire the next generation of outstanding students in our unwavering determination to make ever-greater contributions toward improving human health on a global scale. □

"We believe answering the great questions in medicine requires bold research focused in areas of high reward. The time for answers is now. Every individual can help us find them. Together, we will make a difference."

Larry J. Shapiro, MD

Executive Vice Chancellor for Medical Affairs and Dean

### The following pages summarize key areas in which support is needed to advance human health:

- UNDERSTANDING THE BRAIN
- CANCER AND PERSONALIZED MEDICINE
- DIABETES, HEART DISEASE, AND OBESITY
- INFECTIOUS DISEASES AND GLOBAL HEALTH
- THE NEXT GENERATION
- THE ANNUAL FUND

Learn more: [medicalalumni.wustl.edu](https://medicalalumni.wustl.edu)



*Together,*  
we discover.

Washington University researchers are committed to studying the human brain across the life span. Terrie E. Inder, MD, PhD, studies neurodevelopmental outcomes of newborn infants.

## UNDERSTANDING THE BRAIN

**T**HE HUMAN BRAIN remains a critical frontier in modern-day medicine. Brain diseases devastate millions of families through loss of life, cognitive and emotional disability, social and financial instability, and fear. Washington University is at the forefront of discovery and treatment in neuroscience. Our enduring partnerships with alumni, friends, and philanthropists allow us to advance the field, simultaneously providing treatment to patients in need and influencing the healing of others throughout the world.

### Areas of excellence

- The Charles F. and Joanne Knight Alzheimer's Disease Research Center (Knight ADRC) is internationally known for leadership in the field. Researchers at the Knight ADRC not only developed the standard clinical measure for staging of dementia, but also established that Alzheimer's disease begins damaging the brain decades before the first appearance of outward symptoms.
- The Taylor Family Institute for Innovative Psychiatric Research in the Department of Psychiatry is advancing the science underlying the diagnosis and treatment of psychiatric illnesses.
- At the Hope Center for Neurological Disorders, more than 500 scientists are devoted to discovering fundamental causes of neurological disorders such as Alzheimer's and Parkinson's diseases, multiple sclerosis, and amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease).

- With more than 17,000 new cases of malignant brain tumors diagnosed each year, the Department of Neurological Surgery is developing new approaches and clinical trials.
- Scientists and physicians at the Intellectual and Developmental Disabilities Research Center provide the latest research to families of children with developmental disabilities.
- Washington University has been chosen by the National Institutes of Health (NIH) to lead a consortium of research institutions in the Human Connectome Project, a bold effort to map the human brain.
- The Washington University Neurofibromatosis Center in the Department of Neurology is the largest and most comprehensive center of its kind in the world.

### Together, we can

- fund clinical trials in Alzheimer's disease and advance our leadership in Alzheimer's and related disorders.
- develop drugs to treat mental illness.
- discover treatments for childhood disabilities.



*Together,*  
we lead.

The Alvin J. Siteman Cancer Center, led by Timothy J. Eberlein, MD, the Spencer T. and Ann W. Olin Distinguished Professor, is a beacon of hope for cancer patients and their families.

## CANCER AND PERSONALIZED MEDICINE

**A**S A LEADER in diagnosis, treatment, and prevention, the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine is driving an ever-greater convergence among oncology, genomics, imaging, and pathology. Its interdisciplinary approach to translating laboratory findings into comprehensive, compassionate patient care will ultimately foster the development of personalized medicine for cancer and other diseases.

### Areas of excellence

- Led by investigators in the Department of Medicine's Division of Oncology, collaborative and creative research seeking to uncover causes and cures for cancer takes place in nearly all departments and divisions throughout Washington University School of Medicine. The division also has joined with several institutions in creating a protein atlas.
- The Genome Institute has helped to define and understand the makeup of the human genome in myriad ways, including contributing 25 percent of the finished sequence to the Human Genome Project. This effort informs other research, including successfully decoding — for the first time in history — the complete DNA of a cancer patient by tracing her disease, acute myelogenous leukemia, to its genetic roots. In sequencing the patient's entire genome and the genome of her leukemia cells, investigators were able to identify the genetic changes unique to her cancer. In addition to its hope for saving lives, this work promises to accelerate the era of personalized medicine.
- The Department of Radiation Oncology works with units across the entire medical enterprise on the development and implementation of new cancer treatments. The recent acquisition of the Midwest's first proton accelerator allows physicians to target tumors with greater precision and minimize radiation of vital organs and tissues surrounding tumors.
- Genomics and Pathology Services (GPS), a collaborative effort between the Department of Pathology and Immunology and the James S. McDonnell Department of Genetics, provides expertise in genetic testing and pathology consultation, including clinical genomics and next-generation sequencing.

### Together, we can

- develop tests to detect cancer at its very beginnings and to assess genetic cancer risk.
- identify and evaluate strategies for stopping cancer growth or preventing it altogether.
- lead the nation in research and treatment of multiple myeloma.



*Together,*  
we innovate.

**Douglas L. Mann, MD, the Tobias and Hortense Lewin Distinguished Professor of Cardiovascular Diseases, leads the university's participation in a national heart-failure research network sponsored by the National Institutes of Health (NIH).**

## DIABETES, HEART DISEASE, AND OBESITY

**H**EART DISEASE, affecting more than 82 million Americans, is the leading cause of death in the United States for adults. In addition, heart disease is the leading cause of complications and death for two-thirds of the 25 million people with diabetes in this country. Obesity plays a major role in both diseases in adults and children. Researchers are tackling these combined problems by providing clinical treatment and conducting scientific studies throughout the School of Medicine in more than a dozen multidisciplinary programs and centers.

### **Areas of excellence**

- At the Diabetic Cardiovascular Disease Center (DCDC), investigators are working toward a better understanding of the underlying basis connecting diabetes and heart disease.
- The School of Medicine is a world-class center for research, educational, and clinical care programs in atrial fibrillation, minimally invasive cardiac surgery, aortic surgery, ventricular-assist devices, and heart transplant.
- Innovative research, along with successful treatments and education programs, is changing lives at the school's Human Nutrition Center.
- Patient care and research in diabetes are advancing on multiple fronts: understanding and treating childhood diabetes by the Department of Pediatrics, significant advances within the Department of Medicine's Division of Endocrinology, genetic studies on type 1 diabetes at The Genome Institute, and research into electric signaling in tissues at the Center for the Investigation of Membrane Excitability Diseases (CIMED).

- The Cardiovascular Division has emerged as a national leader in both research and delivery of high-quality cardiovascular care to a large patient population. Faculty members in the division have conducted groundbreaking research in the area of dissolving blood clots for acute myocardial infarction, biomarkers for cardiac injury, and cardiac imaging.
- The David Goldring Division of Pediatric Cardiology and its partner, St. Louis Children's Hospital, have been recognized for more than a half-century for innovative approaches to infants and children with congenital heart disease. This reputation continues today with the division's recognition as a national leader in the area of heart failure and transplantation.

### **Together, we can**

- partner with start-up companies to develop drugs for heart disease.
- identify defects that underlie many of the world's most important diseases, including heart arrhythmias, diabetes, and epilepsy.
- identify new therapies for heart and vascular disease in diabetes.



*Together,  
we heal.*

**Mark J. Manary, MD, the Helene B. Roberson Professor in Pediatrics, and colleagues have worked for nearly two decades to reduce childhood malnutrition.**

## INFECTIOUS DISEASES AND GLOBAL HEALTH

**I**MPROVING GLOBAL HEALTH is among the world's most pressing challenges, and infectious diseases research has become one of the largest areas of concentration within the School of Medicine. As new diseases appear, there is an ever-greater risk of rapid transmission and spread of infection. By traveling to foreign countries to provide basic health care or by offering programs in St. Louis aimed at preventing sexually transmitted diseases, our faculty, students, and staff are dedicated to making a difference — locally, nationally, and globally.

### **Areas of excellence**

- Children are disproportionately affected by infectious diseases, as well as by malnutrition. In an effort to cost-effectively reduce the malnutrition rate and reverse the cycle of poor health standards and lower educational achievements associated with it, School of Medicine researchers have developed ready-to-use therapeutic foods (RUTFs) that can be locally manufactured, easily stored without refrigeration, and successfully used to ensure proper nutrition for children.
- The study of the human microbiome promises to provide a better road map for investigating what goes awry in diseases thought to have microbial links and determining why the dangerous pathogens residing within us do not always cause life-threatening illnesses.
- Washington University has been selected by the federal Centers for Disease Control and Prevention to develop and test new approaches for reducing health care-associated infections.

- With support from the Bill and Melinda Gates Foundation, researchers hope to reduce suffering caused by two tropical diseases: onchocerciasis (river blindness) and lymphatic filariasis (elephantiasis). By optimizing simple and cost-effective treatments already being used to help hundreds of millions of people, the researchers seek to provide treatment for many neglected tropical diseases.
- Washington University's scope of work in this broad field includes patient safety, reduction of hospital-acquired infection incidence rates, community outreach, and the establishment of a Midwest Regional Center of Excellence for Biodefense and Emerging Infectious Diseases Research.

### **Together, we can**

- effectively prevent and treat infectious diseases of the urinary and reproductive tracts to alleviate suffering of women and children worldwide.
- recognize commonalities among diseases and, where possible, apply effective solutions broadly.
- explain diseases not yet known to be related to infection.



*Together,  
we learn.*

**Teaching and inspiring: David J. Murray, MD, the Carol B. and Jerome T. Loeb Professor of Anesthesiology, helps students develop good judgment and problem-solving diagnostic skills in the Howard and Joyce Wood Simulation Center.**

## THE NEXT GENERATION

**I**N MEDICINE, knowledge, experience, and inspiration is passed from one generation to the next in a grand continuum. Washington University is committed to providing its students with a rigorous foundation in science, advancing the tools needed to diagnose and treat patients, and developing the ethical basis for making critical decisions in a rapidly changing health care environment. Attracting the best students and faculty, with the support of alumni and friends, represents a partnership for the future.

### **Areas of excellence**

- To secure the future of our leadership in medical education, it is imperative to increase the number of endowed professorships for clinical and basic science faculty, as well as professorships for preceptors, those clinicians who provide hands-on training to students. An endowed professorship is often a crucial factor in an individual's decision to join the School of Medicine faculty. These professorships — which provide support for salary, benefits, and research needs — are central to retaining our most promising faculty and recruiting stellar outside leaders.
- We continue to seek support for scholarships to address the cost of education, reduce debt upon graduation, and recruit the best students. Medical, occupational therapy, physical therapy, and audiology students have been the primary beneficiaries of these scholarships; we are extending our efforts to include students in the Medical Scientist Training Program and the Division of Biology and Biomedical Sciences.

- The partnerships our faculty and students form with our generous donors are often warm and enduring. Endowed professorships can serve as the foundation for lifelong collaboration between faculty and donors in the advancement of medicine. The joy of providing a student scholarship, meeting the student who receives it, learning about the student's aspirations, and knowing that one has played an important role in shaping the future of medicine can be very rewarding for donors. For students, this relationship often inspires them to make a commitment to continue the tradition of philanthropic support when they are positioned to do so.

### **Together, we can**

- recruit and empower the brightest faculty and most gifted and creative graduate students.
- advance our leadership in both innovative learning methods and in adapting teaching resources to meet the changes in medical knowledge and practice.



*Together,*  
we advance.

**Outstanding teacher and mentor Jeffrey I. Gordon, MD, the Dr. Robert J. Glaser Distinguished University Professor, with trainees in his laboratory.**

## THE ANNUAL FUND

**T**HE ANNUAL FUND provides essential support for scholarships, seed funding for initiatives that sustain intellectual vitality, and resources to respond to new opportunities and challenges. Unrestricted annual giving empowers the leaders of the School of Medicine to support its highest priorities, allowing the university to maintain its margin of excellence. Every gift matters; growing our Annual Fund participation has never been more critical.

### **Areas of excellence**

- In recent years, reunion class giving has become increasingly important. Each year, class gifts to the Annual Fund provide either fully endowed scholarships or annually funded scholarships, honoring the philanthropy of each class gift. Thus far, 23 alumni classes have endowed scholarships benefitting 231 students.
- Annual Fund gifts from medical student and house staff alumni are divided among scholarships, student programs, alumni endowed professorships, and other high priorities of the dean.
- School of Medicine faculty are among the most committed supporters. Since 2010, current and former faculty have provided nearly 40 annual scholarships, demonstrating their commitment to our students and, most significantly, to addressing the complexity and cost of a comprehensive 21st-century medical education.

- Many former house staff and fellows support the Annual Fund within the departments and divisions in which they trained. Their generosity funds resident education, research, training, and special projects.
- The local community benefits from a wide range of student-initiated projects. More than 40 of these have been funded with help of unrestricted annual gifts.
- The school's Programs in Physical Therapy, Occupational Therapy, and Audiology and Communication Sciences also benefit from gifts to the Annual Fund. Most gifts are directed to student support.

### **Together, we can**

- support the eight out of 10 medical students who need financial assistance.
- support student programs that benefit the community.
- provide alumni endowed professorships.
- provide key resources throughout the School of Medicine.

## 1940s

### Stanley Kahn, MD 43

Kahn spends time reading, practicing the piano, and enjoying his two grandchildren.

## 1950s

### James Dunlevy, MD 51

Dunlevy is living in the Chippewa National Forest on the shores of a huge glacier lake in northern Minnesota with his wife, **Allie (Phelps) Dunlevy, NU 50**. Their "neighbors" include deer, loons, geese, timber wolves, beavers, birds, ducks and lots of fish.

### John Denman, MD 52

Denman enjoys playing the clarinet in a dixie/big band. He also plays golf and tennis. He formally retired from medicine in 2011.

### John Finch, MD 59

Finch's interests include photography, traveling, reading, fishing and family.

## 1960s

### David Nelson, MD 63

Nelson is enjoying his retirement in Hilton Head SC and is looking forward to his 50th reunion.

### Albert Wermuth Jr., MD 67

Wermuth retired from active practice in 2009.

## 1970s

### Robin Bernhoft, MD 76

Bernhoft retrained in environmental medicine and is enjoying practicing "psychological" medicine.

### Alice Ackerman, MD 79

Ackerman has become active in social media, keeping a children's health care blog at [www.carilionclinic.org/blogs/ackerman](http://www.carilionclinic.org/blogs/ackerman). She has two young grandsons.

## 1980s

### Priscilla Bade, MD 87

Bade is a professor of internal medicine at Sanford School of Medicine at the University of South Dakota and medical director of both the Hospice of the Hills and Golden Living Bella Vista in Rapid City SD. She coordinates an interdisciplinary palliative care course for medical and nursing students and was a finalist for Medical Director of the Year from Golden Living District 4.

## 1990s

### Cheryl Whitaker, MD 93

Whitaker was appointed chief medical officer of Merge Healthcare. She also was appointed by Governor Pat Quinn to the board of directors of the Illinois Health Information Exchange Authority.

### Thomas Allen, MD 97

Allen is an assistant professor of pediatrics at the University of Central Florida/ Nemours Children's Hospital. His pastimes include traveling and skiing in Austria.

## 2000s

### Edward Miner, MD 02

Miner is an interventional cardiologist at Utah Heart Clinic in Salt Lake City UT. He has five children and enjoys playing basketball, skiing and teaching his children. Though he no longer lives in St. Louis, he is still a Cardinals fan.

## IN MEMORY

### Bernard Adler, MD 37

Adler died April 14, 2011. He was 97.

### Jerome Madden, DE 42

Madden died April 19, 2011. He is survived by five children, five grandchildren and many friends.

### John Martz, MD 42, HS 47

Martz, 95, died April 6, 2012. He served as a captain in the U.S. Army Medical Corps treating the wounded on the front

lines in World War II. He retired in 1985 after 37 years as a pediatrician and as an associate professor of clinical pediatrics at Washington University School of Medicine.

### Virginia Peden, MD 47

Peden died May 28, 2011. She is survived by a brother, four children and six grandchildren.

### Thomas Zaydon Sr., HS

Zaydon died Jan. 12, 2012. He was former chief of plastic surgery at Miami Heart Institute, St. Francis, Mount Sinai and Mercy Hospital and received numerous civic, religious and professional awards. He is survived by eight children, seven grandchildren, numerous nieces and nephews, and many other close family members, friends and colleagues.

### Noah Susman, LA 48, MD 52, HS 55

Susman, who died March 1, 2012, was professor emeritus of clinical radiology at Washington University School of Medicine and a former chief of radiology at Jewish Hospital of St. Louis. He had been president of the Vaad Hoeir of St. Louis, the founding president of Block Yeshiva High School, a founding member of Young Israel Synagogue of St. Louis, and a former board member of the Jewish Federation of St. Louis. Susman is survived by his wife, four children, and many beloved grandchildren.

### William Sawyer, MD 54

Sawyer, 82, died March 20, 2012. He served nine years in the U.S. Army followed by years of research and teaching at Johns Hopkins University School of Medicine, Mahidol University in Bangkok, Thailand, and Indiana University School of Medicine in Indianapolis. He was dean of the medical school at Wright State University in Dayton OH. He was president, until his retirement in 1997, of the China Medical Board of New York, a foundation that supports research and education in medicine, nursing and public health in East and Southeast Asia. He was only the second American to be awarded the China Health Medal for his work in China. This was presented in a ceremony in the Great Hall of the People in Beijing. Sawyer is survived by his wife, two children and six grandchildren.

**Lois Gasteyer, NU 55**

Gasteyer died Feb. 16, 2012, at age 77. She was married to **Theodore Hall Gasteyer II, MD 57**, for 54 years. She was active in multiple community organizations, including school PTAs and the Christ Hospital Women's Auxiliary. She served on the Oak Lawn Library Board and was instrumental in the establishment of the Oak Lawn Library Educational Foundation. She is survived by her husband, two children and four grandchildren.

**George Koehler, MD 58**

Koehler died Jan. 24, 2012, at age 80. He specialized in internal medicine and was on the staff of St. Luke's Hospital. He loved playing golf and embraced the study of the German language with a passion. He is survived by his wife, two siblings, two children and two grandchildren.

## FACULTY

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**Michael J. Welch, PhD**

Welch, a pioneering radiochemist, died May 6, 2012. He was 72. He joined the Washington University faculty in 1967, and was professor of radiology, of chemistry, of biomedical engineering and of developmental biology. He was the founding leader of the Oncologic Imaging Research Program at the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine and a member of the cancer center's senior leadership. He was elected to the Institute of Medicine and received many of his field's highest honors, including the Benedict Cassen Award from the Society of Nuclear Medicine. In 2008, the society named its award for outstanding contributions to radiopharmaceutical research after Welch.

**If you wish to make a tribute gift in honor of any of the above alumni or faculty,** please contact: Pamela Buell, Washington University Medical Alumni and Development, Campus Box 1247, 7425 Forsyth Blvd., Suite 2100, St. Louis MO 63105-2161, (314) 935-9691.

**Emeritus • 1953 • 1958 • 1963**

**• 1968 • 1973 • 1978 • 1983**

**• 1988 • 1993 • 1998 • 2003**

## Mark your calendar!

Make plans to return for the fun and excitement of Reunion! Catch up with classmates and learn what's happening at the School of Medicine.

**Welcome reception**

**CME programming**

**Dean's luncheon**

**School updates and tours**

**Class dinners and photos**

**Activities around St. Louis**

**Reunion awards banquet**

**And more fun!**

**Questions? Want to join your Reunion Committee?**

**medicalalumni@wustl.edu**

**314.935.9682 or 877.816.2586**

# April 25–28

# REUNION

## 2013



advancing health

*Together*

transforming lives

**Leading together**, the Washington University community defines the forefront of medical innovation — advancing human health, preparing tomorrow's leaders, and enriching the quality of life. A simple yet significant way to support these efforts is by making a planned gift through your will, trust, life insurance, IRA, or qualified retirement plan.

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**Together, we can change lives!**

For information on supporting the School of Medicine through an outright gift, contact:

Pamela Buell, Associate Vice Chancellor for Medical Alumni and Development

(314) 935-9698 email: [meddev@wustl.edu](mailto:meddev@wustl.edu)

LEADING *Together*

The Campaign for Washington University

*Consult with your legal or tax advisor before making a charitable gift.*

Poster session in the Farrell Learning and Teaching Center.

## Transformation

Pipette tip packaging found new meaning as sculpture created by Material Monster, a student group focused on materials reuse and education. Caitlin E. Lee, an undergraduate fine arts major and founder of the group, and Susan Q. Shen, a graduate student in neuropathology, collaborated with artist Catherine A. Leberg and other Washington University students in the effort. To learn more, visit [outlook.wustl.edu](http://outlook.wustl.edu).



Washington University School of Medicine  
Office of Medical Public Affairs  
Campus Box 8508  
4444 Forest Park Ave.  
St. Louis, MO 63108

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