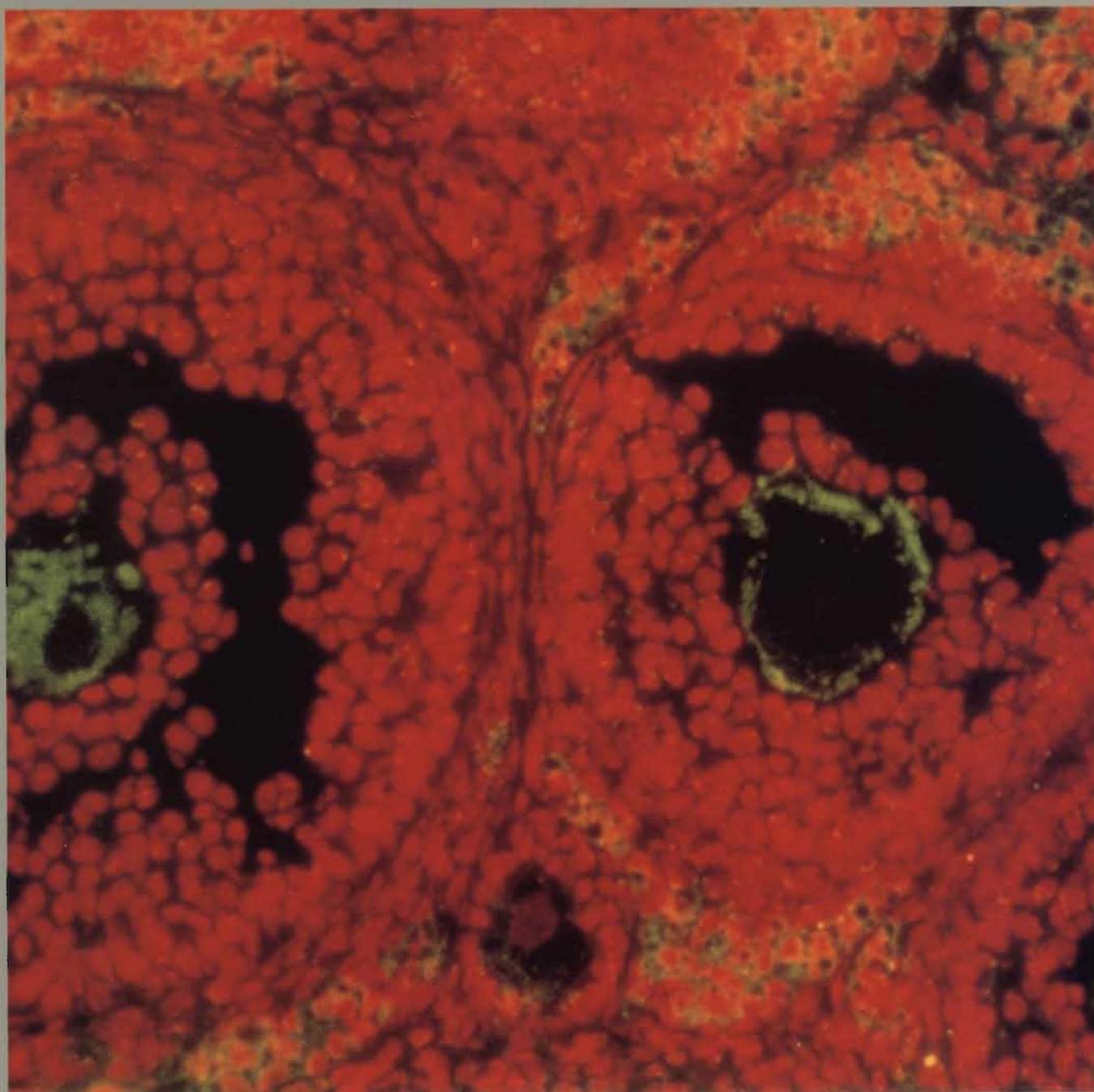


# Outlook

Washington University School of Medicine

Summer 1997



Campus Integration • **Gynecologic Research** • ACES Program



But it looks so easy. So thought Holman Middle School student Mike Derby, second from left, as he missed his nose in a kinesthesia demonstration during the annual Brain Awareness Week at the St. Louis Science Center. Derby's classmates, from left, Emily Richmond and Emily Linders (back), third-year medical student Alex Yuan, and classmates Ryan Fitzpatrick and Nick Prospero look on. Sponsors for the March event included the School of Medicine, the science center and BJC Health System.

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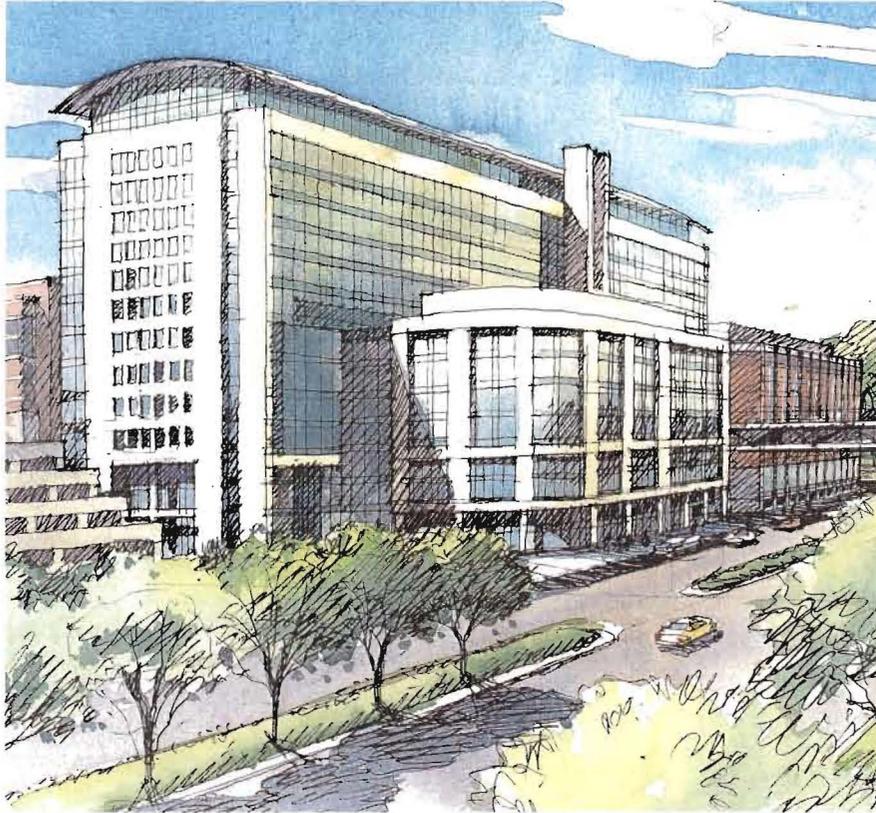
C I R C U L A T I O N

# Outlook

Washington University School of Medicine



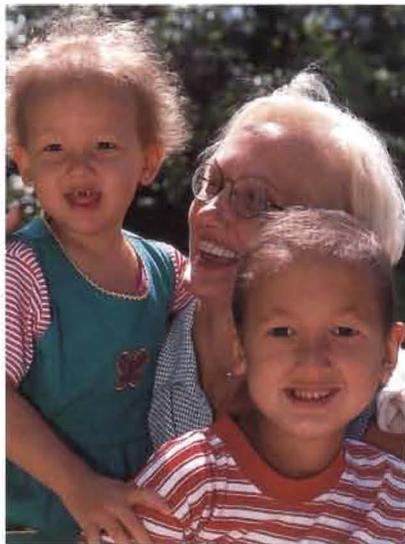
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## THE COVER

Immunofluorescence techniques have been applied to localize endothelial nitric oxide synthase (eNOS) in sections of rat ovaries during follicular development. The areas of yellow-green fluorescence on the surfaces of rat eggs indicates the presence of eNOS, which, until now, had not been identified. The study to determine the role of nitric oxide in ovarian physiology was conducted by Albina Jablonka-Shariff, PhD. For more on her work and that of other young investigators in obstetrics and gynecology, turn to page 16.



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## Cooper Directs Cardiothoracic Surgery

**J**OEL D. Cooper, MD, Joseph C. Bancroft Professor of Cardiothoracic Surgery, has been named director of the division of cardiothoracic surgery.



Joel D. Cooper, MD

Cooper serves as chief of thoracic surgery at Barnes-Jewish Hospital. He is a renowned lung surgeon whose pioneering techniques have led to marked progress in the treatment of lung disease. Cooper completed the first successful

single-lung transplant and the first double-lung transplant. He also developed lung volume reduction surgery, an operation that greatly improves the breathing capacity of emphysema patients.

An author or co-author of nearly 300 scientific articles, Cooper has served on many medical advisory and editorial review panels in the surgical field. Recently, he was named the recipient of the Jacobson Innovation Award from the American College of Surgeons, an award that honors living surgeons who have developed new surgical techniques.

Cooper succeeds James L. Cox, MD, the Evarts A. Graham Professor of Surgery, who is now chief of the Section of Cardiothoracic and Vascular Surgery and director of the Georgetown Cardiovascular Institute at Georgetown University Medical Center. As director of the division of cardiothoracic surgery at the School of Medicine for the last 14 years, Cox built a program with an international reputation and recruited outstanding faculty for the division. ●

## Zorumski Named To Head Psychiatry

**C**HARLES F. Zorumski, MD, has been named head of the Department of Psychiatry and psychiatrist-in-chief at Barnes-Jewish and St. Louis Children's hospitals.

Zorumski replaces Samuel B. Guze, MD, who headed the department from 1975 to 1989 and again from 1993 to the present. Guze, who will remain the Spencer T. Olin Professor of Psychiatry, is stepping down to teach and continue his research.

A professor of psychiatry and neurobiology at the School of Medicine, Zorumski is a renowned expert on depression and its treatment. His clinical research involves examining the safety and efficacy of electroconvulsive therapy (ECT) in patients with psychiatric disorders.

He is particularly interested in synaptic transmission and the ways that brain cells communicate in the hippocampus, a brain region important to learning and memory. Zorumski is a noted authority on the phenomenon known as long-term potentiation, a natural process in the hippocampus that enhances cellular communication. His lab is one of only a few in the world specializing in this area.

Zorumski conducted research as a Klingenstein Fellow in the Neurosciences from 1987 to 1990. In 1996, Woodward/White Inc., listed him in its book, *"Best Doctors in America,"* based on surveys of specialists asked to rate the clinical abilities of their peers. ●

## 'For Humanism In Medicine'



Kenneth M. Ludmerer, MD

**K**ENNETH M. Ludmerer, MD, professor of medicine and of history in Arts and Sciences at Washington University, has received the Nicholas E. Davies Memorial Scholar Award for "outstanding contributions to humanism in medicine," presented by the American College of Physicians.

In addition to practicing and teaching internal medicine, Ludmerer studies the history of medicine and medical education. His research into medicine's past has given him insights into today's problems.

Ludmerer gained national attention in 1985 with his book, *"Learning to Heal,"* which looked at the history of medical education in America. He has expanded on that topic with his upcoming book, *"American Medical Education in the Twentieth Century,"* to be published in the spring of 1998.

The new book grew from Ludmerer's fear that the managed-care revolution may dismantle the education system that has served America well for the last 100 years. If teaching hospitals become driven to produce doctors economically and efficiently, the doctors may not have the opportunity to develop the skills, responsibility and compassion needed to care for patients, he says. ●

## DBBS Recognizes Students

**T**WO students in the Division of Biology and Biomedical Sciences have been recognized for outstanding achievements in biomedical research.

Peter Nichol, MD, PhD, received the 1997 Needleman Award at the School of Medicine's commencement in May, and Jennifer Ostrom Liang, who is in her final year of PhD research, has just received the 1997 Jakschik Award.

Nichol, who was in the University's Medical Scientist Training Program, studied interactions of herpes simplex virus with neurons and the mechanism of herpes latency and reactivation in the laboratories of Eugene M. Johnson, Jr., PhD, and Paul D. Olivo, MD, PhD. Nichol begins a residency in urology this summer at the University of Virginia.

Liang's work, conducted in the laboratory of Stuart Kornfeld, MD, helps to explain the role that a protein called ARF1 plays in cell trafficking, the complex process cells use to shuttle materials from one part of a cell to another. Cell trafficking is essential for a host of vital jobs, from destroying invading organisms to pulling nutrients from the blood. ●

## Surgical Society Elects Kodner

**I**RA J. Kodner, MD, professor of surgery, has been named president of the American Society of Colon and Rectal Surgeons (ASCRS). He assumed the presidency after an election at the annual meeting in June 1997.

Kodner, who directs the section of colon and rectal surgery at the Medical Center, has been a member of ASCRS since 1978. He has served on the ASCRS executive council for five years, and was secretary from 1992-96. ●

## Pediatric Hematology/Oncology To Be Directed By Wilson

**D**AVID B. Wilson, MD, PhD, assistant professor of pediatrics, has been named director of the division of pediatric hematology/oncology.

Wilson succeeds Alan L. Schwartz, MD, PhD, Alumni Endowed Professor and head of the Department of Pediatrics and pediatrician-in-chief at St. Louis Children's Hospital, who has served as division director since 1986.

In his research, Wilson, a hematologist and an assistant professor of molecular biology and pharmacology, tries to understand factors involved in human embryonic yolk sac and heart development. His team has identified GATA-4, a factor that

appears to be an important regulator of both. They found that when GATA-4 is deleted from tissue, there are abnormalities in development of the yolk sac and heart. The research should provide insight into the genes involved in normal and abnormal human development.

Wilson, a pediatrician at Children's Hospital, graduated from the Medical Scientist Training Program at the School of Medicine in 1986. While in the seven-year program, he worked with Philip W. Majerus, MD, in the division of biochemistry and molecular biology, and contributed greatly to the field of second-messenger signaling. ●

## AOA Fellowship Recipient



Ali Husain, center, a second-year medical student, received the Alpha Omega Alpha Student Research Fellowship from John D. Davidson, MD, left, Alpha Omega Alpha Councilor, and S. Bruce Dowton, MD, associate dean for medical education. Husain will use the \$3,000 award to conduct an original research project this summer in the laboratory of Samuel L. Stanley, Jr., MD, associate professor of medicine and of molecular microbiology. Husain was one of 36 fellowship recipients nationwide.

## School Launches Residency Program For Emergency Medicine

**T**HIS summer, 10 residents will inaugurate a new School of Medicine residency program in emergency medicine. The program, the first of its kind in the region, will help establish the medical school as a premier center for emergency care and research.

Dane Chapman, MD, PhD, associate professor of medicine and director of the program, joined the School of Medicine in 1996 to help start the new program. "I saw that the potential here was just phenomenal for establishing one of the best emergency residency programs in the country," he says.

Residents from several specialties currently serve short rotations in



Dane Chapman, MD, PhD



Lawrence Lewis, MD

the emergency department, but Chapman says several months is not enough time to learn many of the subtleties of emergency medicine. "The standard of care will improve, because emergency medicine residents will have a chance to

fine-tune their responses to the serious injuries and diseases they see," says Chapman.

Residents in the four-year program will spend about half of their time treating patients in an emergency department at either Barnes-Jewish or Children's hospital or a private hospital. In addition to attending five hours of academic conferences each week, the residents also will rotate in

specialties such as trauma, orthopaedics, toxicology and pediatrics.

Lawrence Lewis, MD, associate professor of medicine and chief of the division of emergency medicine, says the new program is a long-awaited reward. For more than a decade, he has wanted to help start an emergency residency program in St. Louis. He came to the School of Medicine in 1994 hoping to achieve that goal.

"The St. Louis area has a low number of residency-trained emergency physicians, and Missouri as a whole has an exceedingly low number," Lewis says. "We realized that there's a definite need for the program — both for the metropolitan area and for the state."

Until recently, almost all emergency medicine residency programs were based in county and community hospitals. Now that academic centers such as the medical school are starting programs of their own, Lewis says he expects to see a flurry of advances in emergency medicine. "Establishing a program at an academic institution of this stature gives us the opportunity to do world-class research and attract high-quality people to the specialty," he says. ●

## A Night At The Ballpark



Tempering their St. Louis Cardinal baseball fever, second-year medical students Ali Husain, Daalon Echols, Patsa Hungspreugs and Mark Walsh share a light moment at Busch Stadium during an early season game between the St. Louis Cardinals and the Houston Astros. The outing was sponsored by the Erlanger-Graham Society, one of three academic societies that enable students and faculty to socialize outside of the classroom.

## Spreading The Word About AIDS

**T**O increase awareness about HIV and AIDS, a group of 30 students from the School of Medicine took part in the eighth annual St. Louis AIDS Walk on May 4.

The group, which included students from the occupational therapy and physical therapy programs as well as medical students, was organized by second-year medical student Tracy Tomlinson. Tomlinson will be a coordinator for the STATS program (Students Teaching AIDS To Students) next year, and says she thought it was important that the medical school be represented at the AIDS awareness event.

The 24-block pledge walk began at Kiener Plaza downtown and raised \$230,000 for local AIDS/HIV education programs. Since the annual walks began in 1990, more than \$1.2 million has been distributed to local AIDS education and caregiving programs.

STATS, which is in its eighth year at the medical school, involves medical students visiting middle school classrooms to discuss HIV and AIDS prevention. The high-

light of the two-day program is a candid talk from an individual living with HIV/AIDS. The program currently works with three St. Louis area middle schools, but Tomlinson says organizers hope to take the program into six middle schools next year. One limiting factor, however, is the number of students available to volunteer as STATS teachers.

"We hope to recruit more students from the occupational therapy and physical therapy programs to become STATS volunteers," says Tomlinson. "With more student volunteers, we can take STATS into more schools and help school children learn how to live in a world where HIV and AIDS exist."

The World Health Organization estimates that as of mid-1995, more than 18 million adults and 1.5 million children worldwide had become infected with HIV since the virus first was discovered. Each day, an estimated 5,000 persons become infected with HIV. AIDS is now the No. 1 killer of men and women aged 25 to 44. In the city of St. Louis alone, there were 3,196 AIDS cases reported as of June 1996. ●



Second-year medical students, from left, Eyad Hanna, Natalie Fowler, Bimal Desai and Tracy Tomlinson, who will be STATS coordinators for 1997-98, took part in the 8th annual St. Louis AIDS Walk in May.

## A Surgeon With Indomitable Spirit



Jessie L. Ternberg, PhD, MD, right, visits with Cristina Ferrone, MD, who was awarded the first annual Ternberg Award at graduation in May.

**T**O honor Jessie L. Ternberg, PhD, MD, professor emeritus of pediatrics and pediatric surgery, former pediatric surgical residents and colleagues have established an award in her name.

The award, which will be presented annually, will go to a woman graduate who best exemplifies Ternberg's "indomitable spirit of determination, perseverance and dedication to her patients." This year's recipient, Cristina Ferrone, MD, graduated from the School of Medicine in May. She currently is doing a residency in general surgery at Massachusetts General Hospital.

Ternberg, who retired from clinical practice one year ago, is a 1953 graduate of the School of Medicine and was the first woman surgical intern here in 1954. In 1958, Carl Moyer, MD, then head of the Department of Surgery, named Ternberg chief resident, at a time when many surgical programs around the country still were routinely not open to women.

More than 20 years passed before another woman followed in Ternberg's footsteps. During that time, Ternberg built a remarkable career, becoming assistant professor of surgery in 1962 and full professor and chief of the division of pediatric surgery in 1972. ●

## Imposter Molecule Stops Osteoporosis In Rats

**R**ESearchers at the School of Medicine and G.D. Searle Corp. have found that a compound created by Searle protects rats from osteoporosis.

The manmade compound blocks a process that is crucial to the onset of osteoporosis, a disease that leaves 20 million Americans, mostly postmenopausal women, with severely weakened bones. The compound's success was described in the May 1 issue of the *Journal of Clinical Investigation*.

Steven Teitelbaum, MD, the Wilma and Roswell Messing Professor of Pathology, was senior author of the study.

The researchers tested the compound, patented by Searle, on female rats that had their ovaries removed. Like women undergoing menopause, the rats became vulnerable to osteoporosis through the rapid loss of female hormones. The disease struck them with amazing speed, consuming between 30

percent and 50 percent of their bone density in just six weeks. Rats treated with the compound, however, retained their bone density throughout the study.

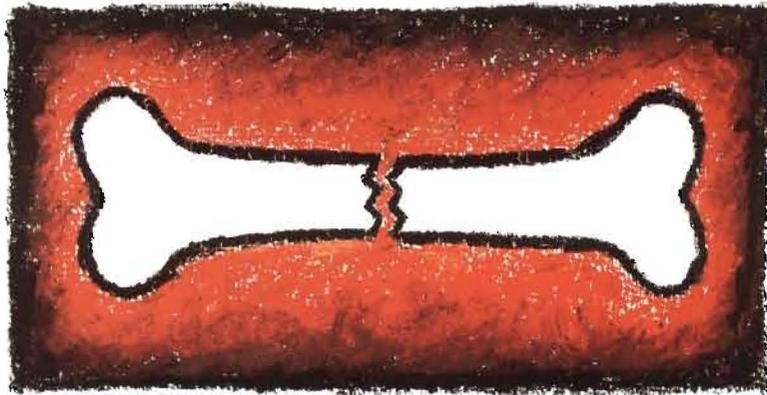


Illustration by Chris Callan

The compound works by fooling the cells that break down bone. These cells, called osteoclasts, attach themselves to bone and release acid that dissolves bone cells. This seemingly hostile act actually helps bones stay healthy by clearing away old bone. But an oversupply of osteoclasts can destroy too much bone, leading to osteoporosis.

Teitelbaum's lab recently discovered that osteoclasts need to

adhere tightly to bones, using molecules called integrins for glue. But integrins, which sit on the surface of the osteoclast, only stick to certain molecules on a bone's surface.

The researchers realized they might be able to stop osteoporosis if they could make it difficult for osteoclasts to attach to bones. The solution: tricking the integrins with an imposter. Searle researchers developed a compound that looks like the sticky molecules on the surface of bones.

When they injected it into rats, many of the osteoclasts stuck harmlessly to the compound instead of to bone. The ruse worked, and none of the rats developed osteoporosis.

Although the results are exciting, Teitelbaum says the compound is not the final cure for osteoporosis. "I don't think any single therapy will work for everybody," he says. "We're constantly looking for other ways to stop the disease." ●

## Unnecessary Victims: More Poor And Rural Children Die In Fires

**A** NEW study by researchers at the School of Medicine shows that children in poor areas are six times more likely than other children to die in a fire, and that children in rural areas are almost three times more likely than children in cities to die in a fire.

The researchers examined the death certificates of all Missouri children who died in household fires between 1990 and 1995. In rural areas, about nine in every 100,000 children under age 5 died in a fire each year, compared with just over three fire-related deaths per 100,000 young children in the cities.

"Fire is one of the leading

causes of death among children, particularly children under the age of 5," says Nancy Wick, MD, a post-doctoral fellow in pediatrics at the School of Medicine and the study's lead researcher.

Wick suspects that unsafe housing is the main cause of the high death rates in both poor and rural areas. She says children in low-income neighborhoods often live in old houses with dangerous heating, such as space heaters and wood stoves. And many children in rural areas live in mobile homes, which can burn quickly and often have only a single exit. Wider use of smoke detectors in all types of

housing would probably lower the death rate, Wick says.

In a previous study, Wick and other researchers found that the fire-related death rate for children in Missouri was twice the national average. Other states in the south and Midwest that have high death rates include Illinois, Oklahoma, Alabama and Mississippi. Wick says these states probably also can trace their death rates to unsafe heaters, mobile homes and old, wooden housing.

In future studies, Wick plans to compare death rates to the causes of the fires, the type of housing, the amount of adult supervision and the use of smoke detectors. ●

## Breathing Easy A Little Longer

**A**N operation that removes large pieces of diseased lungs gives some emphysema patients at least two years of easier breathing.

In one of the longest follow-up studies ever reported on the subject, School of Medicine researchers found that patients who had lung volume-reduction surgery maintained improvement in stamina and breathing two years after surgery. Before surgery, 40 percent of the patients needed bottled oxygen 24 hours a day. Only 9 percent of the patients needed continuous oxygen two years after the surgery.

Emphysema robs lungs of their elasticity, making it difficult for patients to breathe in and out. Lung

volume-reduction surgery removes the most damaged portions of the lungs, allowing them to regain some of their elasticity and have more room to inflate.

Researchers followed the first 42 end-stage emphysema patients to receive lung volume-reduction surgery. Joel D. Cooper, MD, director of the division of cardiothoracic surgery, developed the modern procedure in 1993.

Researchers tested each patient's breathing, stamina and oxygen levels before surgery, one year after surgery and two years after surgery. Most patients showed some deterioration over the two years but remained far better off than they were before surgery. ●

## A Heavy Heart May Lead To Heart Attack

**I**NVESTIGATORS from the School of Medicine have found that depression may interfere with the heart's normal rhythm and can put people at an increased risk for heart attack and premature death.

Phyllis K. Stein, PhD, research instructor of medicine, says that depression appears to affect the heart's rhythm, and more severe depression has a greater adverse effect. Working with Robert M. Carney, PhD, professor of medical psychology in psychiatry, Stein has found that severe depression is associated with a significant reduction in a measurement called heart rate variability, which is the heart's response to normal body fluctuations such as blood pressure, breathing and body temperature.

Stein studied 70 patients with documented coronary heart disease and found that 39 also were depressed and had slightly higher heart rates and less heart rate variability. She compared 19 of the patients who had moderate to severe depression to the other 20 whose depression



*Robert M. Carney, PhD, and Phyllis K. Stein, PhD*

was mild to moderate. The more severely depressed patients had significantly lower heart rate variability than those with mild to moderate depression, she found.

The researchers believe severe depression may affect the autonomic nervous system, which controls heart rhythms, perhaps by changing the normal secretion of stress hormones. They now are studying whether high stress hormone levels can explain the increased risk of heart attack and premature death. ●

## The Question Of A PSA Safety Zone

**P**HYSICIANS who use the prostate-specific antigen (PSA) test to screen for prostate cancer have long held to the rule that if the PSA in a man's blood is less than 4 nanograms per milliliter and the digital rectal exam is normal, he doesn't need to be biopsied for cancer.

But a new School of Medicine study shows that doctors who follow this rule may be missing many more cancers than previously thought. Researchers biopsied 332 men who had PSA levels between 2.6 and 4 and found that a surprising 22 percent of them had prostate cancer. The findings were reported in the May 14 *Journal of the American Medical Association*.

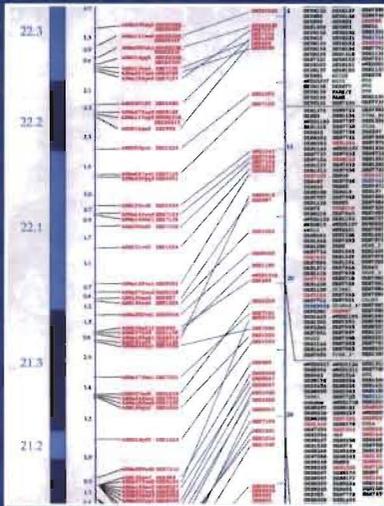
The study underscores the need for yearly PSA tests, particularly for men over 50, says William Catalona, MD, professor of surgery and head of the division of urologic surgery. He says a safe reading of 1 or 1.5 could easily rise to a suspicious reading of 2.6 or 3 in a year's time.

Catalona says previous studies have hinted that the PSA cutoff needs to be lowered. In 1995, a study by Harvard researchers showed that men with PSA levels of 2.6 to 4 were six to nine times more likely to eventually develop prostate cancer compared with men who had PSA levels below 1.

In May 1995, Catalona began recommending biopsies for all of his patients with PSA levels of 2.5 or higher. Out of 914 patients at the School of Medicine, 582 declined the biopsy, often because other doctors had told them that any reading under 4 was safe. "The cutoff of 4 is very well-established in the medical community," Catalona says. "It will be very difficult to change that."

A lower cutoff may be particularly important for black men, since they have a 40 percent higher incidence of prostate cancer, Catalona says. ●

THE  
BOOK  
OF



Scientists Reach  
A Milestone In  
Genetics With  
A Detailed  
Chromosome Map

BY LINDA SAGE

**M**ost parents revel in the arrival of their children's first teeth. But Martha Sakuma of St. Charles was ecstatic when her daughter, Shelby, cut a single lower tooth. For Shelby, like her mother, brother, grandmother, a cousin, an aunt and an uncle, inherited the gene for ectodermal dysplasia, a disorder that affects tooth, hair and sweat gland development. Shelby, now 2, is the only affected family member who has a lower front tooth.

Ectodermal dysplasia is linked to X, one of the chromosomes that carry our genes. Other X-linked disorders include hemophilia, color blindness and fragile X syndrome — a common cause of mental retardation.

Chromosome X determines gender — women have two copies and men have one X and one Y. Therefore, women who inherit a faulty X gene may still have one normal version. But because men don't have this extra copy, they are likely to exhibit disease — or have more severe symptoms. Six-year-old Colbei Sakuma, for example, has more symptoms of ectodermal dysplasia than his sister or mother.

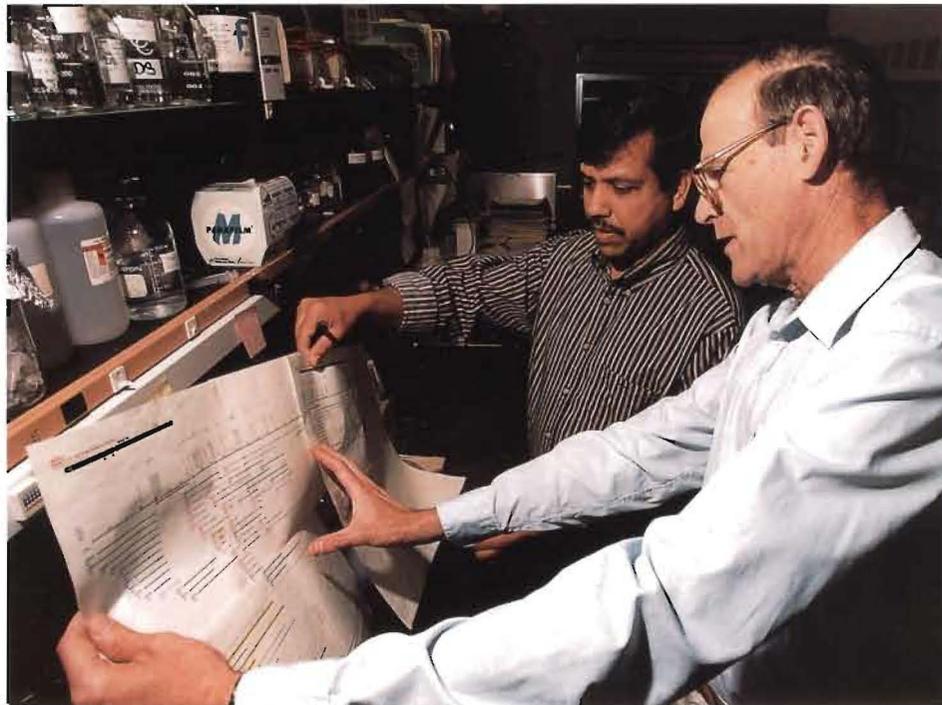
X's tendency to cause disease made it a prime target for David Schlessinger, PhD, director of the Center for Genetics in Medicine. By producing a detailed map of X, he has added a milestone to the history of genetics. The project also helped launch the Human Genome Project — the international quest to decipher all of human DNA.

By the year 2005, the Human Genome

Project aims to record the entire sequence of the chemical "letters" in genes, their regulators and the rest of the DNA in human chromosomes. The information will help scientists determine the functions of the genes that transform us from fertilized eggs to senior citizens. And because malfunctioning genes cause disease, it should lead to new ways of managing inherited disorders. Some scientists even predict it may change surgeons into genetic engineers who reactivate long-dormant genes to replace diseased or severed parts of the body.

The Human Genome Project was launched in 1990, but its foundation was laid long before, by Schlessinger and other scientists who use chromosome maps to get their bearings as they analyze minute fragments of DNA. Without knowing where each piece belongs, they would end up with genetic gibberish instead of a correctly ordered sequence.

But when Schlessinger first requested funds to make a detailed map of X, his peers were caustic. It's only mapping, was one reviewer's comment.



David Schlessinger, PhD, right, and Ramaiah Nagaraja, PhD, review a segment of the recently completed X chromosome map, the most detailed map of X to date.

## The Impossible Becomes Possible

**A** grant from the James S. McDonnell Foundation in 1987 enabled

Schlessinger's group to prove that detailed mapping was feasible. Then, like the foolhardy pioneers who explored the American West, they set out to chart landmark features.

Ten years and two multi-million dollar federal grants later, Schlessinger holds the map, which was published in the March issue of *Genome Research*. Ramaiah Nagaraja, PhD, research instructor in molecular microbiology, was the paper's lead author. He was instrumental in converting the laboratory data into an internally consistent product.

The map has 2,100 unique landmarks — three times as many as any previous X chromosome map. If it were a road map from St. Louis to San Francisco, it would show a

marker every mile.

X's DNA is one long double helix — 160 million nucleotide base pairs. On average, the new map has a landmark every 75,000 base pairs. The national goal for chromosome mapping is one landmark every 100,000 base pairs.

Unlike someone mapping a road who could drive along the route and record landmarks in

sequence, the researchers had a much more difficult task. They started with more than 5,000 fragments from seven different libraries of human DNA. They then identified unique landmarks on the fragments. If two pieces contained the same landmark, they knew the fragments must overlap. By painstakingly aligning all the pieces of DNA, they mapped the entire length of X.

A method for cloning large pieces of DNA made this jigsaw puzzle manageable. In the 1980s, David T. Burke, then a graduate student in the laboratory of Maynard V. Olson, PhD, invented the yeast artificial chromosome or YAC. "David was in his third year of a molecular genetics project that was going well, when he did what all students are told not to do — start another project," recalls Olson, who now is a professor of medicine and genetics at the University of Washington in Seattle.

Six months of after-hours experiments proved Burke's idea valid. So with funding from the Monsanto Co., he developed the YAC system that now is used throughout the world. Burke since has moved to the University of Michigan.

A YAC contains a segment of, say, human DNA and structures that make it behave like a yeast chromosome. As yeast cells divide,

they copy the artificial chromosome over and over, generating sufficient DNA for analysis. "Because each YAC can contain hundreds of thousands of base pairs, a reasonable number of YACs fit along a chromosome," says Schlessinger, who also is a professor of molecular microbiology, genetics and medicine. "Before YACs, we could clone less than one-tenth as much DNA in a single piece."

Buddy H. Brownstein, PhD, research assistant professor of genetics and the center's assistant director, organized the first YAC library of human DNA. With colleagues at the center, he also showed that it was possible to recover YACs with human-specific markers. At the time, however, technology was slow and cumbersome, and mapping by that method would have taken many years.

Defining mapping landmarks that could be verified easily and used by anyone in the world was another key development. Olson, who used to copy maps from atlases as a child, had mapped yeast DNA since arriving at the School of Medicine in 1979. "I realized the mapping methods we had used for this simpler organism would be inadequate for building huge mammalian chromosome maps," he says.

In 1990, he and Eric D. Green, then a postdoctoral fellow at Washington University, unveiled a strategy to use the polymerase chain reaction (PCR) — an enzymatic method for copying specific DNA sequences — to locate short, unique segments within YACs.

These snippets of about 300 base pairs — called sequence-tagged sites (STSs) — could act as landmarks on chromosome maps the way highway exits and rest areas punctuate road maps, the researchers reasoned.

"You get small fragments of X and sequence them and make primers for unique STSs," Schlessinger says. "Then you use these primers in PCR reactions and test them to determine which YACs contain a particular STS sequence. The cleverness of this system is that it automatically gives you the landmarks and the map at the same time."

The use of PCR turned a slow and cumbersome process into a viable method. "It really made mapping take off," Brownstein says.

Rather than conducting a random search for YACs that contained the same STS, Schlessinger and colleagues used a technique called chromosome walking to systematically work their way along the DNA and align sequential fragments. "We started out with a selection of YACs and made STSs from the ends of those clones," Schlessinger explains. "Then we kept screening all the other clones to find the next one. More than 1,500 screenings were required."

Such work, if done by hand, would be drudgery. But Brownstein's unit, which maintains all of the human DNA libraries, screens YACs and improves screening methods, uses a robotic workstation designed by Volker Nowotny, PhD, research assistant professor of genetics. This automated system can accomplish in two weeks what used to take a whole summer. It includes a choreographed "pogo stick" that dips pipettes in and out of tubes, a thermocycling unit for doing 576 simultaneous PCR reactions, and metal arms that open boxes and cast lids into the trash. "This robot has made the project succeed," Brownstein says. "It saves a small army of people from doing the same operations over and over again during every working day."

The center also had to develop new software to order and store the vast amount of data being produced. Philip P. Green, PhD, devised several programs, including SEGMAP, which has proved particularly valuable. "Every night, SEGMAP regenerated our map based on the day's new information," Schlessinger explains. "It showed us the order of



Buddy Brownstein, PhD, left, with Volker Nowotny, PhD, who designed the robotic workstation that rapidly analyzes fragments of DNA.

the YACs and their markers, telling us which data were ambiguous and which were certain.”

When Green moved to the University of Washington, David J. States, MD, PhD, director of biomedical computing and of biomedical engineering, became director of informatics. States also is associate professor of biomedical computing and director of the Institute for Biomedical Computing. The central role of computing in genome analysis has catalyzed the formation of a computational molecular biology program at Washington University.

## Some Surprising Findings

Only mapping” led Schlessinger’s team to some surprising findings. “When you construct a map, you make many discoveries that could not be anticipated,” Schlessinger says. “There’s a terrific kick in defining something that’s never been known before.”

The project’s completion has permitted the first comparison between a physical map and a genetic map of a chromosome. Genetic maps are constructed by studying the passage of traits from one generation to another. The closer two genes are on a chromosome, the less likely they are to get separated as chromosomes swap genetic material during egg and sperm formation. Distances on genetic maps can differ greatly from those on physical maps, however, because some regions of chromosomes recombine more often than others.

The genetic map of X has several hundred markers. When the researchers compared it with their map of X, they found an area in the middle that corresponds with a much longer stretch — 17 million



Martha Sakuma, center, and her daughter Shelby, and son Colbei, have inherited the gene for ectodermal dysplasia, an X-linked disorder that affects tooth, hair and sweat gland development.

## Locating Disease Genes

The project also enabled Schlessinger and colleagues to locate several disease genes as YACs containing the relevant regions of X became available. They found the gene for an overgrowth disorder called Simpson-Golabi-Behmel syndrome (Summer 1996 *Outlook*) and have mapped and are analyzing genes that prematurely halt ovarian function. They also were part of an international team that tracked down the gene for fragile X syndrome. “Without YACs, there would have been no way to find the DNA that covered that region,” Schlessinger says.

In 1996, the team found the gene for ectodermal dysplasia, the condition that affects the Sakumas. Other groups are now systematically locating genes along the map.

“Finding disease genes is not a quick fix,” says Robert H. Waterston, MD, the James S. McDonnell Professor and head of the Department of Genetics. “But it gives us an opening to deal with inherited diseases and conditions such as hypertension, cancer and heart disease that have genetic components.”

Waterston directs the Genome Sequencing Center, which is using the clones and map of X in sequencing human DNA. “The human genome is like a row of books on a shelf,” Waterston says. “Now that this map has marked the chapters in the book of X, our task is to decipher every letter.” ●

**Editor’s Note:** David Schlessinger, PhD, is moving to the Johns Hopkins/National Institutes of Health Bayview Campus in Baltimore MD. Beginning Oct. 1, he will direct the new Laboratory of Genetics at the National Institute on Aging.

base pairs — of the physical map. “This region is uneventful on the genetic map, whereas it contains a whole bunch of markers on the physical map,” Schlessinger says. “But we don’t know why the X chromosome should have this large area of poor recombination.”

He speculates that the answer may involve the X inactivation locus, which in women turns off most of the genes on one copy of X, leaving the other to direct biological activities. The region of low recombination is on X’s long arm, beginning near the X inactivation locus and ending at a distinctive region that also is seen on the Y chromosome.

The researchers were able to determine how the chemical composition of X varies along the chromosome, because the 2,100 STSs provide a representative sample of X’s DNA. Four types of nucleotides form the building blocks of DNA — A, C, G and T — and any sample contains as much A as T and as much C as G. For some unknown reason, regions that are rich in genes have a higher G+C content than noncoding regions. “We found a region near the end of the long arm that is very rich in G+C,” says Schlessinger. “Four other regions also had a high percentage. So the map has given us an early estimate of the relative density of genes across the chromosome.”

# Campus Integration

## A Game Of Three-Dimensional Chess

by Candace O'Connor

Even a world-class medical center can't afford to be complacent.

That's what officials at the School of Medicine and BJC Health System decided two years ago when they took a hard look at the Washington University Medical Center — and at the health care environment of the future. On campus, they found aging buildings and scattered services; outside, they saw a growing need for outpatient services in a competitive, cost-conscious health care world dominated by managed care.

"The Medical Center currently has 13 clinical departments and 55 divisions practicing in 32 different geographic locations. Our physical plant significantly limits our efficiency and ability to provide patient-focused care," says James P. Crane, MD, associate vice chancellor for clinical affairs at the School of Medicine and medical director for Barnes-Jewish Hospital.

Their solution? The Campus Integration Plan, a breathtaking blueprint for the future that will change the face of the Medical Center. Over the next 10 years, half of the existing buildings will be torn down, others will be renovated, and new, state-of-the-art structures will

go up, surrounded by landscaping, lighting and highway ramp improvements. And, these buildings will house programs that represent a bold new vision of health care, in which complementary services are clustered in "centers of excellence" for the convenience of patients and physicians.

"This is a remarkable opportunity for the School of Medicine," says Joan M. Podleski, assistant dean for clinical operations, who coordinates program planning for the project. "It's our chance to redesign how we practice, keep the things the same that make us what we are, and change those things that will help make us better."

"The Campus Integration Plan is the most exciting thing that has happened to the Medical Center since I have been here," says Barbara Monsees, MD, professor of radiology and chief of the breast imaging section, who serves on two planning committees. "Not only will it produce a beautiful new physical plant, but it also will foster interdisciplinary practice."

A key element of the plan, made possible by the Barnes-Jewish hospital merger in January 1996, is the consolidation of services at either end of the Medical Center.

Ultimately, all ambulatory care outpatient diagnostics and cancer care services will be located at the north end of campus, while complex inpatient medical and surgical care will shift to the south end. This realignment will eliminate duplication of services and reduce operating costs by more than \$20 million each year.

Reaching this point will require a three-stage approach. Phase I, due to begin this year and will be completed late in 2000, will include construction of an Ambulatory Care Center, a Cancer Center, a surgicenter for ambulant surgical cases and a 1,000-car parking garage on the north end of the campus. Along Kingshighway, on the south end, will be a new emergency, urgent care and trauma area served by a

*Looking south along Kingshighway is the proposed Emergency Department, Trauma Center and urgent care facility, which will be housed in the lower level of the southernmost tower and extend northward into the second tower (closest in the rendering). The first tower also will house a cafeteria and laboratories for patient care and clinical research. A 650-car parking garage for Children's Hospital employees will be tucked in between the towers.*



heliport and connected to a convenient parking garage. A new 150- to 200-room hotel at the corner of Euclid and Forest Park Ave. will service the entire Medical Center. The cost of Phase I, approximately \$225 million, will be financed by BJC through existing capital and operating revenues.

"The real benefit of the campus integration plan is that it brings together all of the various sites of care for adult patients in one location and creates centers of excellence, which further consolidate and focus these highly specialized treatment areas," says Fred E. DeWeese, director of design and construction for the School of Medicine, who has assisted with program planning for the project. "That should benefit both physicians who provide the care and patients who come to this facility to receive care by offering a higher level of efficiency and cost savings to all."

The work involved in planning this effort is mind-boggling, says Ken Kadel, project director for BJC

Design and Construction Services. In his group alone, three area managers and 10 project managers are assigned to the project. They are in daily contact with engineers, various consultants and a "dream team" of some 50 architects from three different firms — Hellmuth, Obata & Kassabaum, Inc., as the lead firm; Cannon, and Christner, Inc. — many of whom have set up shop on campus in the Etrick Building.

One of the most difficult parts of the process, he says, is the careful planning required to minimize disruption for staff and patients while this work goes on. In the next six months alone, they have to move 1,500 people, some to permanent locations and others to temporary offices nearby.

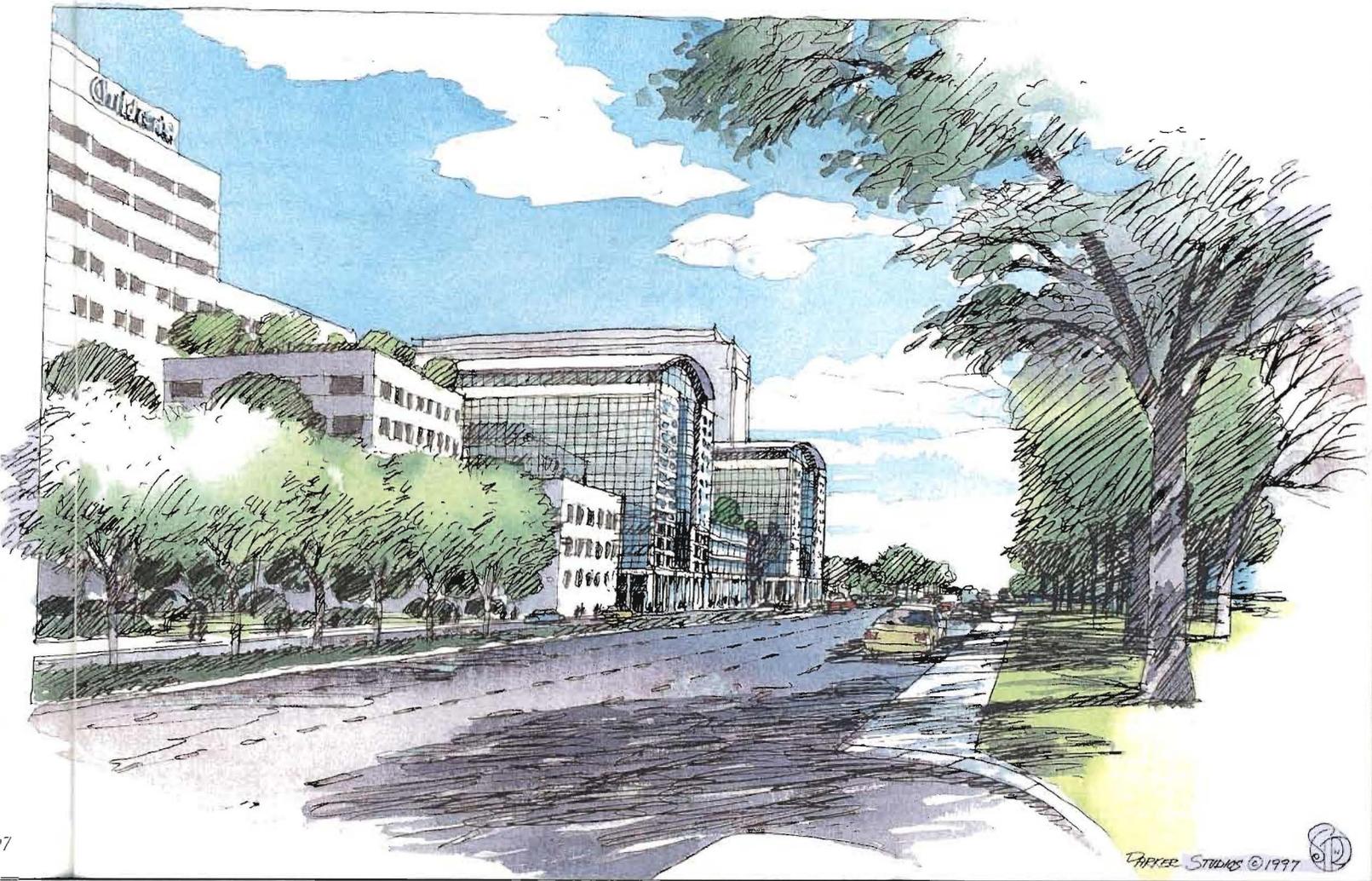
The whole thing, says Kadel, feels like a giant board game. "It's three-dimensional chess," he says. "You just have to keep thinking way ahead, because every move you make today has an impact on what you do down the road."

## A Look Back

More than 10 years ago, the School of Medicine and Barnes and Jewish hospitals each recognized independently that they needed a new, more consolidated approach to ambulatory care.

"Patients were pleased with the quality of their medical care. They liked their doctors and felt they were being treated very well," says Podleski. "What was getting in the way were some non-medical, service kinds of things, such as finding convenient parking or locating physicians' offices that are scattered all over the campus."

In 1995, a steering board was established with representatives of Barnes and Jewish hospitals, the School of Medicine and community physicians on the medical staff. The board, which met weekly for six months, had three goals: create a





Barbara S. Monsees, MD

single medical staff for Barnes and Jewish hospitals so physicians could access new services anywhere on campus; consolidate ambulant activities into a single, patient-focused site; and integrate inpatient activities in a way that maximized the quality and efficiency of their care. Out of that committee's work came a general concept whereby low acuity inpatient and outpatient activities would be moved to the north side of the campus. Conversely, the plan called for consolidating resource-intensive, complex inpatient care on the south end of the campus.

"Once the steering board had agreed upon this approach, the hospitals had a blueprint for rationalizing care on campus," says Crane. "It became evident, however, that unified governance and management would be required to really implement changes of this magnitude. That led to additional discussions that culminated in the merger of Barnes and Jewish in January 1996."

By the following March, the medical staffs also had merged. And a new committee, headed by Crane, had formed to devise a detailed master plan for the campus. Last August, they presented their plan to the boards of Barnes-Jewish Hospital and BJC Health System, which approved it; the School of Medicine also endorsed the proposal.

Since then, various committees — with members drawn from the School of Medicine, the hospital, BJC and the architectural team — have carried the planning effort for-

ward. A small group headed by Crane meets weekly to direct the project, while a larger core team gathers to provide input and discuss new plans. Hospital re-engineering and faculty practice plan teams also have been developing recommendations. And recently, 16 programming committees, with strong physician representation, were set up to look at detailed functional needs for areas identified in the master plan.

As the project moves ahead, physicians will continue to play a critical role in the planning process. At informational Town Hall meetings last fall, Podleski asked for volunteers to serve on the five re-engineering teams related to the faculty practice plan. More than 180 faculty members came forward.

"They have been spectacular," she says. "They are dedicated; they give their time generously, and they take this project very seriously. What's more, they are willing to think out of the box and to challenge traditional ways of doing things."

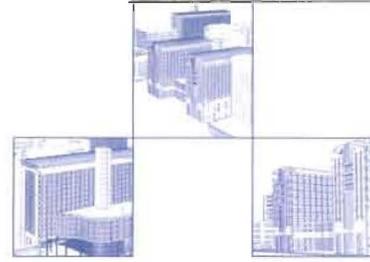
## Restructuring Outpatient Care

Currently, physicians provide cardiac outpatient care in five sites around campus. Other ambulatory services are similarly dispersed. So

when the Ambulatory Care Operations Design Team began meeting last November, it took a close look at ways to restructure outpatient treatment.

After five months of work, the team produced a plan that reflects an exciting, multidisciplinary approach to patient care. Closely related services — such as cardiology and cardiothoracic surgery — will be located side by side. Services that are often needed by the same kinds of patients will be clustered together.

"People with heart disease may also have lung disease, diabetes or



peripheral vascular disease," says Michael E. Cain, MD, Tobias and Hortense Lewin Professor of Medicine and director of the cardiovascular division, who co-chaired the 26-member Ambulatory Care Operations Design Team. "So it makes sense to group heart, lung, endocrine and vascular services together rather than follow the traditional model in which each service is located in a different place and there is duplication — sometimes triplication — of resources."

While patients should find this convenient, physicians will have some adjustments to make. The cardiac service of the Ambulatory Care Center, for example, will probably have a physician as medical director. But that director could be a cardiologist who has to lead fellow cardiologists along with cardiothoracic surgeons.

"That's a different paradigm than we've had in the past in which cardiothoracic surgeons focus vertically to the Department of Surgery chairman," says Daniel Cooper, executive director for the departments of surgery and obstetrics/gynecology, who also co-chaired the team. "These are challenging issues, and the Ambulatory Care Center symbolizes things that will be going on throughout the Medical Center."

It was tough to figure out which practices to combine into centers of excellence and which centers to cluster together, says Monsees, who served on the design team. "People had requests, but were they valid? Were they top priority? These were difficult decisions, but the team did a very good job."

*The 15-story Ambulatory Care Center will be built at the north end of the medical campus and will be adjacent to the eight-story Cancer Center. The Ambulatory Care Center will house medical office space for full-time and private practice physicians as well as outpatient diagnostic and support services.*

## Change In The Air

**B**eginning late this year, the public will start to see changes at the Medical Center. At the north end of campus, the Stix-Michaels

School, the Shoenberg Garage, the Central Medical Building and the Newman building at the corner of Parkview and Euclid all will come down. At the south end, the Barnes College of Nursing, the Children's Hospital Parking Garage and the Children's Annex also will be demolished. Early in the project, Kadel's group led a team of evaluators that ranked campus buildings according to their condition, focusing on such factors as seismic safety, efficiency and building system infrastructure. Some of the older buildings fared poorly in this process.

"If you go back and retrofit these older buildings to make them seismically correct, the floor height



*Michael E. Cain, MD*

is often not right for all the ductwork and utilities you have in today's health care environment," says Kadel. "So even if you spent the money to fix them — more than it would cost for a new building — you wouldn't have a building that functions appropriately."

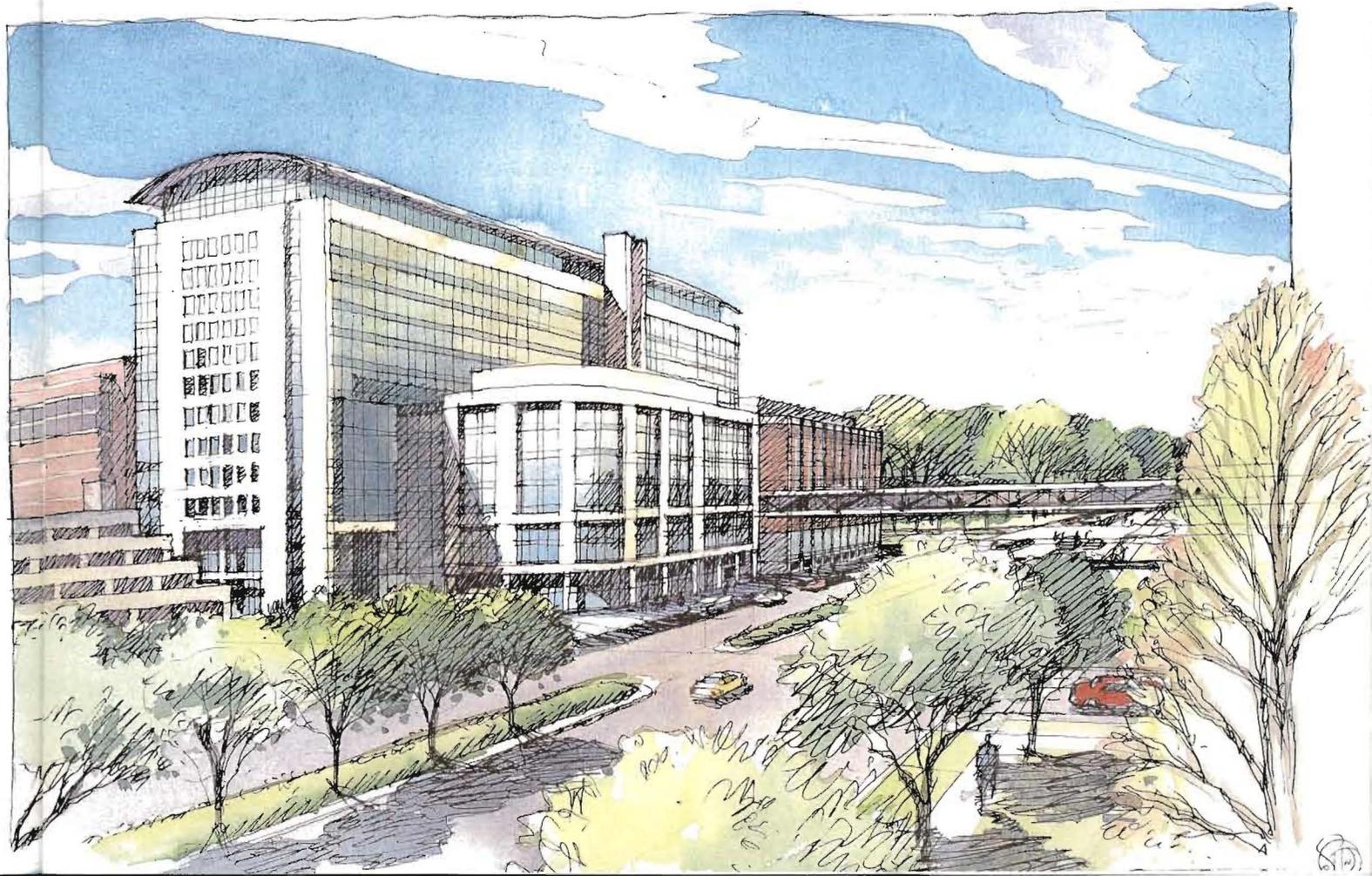
As demolition begins, outside changes also will get underway. Streets, sidewalks, lighting, signage and landscaping will all be improved as part of an \$8 million "Public

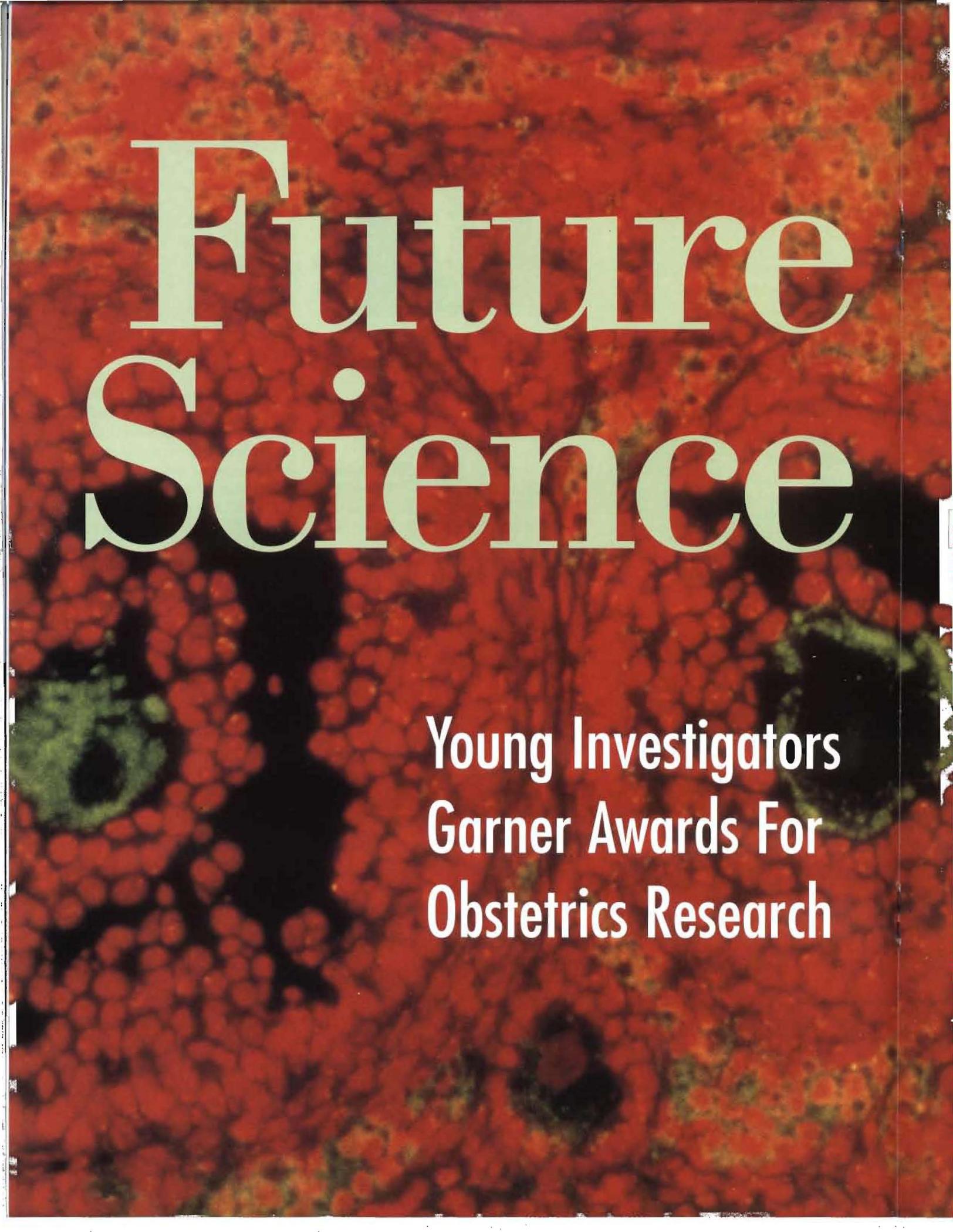
Realm Project." Eventually, new Highway 40 ramps will allow eastbound traffic to exit at Tower Grove Avenue and westbound traffic to get on the highway at Boyle.

City officials and neighborhood residents have all supported the project. When public hearings took place in Jefferson City last January, former St. Louis mayor Freeman R. Bosley, Jr. testified in favor of the plan, which is the largest Certificate of Need project ever approved by the state.

When the project is complete, some changes will be obvious, such as a new, more unified campus look. Patients may scarcely notice other, behind-the-scenes additions: standard-size exam rooms that allow easy reallocation of space as departmental needs change, electronic record-keeping systems and a single e-mail system throughout the campus.

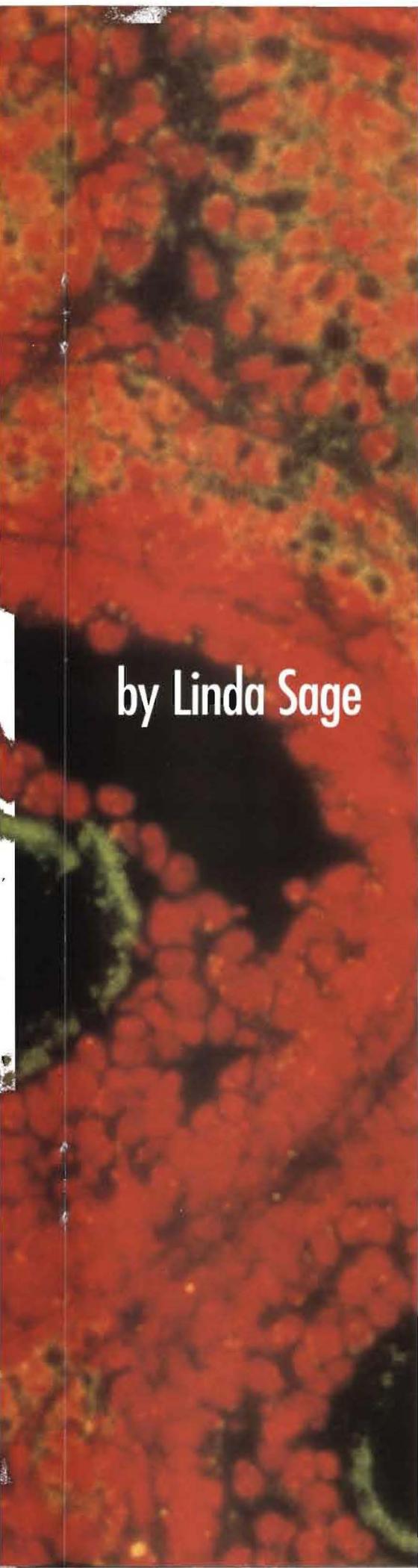
Altogether, the results will be spectacular. "We're laying out a plan for the Medical Center that will allow us to practice 21st century medicine," says Crane. ●



The background of the entire page is a microscopic image of tissue. It features a dense network of red-stained cells and fibers, with several larger, circular structures stained in a bright green color. The overall appearance is that of a histological section, possibly showing cellular morphology and connective tissue components.

# Future Science

Young Investigators  
Garner Awards For  
Obstetrics Research



by Linda Sage

**T**he future of science is in the hands of the young. Witness the efforts of this medical community's freshman physicians and scientists, men and women who are already contributing to the store of scientific knowledge.

"These young research physicians have joined the ranks of their more seasoned colleagues with significant contributions and leadership in the field of medicine," says James R. Schreiber, MD, professor and head of the Department of Obstetrics and Gynecology.

Recently, three young investigators at the School of Medicine were honored at the annual meeting of the Society for Gynecologic Investigation in San Diego. Kelle Moley, Eyal Anteby and Albina Jablonka-Shariff were among an elite group of researchers whose work was selected from more than 1,000 abstracts. Moley received one of six President's Plenary Awards for young faculty; Anteby and Jablonka-Shariff received two of 25 President's Investigator Awards for individuals in training.

"The future of our specialty is tied up in its young investigators," adds Schreiber. "I am pleased for the department and the school."

# In Harm's Way

## Uncontrolled Glucose Levels Put Embryo At Risk

**K**elle H. Moley, MD, instructor in obstetrics and gynecology, came to Washington University from Yale School of Medicine in 1988 and joined the faculty in 1994. She is one of the few people in the world studying the effects of diabetes on early development — women with poorly controlled blood sugar miscarry up to 20 percent more often than other women and expose their children to three to four times the risk of birth defects.

Diabetic women are told to control their glucose levels very closely during pregnancy, but studies by Moley and others suggest they should be equally careful when trying to conceive. "It appears that glucose can harm the embryo even before a woman knows she's pregnant," Moley says.

Moley uses a powerful combination of techniques to monitor genes, enzymes and small molecules as a fertilized egg develops from a single cell to a hollow ball of cells, called a blastocyst, which has about 100 cells. This 96-hour process in a mouse corresponds to the first week of pregnancy in humans.

When the mother is diabetic, Moley discovered, the embryo



Mike M. Mueckler, PhD, professor of cell biology and physiology, left, says research being performed by Kelle Moley, MD, right, is particularly difficult because it involves the microanalysis of single cells.

develops more slowly, often reaching only the 64-cell morula stage by 96 hours. She also has uncovered a likely reason. While it is still a single cell, the fertilized egg of a diabetic mouse contains an abnormally high level of glucose, which then plummets at the two-cell stage. The level goes sky-high again by the time the embryo becomes a morula and drops off again in the blastocyst. This roller-coaster metabolism deprives the embryo of glucose just at the time it needs energy to divide further or implant in the womb.

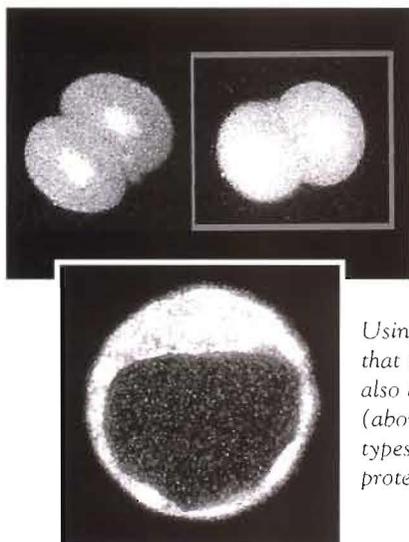
"The embryo is starving itself of the glucose it needs," Moley says. "It may then abort, or this early growth retardation may lead to some kind of malformation."

Glucose cannot enter cells by itself — proteins called glucose transporters ferry it across the cell membrane. Moley showed that the one-celled embryo makes one type of transporter, GLUT1, that brings glucose into the cell. But in the diabetic mouse, the resulting intracellular sugar-high damps the expression of the gene for that transporter at the two-cell stage, decreasing the production of the protein by 44 percent.

By the morula stage, the embryo makes two other kinds of glucose transporters, GLUT2 and GLUT3, so glucose accumulates once more. But abnormally high glucose levels down-regulate the genes for these transporters at the blastocyst stage, depriving the embryo of glucose once again.

Moley's microanalytical approach may prove relevant to studies of *in vitro* fertilization (IVF). Eggs that are fertilized in the laboratory also develop more slowly than normal, dividing into only two or four cells in the two days before they must be implanted. "If we could use our mouse model to figure out what retards the development of these embryos, we could perhaps improve the IVF success rate," Moley says.

Although Moley is an independent investigator, she works in the laboratory of Mike M. Mueckler, PhD, professor of cell biology and physiology.



Moley compared two-cell embryos from diabetic mice with two-cell embryos from nondiabetic mothers. She labeled the embryos with an antibody to GLUT1, the glucose transporter that is produced at this stage of development. The amount of GLUT1 protein was 44 percent less in an embryo from a diabetic animal (left) than in a normal embryo (right).

Using an antibody to GLUT3, a glucose transporter that is produced later in embryonic development, Moley also detected less transporter protein in mouse blastocysts (about 100 cells) than in diabetic mothers. The two types of embryos had equal amounts of the transporter protein 24 hours earlier.

# Balancing Act

## Prostaglandin Regulation May Be Key To Preventing Preeclampsia

**E**yal Y. Anteby, MD, fellow in maternal medicine, was the recipient of a President's Investigator Award plus a \$15,000 Society for Gynecologic Investigation/Mead Johnson Bristol-Myers Squibb Research Grant. He came to Washington University from the Hebrew University in Jerusalem in 1996, drawn by the University's reputation for basic research and its roster of complex cases.

Anteby studies preeclampsia, a precipitous rise in blood pressure that threatens the pregnancies of 300,000 American women each year. He focuses on fatty acid derivatives called prostaglandins, which act on smooth muscle. Produced in many parts of the body including the placenta, some prostaglandins constrict blood vessels, whereas others dilate them. A loss of balance between these opposing functions may contribute to preeclampsia, initial evidence suggests.

Working with both D. Michael Nelson, MD, PhD, professor of

obstetrics and gynecology, and Yoel Sadovsky, MD, assistant professor of obstetrics and gynecology, Anteby studies an enzyme that

plays a key role in prostaglandin synthesis.

"Although this enzyme would seem to be just a small piece of the puzzle, it has a big impact on events such as the transport of nutrients between mother and fetus," Nelson says. "It also plays an important role in the alterations of transport that result in preeclampsia and in fetal growth restriction, which affects 10 percent of pregnancies. These conditions contribute significantly to morbidity, mortality and health care costs."

Before Anteby could study the regulation of the enzyme — prostaglandin H synthase (PGHS) — he had to solve a "crime" in which there were two nearly identical suspects. About seven years ago, it became apparent that PGHS exists as closely related proteins called PGHS-1 and PGHS-2.

In 1996, Anteby set out to find out which form of the enzyme is the culprit in preeclampsia. He used cell lines derived from human placenta and primary human trophoblasts,



Placental trophoblast cells stained with cytokeratin (top) and desmosomal stain (left), show the formation of multinucleated cells.

which provide the barrier between mother and fetus and produce hormones and other substances.

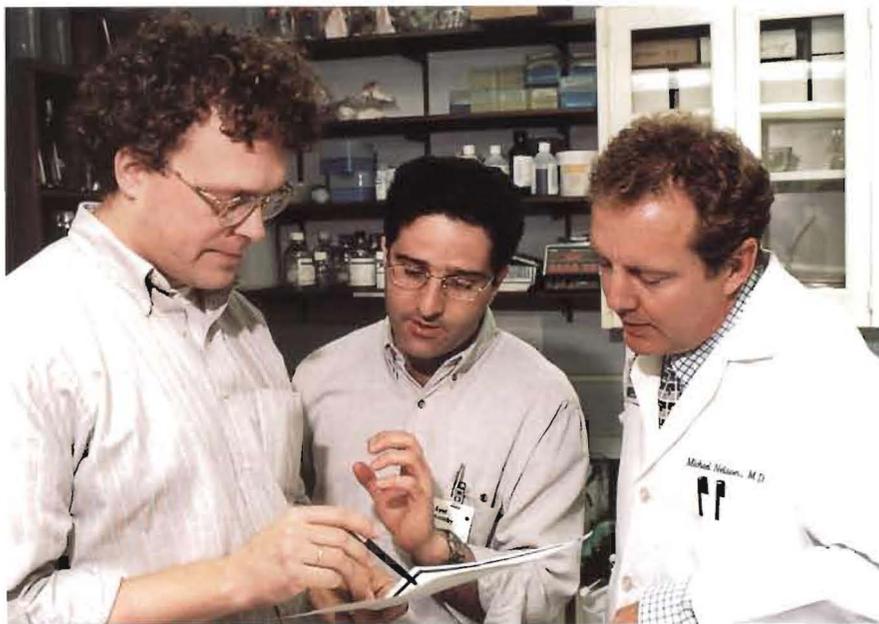
To find out which PGHS gene is active in these cells, Anteby focused on the promoter — a stretch of DNA that lies before a gene and switches it on or off in response to cellular signals. The promoter for either PGHS-1 or PGHS-2, attached to a measurable marker, was introduced into placental cells.

"We found that it is mainly the promoter of PGHS-2 that is active in placental cells," Anteby says.

The next step was to find the cellular signals that activate the gene for PGHS-2. "By understanding this regulation, we eventually may be able to find a way to repress the enzyme and thereby alleviate some preeclamptic symptoms," Anteby says.

He found that two small molecules, cyclic AMP and phorbol ester, activated the gene for PGHS-2 — but not PGHS-1. Moreover, prostaglandin-2 synthesis increased when the PGHS-2 gene was switched on.

Anteby's work fits into a much larger research program. "If there's one phrase that describes our work, it's placental dysfunction," Nelson says. "You need a placenta for normal pregnancy, and abnormalities of pregnancy often are directly linked to problems with placental function."



Eyal Y. Anteby, MD, center, with Yoel Sadovsky, MD, left, and D. Michael Nelson, MD, PhD, studies prostaglandin regulation, which may be key to preventing preeclampsia during pregnancy.

# (NO)S Doubt About It

## Researcher Finds That Nitric Oxide Is Critical To Development Of Healthy Eggs

**A**lbina Jablonka-Shariff, PhD, postdoctoral fellow in obstetrics and gynecology, has been awarded a one-year fellowship from the Lalor Foundation in addition to being honored by the Society of Gynecologic Investigation.

She moved to Washington University in 1995 after completing a doctoral program at Jagiellonian University in Krakow, Poland, and North Dakota State University in Fargo. She works in the laboratory of Lisa M. Olson, PhD, assistant professor of obstetrics and gynecology.



Working in the laboratory of Lisa M. Olson, PhD, left, Albina Jablonka-Shariff, PhD, has found that nitric oxide appears to play a significant role in reproduction.

Jablonka-Shariff studies the role of nitric oxide in normal egg development. Although the gas was known to act as a signaling molecule in several areas of the body and to be synthesized by immature ovarian cells, its involvement in ovarian physiology was unknown.

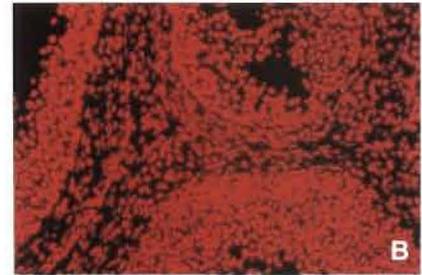
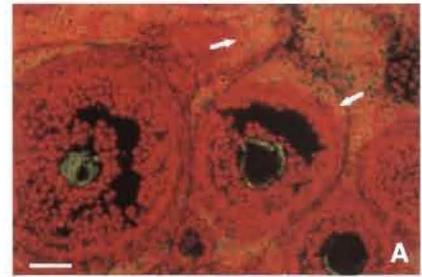
Three closely related forms of nitric oxide synthase (NOS), the

enzyme that makes the gas, have been identified. Using immunochemical techniques, Jablonka-Shariff detected two of these — endothelial NOS and inducible NOS — in rat ovarian sections. Moreover, levels of the two enzymes in the ovary differed after injections of hormones that regulate ovarian development. Both pregnant mare serum gonadotropin (PMSG) and human chorionic gonadotropin (hCG) increased endothelial NOS. Only hCG elevated inducible NOS levels.

Endothelial NOS — but not inducible NOS — was located on the surface of eggs, Jablonka-Shariff discovered. So, she explored the enzyme's possible role in egg development. She used hormonal injections to make rats release a large number of eggs, also treating some of the animals with an inhibitor of NOS. The rats that received the inhibitor released only about half the normal number of eggs. Adding arginine, a precursor of nitric oxide,

at the same time as the inhibitor restored the ovulation rate. "This shows that nitric oxide is necessary for optimum ovulation," Jablonka-Shariff says.

She also looked to see if the eggs were fully developed. Whereas 81 percent of those from the control animals were ready to be fertilized, only about half as many had



A. The yellow-green fluorescence (arrows) on the surfaces of the eggs indicates the presence of eNOS. B. A negative control incubated with normal rabbit serum in place of anti-serum to eNOS shows that the staining in (A) is specific to eNOS.

matured in animals treated with inhibitor. Adding arginine restored the percentage to four-fifths of the original level.

Many of the eggs from the inhibitor-treated rats also had divided cytoplasm or other abnormal features of meiosis, the type of cell division that generates eggs or sperm.

"The identification of endothelial NOS on the surface of the egg and the demonstration that inhibiting this enzyme affects egg maturation is very significant," Olson says. "Nitric oxide may play an important role in gamete development and therefore in the reproduction of the species."

The role of nitric oxide in reproduction is the main focus of Olson's lab, and she sees implications for *in vitro* fertilization. "If endothelial NOS plays the same role in the development of human eggs, it would be important to include nutrients such as arginine in the culture medium, which is something that has never been considered," she says. "So there may be the potential to improve the success rate of IVF once we understand more about the signals that direct egg maturation." ●

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# IN SICKNESS THE HLLVYEH NI

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## ACES Program Prepares Students For Careers In Primary Care

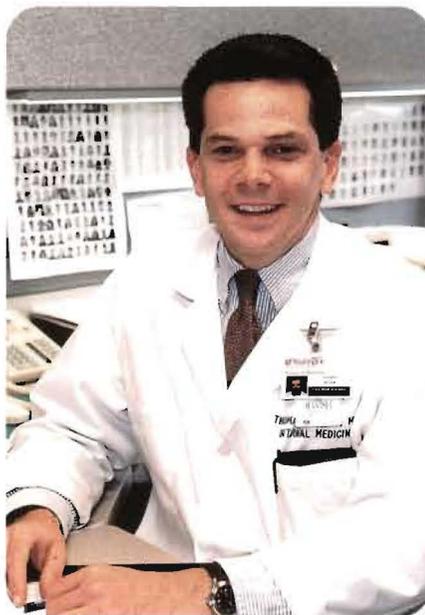
by HOLLY EDMISTON



If experience is the best teacher, then Washington University has a training program that is "ACES."

The Ambulatory Care Experience for Students, or ACES program, is a new clerkship that allows medical students to gain hands-on knowledge and skills in the practice of ambulatory internal medicine.

The program pairs third-year medical students with St. Louis-area physicians in private practice. The mentoring relationships help students to gain an appreciation of the



special aspects of outpatient care and to define the role of the primary care physician.

According to Thomas De Fer, MD, director of the ACES program and assistant professor of medicine, it can take a year or more for doctors coming out of residency training to establish themselves in a routine that results in an efficient, well-run primary care practice.

Traditional third-year clerkship training has focused on inpatient care, which exposes students only to

*Thomas De Fer, MD, director of the ACES program.*

the sickest patients with the most complex illnesses. Inpatient training, though important, is not an accurate reflection of the type of patients an internist will be likely to encounter once he or she becomes a practicing physician, says De Fer, who also is site director for medicine clerkship at Barnes-Jewish Hospital, north campus.

"The typical career internist spends more than 90 percent of his or her time in the ambulatory setting," says De Fer. "We need to show our students what internal medicine is all about as a career and a specialty to better prepare them for the challenges they will face on a day-to-day basis."

## ACES: Partnerships For Success



Students who have taken part in the ACES program say the exposure to preventive medicine is a necessary addition to the tertiary care provided in the hospital. Both types of training, they say, are required for a complete medical education.

"Most of the training we receive is in the hospital setting," says third-year medical student Marc Seidman. "For those of us interested in primary care, it's useful to gain some experience working in the community."

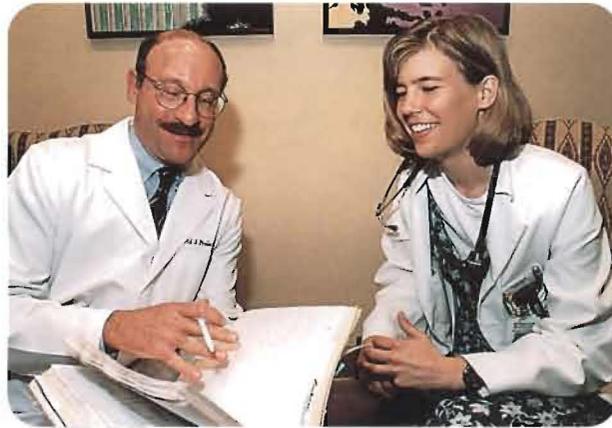
Seidman was paired with Jose Vazquez, MD, for his four-week internal medicine rotation. "I learned a lot about medicine and being a doctor," he says of the experience.

Vazquez says he enjoyed working closely with a medical student. "It was interesting to be involved in the teaching and advancement of a future doctor," he says. "It was also a good way to keep updated —

nothing is more challenging than a well-prepared, well-read student asking questions.

"Having patient interactions that build lasting relationships is something I think is missing in big institutions and in the academic setting," says Vazquez, who is on staff at Christian Hospital Northeast, a BJC affiliate. He says the monthlong ACES partnership is beneficial for students, doctors and patients, and he hopes that Marc Seidman left the rotation with an idea of the nature of primary care.

Students participating in the ACES rotation divide their time between the assigned preceptor's office and the medical school campus. While working with their mentoring physician, students not only



Preceptor David Prelutsky, MD, left, says he enjoys working with medical students because they make him more aware of medical decisions he often makes automatically. Here, Prelutsky and third-year medical student Ariel Smits review the recommended treatment for a patient.

interact with patients, but also get a glimpse of the administrative aspects of medicine: issues such as billing, insurance and personnel.

In addition to the clinical experience, students attend lectures and are exposed to problem-based learning sessions. A variety of ordinary outpatient concerns is addressed, such as musculo-skeletal complaints, hypertension and the common cold. Students also attend skills workshops where they learn how to perform basic procedures such as urinalyses and pulmonary function tests.

De Fer says such training is necessary because the spectrum of problems seen at a preceptor's office is broader than that to which students are exposed in treating inpatients. "Outpatients are generally younger and healthier than inpatients, with less complex medical concerns," he says. "But if a doctor has never been exposed to the problems they do have, it's very hard to deal with their concerns effectively.

"Patient statements such as 'Doctor, you're running behind' or 'I have to be back at work in half an hour' are common. Internists don't have the liberty of talking to a patient for a prolonged period as they do with captive inpatients — they have other patients waiting.

"Each student's experience is very different," explains De Fer.

"There's a diversity built into the ACES project that assures students a variety of experiences while they learn the basics of ambulatory internal medicine care."

Patient response to the presence of students has been positive, says De Fer. Most are pleased to be a part of the education process, and in some cases patients have attempted to act as teachers themselves.

"Patients not only told me about their symptoms," says third-year student Ariel Smits, "they gave me feedback on treatment they didn't like or felt didn't work, as well as general advice on bedside manner."

Among the tips Smits received were to sit down — not stand — while talking to patients because it makes them feel they have the doctor's full attention. And to really listen to what patients are saying.

"Having a student in the office makes a physician more aware of doctor-patient interactions and medical decision-making that we ordinarily do automatically," says Smits' preceptor, David Prelutsky, MD, clinical instructor in medicine. "The student makes us question the things we do and the way we interact with patients."

Smits was surprised to learn how much of medicine is about listening to what the patient doesn't say. Often, she says, patients just need to talk about what is going on in their lives.

"My preceptor really knows how to approach patients and how to talk to them," says Smits, adding that often a patient's social or domestic situation causes stress that can create illness. "Dr. Prelutsky is very good at picking up on what the patient is going through.

"Physicians in the community have a lot to teach about practical matters and serious diseases that affect 'well' patients, like hypertension or diabetes," says Smits. "The academic setting teaches us how to take care of the extremes, such as heart failure. What we need to learn more about is how to treat hypertension when a patient is 40 so that it never gets to the point of heart failure."

## Changes In Clinical Curriculum



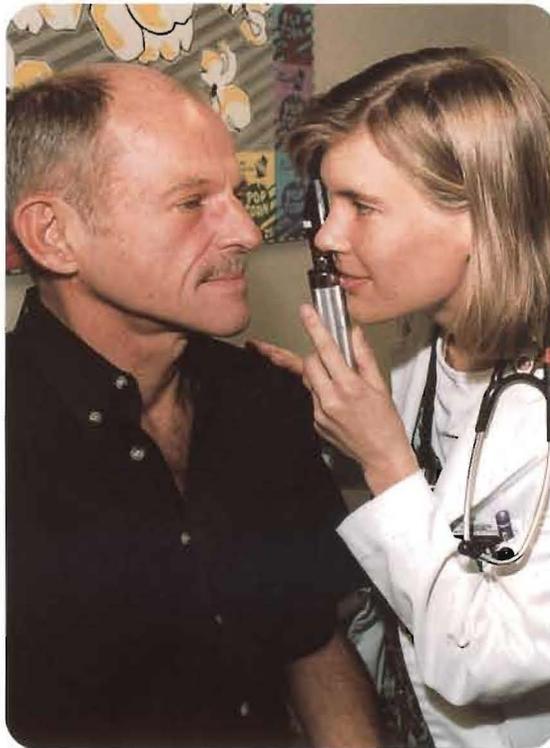
The ACES program was conceived and developed with the idea that more of internal medicine is going on in the outpatient setting, says Alison Whelan, MD, assistant professor of medicine and coursemaster for the third-year internal medicine clerkship.

As the direction of health care provision has changed from inpatient- to outpatient-based, administrators at the medical school have revised its curriculum to offer students more flexibility and educational opportunities in ambulatory settings.

According to Whelan, the four-week ACES rotation is the core ambulatory experience of the 12-week internal medicine clerkship. Spending time with physicians in private practice and in the community working with "well" patients is essential in the process of teaching

students what an internist does, she says.

"For the student, ambulatory internal medicine is the way medicine is going to be practiced in the



*Third-year medical student Ariel Smits, shown here examining patient William Smock, says the ACES program has made her realize that much of the practice of medicine is about listening — to what a patient does and does not say.*

future," adds Prelutsky. "Just having inpatient experience severely limits the student from getting the whole perspective on what being an internist is about.

"The student also gets a better perspective on where the patient is coming from when seeing them on an outpatient basis — it's a less artificial environment than the hospital setting."

Students generally begin the ACES rotation "shadowing" their preceptors, accompanying the physician while he or she is seeing patients. Once the physician determines the student's abilities, greater responsibilities may be assigned. In some offices, students may approach a patient alone to conduct an initial history and physical exam, confer with the preceptor on the case, and

then join the physician in a final conference with the patient.

The level of each student's participation varies, depending on his or her skills and the comfort level of the participating physician.

Among the chief goals of the ACES program are to make medical students more aware of managed care issues, to be concise without sacrificing thoroughness, to be sensitive to cost containment issues, and to become aware of the long-term nature of doctor-patient relationships in primary care.

Initially, students in the ACES program were required to spend all of their rotation at Medical Center clinics. Since November 1996, the outpatient portion of the program has moved entirely into the offices of participating preceptors. The 1997-98 academic year will mark the first full year of working within the preceptor model. De Fer says he expects that some 42 physician-student teams will be formed, a number that will more than double previous efforts.

"For physicians, our hope is that working with students will be intellectually and personally stimulating," says Whelan.

"The students who have participated in ACES have had a wonderful experience that's very different from anything they've done previously," says De Fer. "Most have found the program extremely rewarding and very eye-opening — they had no idea what it was like to be a practicing physician." ●

**Editor's Note:** For additional information on the ACES program, contact Deidre Murphy, administrative coordinator, ACES Program, Washington University School of Medicine, Campus Box 8214, 660 S. Euclid Ave., St. Louis, MO 63110-1093, (314) 747-1397.

## Match Day 1997

The annual Match Day took place on March 19 with 115 of the 127 graduating medical students participating in the National Residency Matching Program.

Of the participants, about 80 percent matched one of their top three choices. Nearly half of those who took part matched into residency training programs at institutions affiliated with the top 10 medical schools in the country. More than 15 percent matched into highly competitive surgical subspecialty training positions. The 12 students who did not take part found positions independent of the NRMP or chose not to take residencies immediately.

Primary care specialties of internal medicine, pediatrics and family practice captured the interest of 60 students. Family practice attracted 11 students this year, three more than last year. Emergency medicine and orthopaedic surgery were fourth in popularity, attracting seven students each, followed by obstetrics and gynecology and general surgery, which attracted six students each, and otolaryngology, neurology and psychiatry, each of which attracted five students.

Twenty-four of the new physicians will remain in Missouri, with 21 at Washington University Medical Center institutions. Other popular destinations were California (16), Massachusetts (13), Maryland (7), New York, Ohio and Pennsylvania (6).

### California

#### La Jolla

Scripps Clinic/Green Hospital  
Internal Medicine  
Steve Song

#### Long Beach

Long Beach Memorial Medical Center

Family Practice  
Susan Sheu

#### Los Angeles

UCLA Medical Center  
Orthopaedic Surgery  
Travis Hanson



Fourth-year medical students Brian Kwon and Steven Lawrence celebrate at Match Day after learning where their medical training will continue. To Lawrence's left is his spouse, Kathy.

UCLA Neuropsych Institute  
Psychiatry

Rekha Rao

Sacramento

Methodist Hospital

Family Practice

Janet Yu

San Diego

Mercy Hospital

Internal Medicine

Dana Kumar

Naval Medical Center

Obstetrics/Gynecology

Adrienne Harper

University of California-SD

Anesthesiology

Jason Carns

Internal Medicine

Vineet Kapur

San Francisco

University of California-SF

Anesthesiology

James Sams

Orthopaedic Surgery

Vikas Patel

Pediatrics

Anita Beck

Michelle Hermiston

San Jose

Santa Clara Valley Medical Center

Obstetrics/Gynecology

Aimee Brecht-Doscher

Stanford

Stanford Health Service

Anesthesiology

Jeffrey Williams  
Physical Medicine &  
Rehabilitation  
Ben Chung

### Colorado

Denver

St. Joseph Hospital

Family Practice

Susan Stevens

University of Colorado

Otolaryngology

Ari Brunschwig

Pediatrics

Sharon Meltzer

### Connecticut

Hartford

University of Connecticut

Family Practice

Howard Yang

New Haven

Yale-New Haven Hospital

Pediatrics

Natasha Leacock

Yale University

Neurosurgery

Randy Johnson

### Delaware

Newark

Medical Center of Delaware

Family Practice

Laura Stone

## District of Columbia

### Washington

Children's National Medical Center  
Pediatrics  
Lisa Wiltrout

## Florida

### Gainesville

University of Florida  
Otolaryngology  
Michele Jones

### Miami

Jackson Memorial  
Pediatrics  
Daniel Schwartz

## Illinois

### Chicago

Rush-Presbyterian-St. Luke's  
General Surgery  
Bernadette Aulivola  
Obstetrics/Gynecology  
Lisa Oldham  
Pediatrics  
Belinda Chen  
University of Chicago Hospital  
Internal Medicine  
Joshua Socolow  
Plastic Surgery  
Charles K. Lee

### Evanston

Evanston Hospital  
Internal Medicine  
David Yung

### Maywood

Loyola University Medical Center  
Orthopaedic Surgery  
Paul Lamberti  
Research  
Aaron Shiels

### Oak Lawn

Christ Hospital and Medical Center  
Emergency Medicine  
Susan Cohan

## Indiana

### Indianapolis

Indiana University  
Obstetrics/Gynecology  
Julie Baglan  
Methodist Hospital  
Emergency Medicine  
Theodore Willmore

## Iowa

### Cedar Rapids

Cedar Rapids Medical Education  
Program  
Family Practice  
Tracie Martin

### Iowa City

University of Iowa Hospitals/Clinics  
Pediatrics  
Andrew Norris

## Maryland

### Baltimore

Johns Hopkins  
Internal Medicine  
Justina Wu  
Psychiatry  
Jennifer Payne  
Nicola Sater  
University of Maryland  
Emergency Medicine  
Matthew Bruckel

### Bethesda

National Naval Medical Center  
Pediatrics  
Gregory Gorman  
Malcolm Grow Medical  
Center/Andrews AF Base  
Family Practice  
Gregory Perron

## Massachusetts

### Boston

Beth Israel Deaconess  
Internal Medicine  
Francoise Le  
Anjala Vaishampayan  
Boston University Medical  
Residency Program  
Internal Medicine  
Kim Harper  
Brigham & Women's Hospital  
Internal Medicine  
Iris Chan  
Jennifer Gold  
Pathology  
Gerald Chu  
Deaconess Hospital  
General Surgery  
Julie Fuchs  
Harvard-Mass Eye & Ear Infirmary  
Otolaryngology  
Feodor Ung  
Massachusetts General Hospital  
General Surgery  
Cristina Ferrone

### Pediatrics

JonDavid Menteer  
New England Medical Center  
Internal Medicine  
Laura Kogelman

### Burlington

Lahey Hitchcock Medical  
Urology  
John Stoffel

### Worcester

University of Massachusetts  
Programs  
Dermatology  
Louis Kuchnir

## Michigan

### Ann Arbor

University of Michigan Hospitals  
Neurology  
Dawn Kleindorfer  
Pediatrics  
Rachel Frank  
Radiology-Diagnostic  
Daniel Overdeck

### Detroit

WSU/Detroit Medical Center  
Pediatrics  
Rebecca Piltch

### Royal Oak

William Beaumont Hospital  
Radiation Oncology  
Kathy Baglan

## Minnesota

### St. Paul

St. Paul-Ramsey Medical Center  
Family Practice  
Eric Poulin

## Missouri

### Columbia

University Hospital & Clinic  
Family Practice  
Scott Shannon

### Kansas City

Children's Mercy Hospital  
Pediatrics  
Claire Sheinker

### St. Louis

Barnes-Jewish Hospital  
Anesthesiology  
Catherine Ifune  
Emergency Medicine  
Maurice Makram  
General Surgery  
Valerie Halpin

Internal Medicine  
 Greg Angstreich  
 Kathryn Brown  
 Jennifer Delaney  
 Steven Lawrence  
 David Lotsoff  
 Robert Mahoney  
 Seetha Monrad  
 Scott Tykodi  
 Radiology-Diagnostic  
 Jennifer Thomure  
 Deaconess Hospital  
 Transitional  
 Jeffrey Williams  
 St. John's Mercy Medical Center  
 Family Practice  
 Thomas Sommers  
 St. Louis Children's Hospital  
 Pediatrics  
 Kirsten Anderson  
 Karl Desch  
 Adam Eaton  
 Nevada Reed  
 Washington University/  
 Barnes-Jewish  
 Orthopaedic Surgery  
 Lloyd Johnson  
 Washington University School of  
 Medicine  
 Neurology  
 Howard Colman  
 Martin Gallagher  
 Stephen Lee  
 Ophthalmology  
 Susan Yang

## New Jersey

*New Brunswick*  
 UMDNJ-Robert Wood Johnson  
 General Surgery  
 Charles J. Oh

## New Mexico

*Albuquerque*  
 University of New Mexico School of  
 Medicine  
 Orthopaedic Surgery  
 Amit Agarwala  
 Emergency Medicine  
 Samuel Slisshan

## New York

*New York*  
 NYU Medical Center  
 Emergency Medicine  
 Fiona Gallahue  
 Psychiatry

Gordon Strauss  
 Presbyterian Hospital  
 Internal Medicine  
 Bruce Darrow  
 The New York Hospital  
 Internal Medicine  
 Karen Manheimer  
*Rochester*  
 University of Rochester/Strong  
 Memorial  
 Pediatrics  
 Pamela Liang  
*Stony Brook*  
 SUNY-Stony Brook  
 Otolaryngology  
 Apurva Thekdi

## North Carolina

*Chapel Hill*  
 University of North Carolina  
 Hospital  
 Internal Medicine  
 Meral Omurtag  
 Michael Zerega  
*Durham*  
 Duke University  
 Obstetrics/Gynecology  
 Damla Karsan (Dryden)

## Ohio

*Cincinnati*  
 University of Cincinnati  
 Emergency Medicine  
 Marleen Cousins  
 Neurosurgery  
 Elias Dagnew  
 Pediatrics  
 Valeria Cohran  
 Karen Dahl  
*Cleveland*  
 University Hospitals of Cleveland  
 Orthopaedic Surgery  
 Brian Kwon  
*Toledo*  
 Toledo Hospital  
 Family Practice  
 Jason Evans

## Pennsylvania

*Philadelphia*  
 Children's Hospital  
 Pediatrics  
 Amy Weed  
 Hospital of the University of  
 Pennsylvania  
 Pathology  
 John Alvarez  
 Bruce Hug

Thomas Jefferson University  
 Orthopaedic Surgery  
 Oren Blam  
 University of Pennsylvania  
 Neurology  
 Paul Kotzbauer  
 Otolaryngology  
 Robert Puchalski

## Tennessee

*Memphis*  
 University of Tennessee College of  
 Medicine-GME  
 Psychiatry  
 Alison Barnes

## Texas

*Houston*  
 Baylor College of Medicine  
 Pediatrics  
 Charles Vedder

## Virginia

*Charlottesville*  
 University of Virginia Health  
 Science Center  
 Urology  
 Peter Nichol

## Washington

*Seattle*  
 University of Washington  
 Pediatrics  
 Kathleen Mooney

## West Virginia

*Morgantown*  
 West Virginia University  
 Urology  
 Shandra Sheppard

## Wisconsin

*Madison*  
 University of Wisconsin  
 Hospitals/Clinics  
 General Surgery  
 Jennifer DeLamielleure  
 Pediatrics  
 Blaise Nemeth  
 Urology  
 Devin Johnson  
*Milwaukee*  
 Medical College of Wisconsin  
 Obstetrics/Gynecology  
 Amy Brown

## Eight Honored With Awards



The 1997 Reunion Award recipients, front row, from left: Ira J. Kodner, MD '67, Arthur Z. Eisen, MD, Helen Hofsommer Glaser, MD '47, John O. Holloszy, MD '57; back row, from left, John M. Eisenberg, MD '72, Robert K. Royce, MD '42, Kenneth R. Smith Jr., MD '57, and John M. Kissane, MD '52.

### Alumni Achievement Awards

John M. Eisenberg, MD '72, is the administrator of the Agency for Health Care Policy and Research, U.S. Department of Health and Human Services. He formerly chaired the Department of Medicine at Georgetown University Medical Center in Washington, D.C. Prior to that, he was on the faculty at the University of Pennsylvania. He is a member of the Institute of Medicine of the National Academy of Sciences.

Helen Hofsommer Glaser, MD '47, is retired from the practice of child and adult psychiatry in Palo Alto CA. She served on the faculty of the University of Colorado School of Medicine and at Harvard Medical School. Glaser joined the faculty at Stanford University in 1965 and served on the clinical faculty in psychiatry and behavioral sciences and in pediatrics until 1994. She received The Aphrodite

Jannopoulos Hofsommer Award, named for her mother, a 1923 School of Medicine graduate, in 1993.

Kenneth R. Smith Jr., MD '57, is professor of surgery and director of the division of neurological surgery at St. Louis University Health Sciences Center. He joined the faculty there in 1966 and became head of the division of neurosurgery in 1968. He is founder and director of the Practical Anatomy and Surgical Technique Workshop of St. Louis, where the latest neurosurgical techniques are taught to neurosurgeons from around the world.

### Alumni/Faculty Awards

John O. Holloszy, MD '57, is professor of medicine, chief of the division of geriatrics and gerontology and director of the section of applied physiology at the School of Medicine. Described as the most eminent exercise physiologist and biochemist of his time, Holloszy researches the role of exercise in

preventive medicine and in slowing the decline in functional capacity with advancing age.

Ira J. Kodner, MD '67, is professor of surgery and director of the section of colon and rectal surgery at Barnes-Jewish Hospital. Kodner has pioneered less radical colorectal cancer therapies and comprehensive care programs for patients with intestinal stomas. Internationally known in his field, Kodner recently was named president of the American Society of Colon and Rectal Surgeons.

Robert K. Royce, MD '42, is clinical professor of genitourinary surgery and associate professor of surgery in the division of urologic surgery at the School of Medicine. Royce has been on the faculty at the medical school since 1949. He served as acting head of the division of urology from 1973 to 1975, and received the Justin Cordonnier Award for service to the division.

### Distinguished Service Awards

Arthur Z. Eisen, MD, the Winfred A. and Emma R. Showman Professor of Dermatology, is clinical director and residency program director in the division of dermatology, which he headed from 1967 to 1996. Eisen's NIH research grant is the largest in dermatology in the country. In 1993, he received dermatology's most prestigious honor, the Stephen Rothman Memorial Award.

John M. Kissane, MD '52, is professor of pathology and of pathology in pediatrics at the School of Medicine. A pioneer in kidney and pediatric pathology, Kissane has been a visiting professor and lecturer worldwide. His extensive publications include the book "Pathology in Infancy and Childhood," and editorship of the seventh, eighth and ninth editions of Anderson's "Pathology." ●



Gerald Medoff, MD, and Robert Edelman, MD, both from the Class of 1962.



From left: Allan Rappaport, MD '72, Bethany Wickwire, and Teresa Clabots, MD, at the reunion awards banquet.



A group of reunion-goers learns about the Internet during Info Expo at the Bernard Becker Medical Library.



From left: Laura Bierut, MD, James Wolfson, MD, and Robert Fuhlbrigge, MD, all members of the Class of 1987.



Dean William Peck, MD, right, presents the Alumni/Faculty Award to Robert Royce, MD '42.



Walter Graul, MD '42 and Marlyn Adderton.



From left: Phyllis and Jerome Robinson, MD '57, with Mimi and Ralph Graff, MD '57.



Linda Stevenson, MD, and husband John Donovan, MD, both from the Class of 1987.



Members of the Class of 1947 stand to be recognized at the banquet: From left: William Hausman, MD, James McNeil, MD, William Regan, MD, Glenn Kellogg, MD, and William Landau, MD. Their spouses are seated beside them.



From left: Richard Windsor, MD '52, Joseph Clabots, MD '77, Teresa Clabots, MD, Gary Szunyogh, and Mary Murphy, MD '82 at the welcoming cocktail party.



WUMCAA President Julian Mosley, MD '72, left, congratulates incoming president Barry Milder, MD '73.



Reunion scientific program attendees in the auditorium of the Eric P. Newman Education Center.

# R E U N I O N 1 9 9 7



From left: Howard Welgus, MD '77, Sandra Masur, PhD, and Victor Schuster, MD '77, enjoy a refreshment break at the reunion scientific program. Both Welgus and Schuster made presentations at the program.



A panel of scientific program presenters from the Class of 1967. From left: Sharon Van Meter, MD, Ira Kodner, MD, Gary Ratkin, MD, and Henry Massie, MD.



Robert McLean, MD '67, left, and Helaine McLean with his classmate, Joella Uley, MD '67.



From left: Dee Lansche, Florence Miller, and W. Edward Lansche, MD '52.



John Nuetzel, MD '47 shares his singing talent at the Docs Off Duty luncheon.



George Sato, MD '47, welcomes C. Todd Vedder, MD, president of the Class of 1997, and his classmates into the alumni association.

# R E U N I O N 1 9 9 7



Classmates, from left, John Ogle, MD, David Clardy, MD, David Desper, MD, and Frank Shirley, MD, all 1977 graduates, reminisce.



Members of the Class of 1972 greet each other at the dean's luncheon. From left: Loren Crown, MD (seated), Marc Hammerman, MD, Timothy Holekamp, MD, and Edward Doisy III, MD (seated).



From left: Barbra Horn, MD '82, Peter Weiss, MD, Walter Peters Jr., MD '82, Sheila Vicars-Duncan, Eric Duncan, MD '82, Daniel Gluckstein, MD, and Akemi Chang, MD '82 at their class dinner.



Christine Mackert, MD '62, describes her mountain climbing experiences at the Docs Off Duty luncheon.



From left: Bruce Horwitz, MD, Luis Vasconez, MD, and John Rich, MD, all from the Class of 1962.



From left: Elliot Krauss, MD, Pamela Freeman Greenwood, MD, Joseph Clabots, MD, Harlan Muntz, MD, and Scott Greenwood, MD, all members of the Class of 1977.



Some members of the Class of 1937 at the welcoming cocktail party. From left: Robert Kingsland, MD, and Shirley Kingsland; Benard Adler, MD, and Phyllis Adler; Clay Huntley, MD, and Helen Huntley.



Some members of the 50th year class and their guests at the welcoming cocktail party: Back row, from left: Ellie and Glenn Kellogg, MD; Arnold Brody, MD, and Lynn Brody; and James McNeil, MD. Front row, from left: George Sato, MD, and B.J. McNeil.



Andrew Kochan, MD '77, demonstrates his magical ability to multiply objects at the Docs Off Duty luncheon. Ruth Bebermeyer, director of alumni and constituent relations for the School of Medicine and ad hoc magician's assistant, displays the results.



Class of 1952 members greet each other at the scientific program. From left: John Davidson, MD, Alfred Markowitz, MD, Sydell Markowitz, and George Murphy, MD.



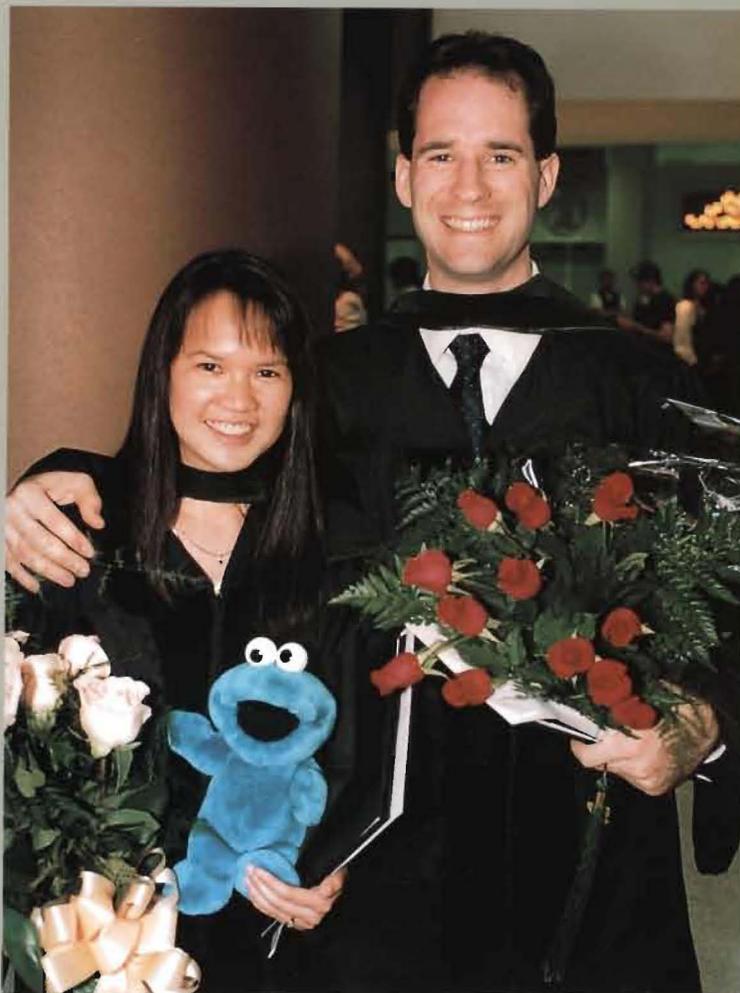
1997 classmates at the reunion banquet. From left: Laura Kogelman, MD, and guest; Kirsten Anderson, MD, Valerie Halpin, MD, Cristina Ferrone, MD, and Fiona Gallahue, MD.



**Potters, painters, weavers and wood carvers** were among the 22 exhibitors at the School of Medicine's Anne F. Dillon Faculty/Family Art Show last month. The artwork was displayed during June in the M. Kenton King Center of the Bernard Becker Medical Library. Here, handwoven silk scarves and shawls by Ann Edington Adams (left) and Barbara Wells (right). The pottery is by Isabel Van Essen. Adams is the wife of Michael Adams, PhD, research assistant professor of psychiatry; Van Essen is the wife of David Van Essen, PhD, head of the Department of Anatomy and Neurobiology; and Wells is the wife of Samuel Wells, MD, head of the Department of Surgery.

 **Washington**  
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**School of Medicine**

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St. Louis, MO 63108-2259



*Matrimony and a medical degree go hand in hand for Françoise Le, left, and JonDavid Menteer, who celebrate their graduation from the School of Medicine on May 16 at the Hilltop Campus and their impending nuptials. The two were among 103 students receiving MD degrees, 16 who received MD/PhD degrees and seven who received MD/MA degrees.*