"It's not so elementary, Watson." Faculty members discuss problems with DNA fingerprinting, on page 8.
DNA on trial

DNA fingerprinting may not be the panacea of justice it promised to be.

Library with a view

Photographer Tom Heine gives readers a look at the new medical library.

Dean among deans

Kenton King, M.D., retires after 25 years as dean of the medical school.

Newsbriefs

Personal Outlook: Corneal transplants in the age of AIDS

Silhouette: Success and the California garage

Alumni Report: Meeting and eating narrow the gap between students and faculty

On the cover:

Kenton King, M.D., flips through a commemorative book given to him upon his retirement.
Regular exercise prevents hip fractures

Two 80-year-old women trip and fall, with very different results. The first lands hard on her hip, fractures it, and is suddenly bed-ridden, having lost her mobility and independence. But the second swiftly puts a hand out to catch herself—and ends up with only a cast on her wrist.

What causes the second woman’s quick reaction? It may come from a consistent pattern of exercise, says a team of researchers from Jewish Hospital. Their work suggests that exercise improves the brain’s central processing time and speeds up reflexive action that can help prevent hip fracture.

The amount and type of exercise required to achieve this benefit is not yet clear, say the researchers, Stanley J. Birge, M.D., associate professor of medicine at the School of Medicine, and Sarah McGee, M.D., whose work is part of a major, four-phase study on falls and hip fracture funded by the National Institute on Aging. But simple stretching exercises, easily performed at home, may well do the trick.

People who exercise consistently are less likely to fracture their hips than their more sedentary counterparts.

This problem is likely to increase dramatically in the next 10 years, Birge says, since the over-80 population is the most rapidly growing segment of the population. Some estimates predict a startling 500,000 hip fractures a year by 1995.

In the past, many scientists believed that hip fractures were linked solely to osteoporosis. Studies have shown that bones weakened by osteoporosis are more likely to break when subjected to a fall.

Yet Birge and his colleagues felt that among older women, especially in the over-70 population, other factors might also play a part. For one thing, careful studies had already shown that bone density among hip fracture and non-fracture patients is similar. “So it’s difficult to attribute hip fracture just to thin bones, though clearly that is part of the problem,” Birge says. “Perhaps even more important in those over 70 is how they fall.”

From a study of some 60 elderly hip fracture patients and 55 control subjects, published last year in the Annals of Internal Medicine, Birge and other researchers found that impaired central processing of information was a very important risk factor for hip fracture. In fact, controls did 78 percent better than hip fracture patients on a test designed to assess the speed at which the central nervous system processes information.

Also, people who participated in some form of regular exercise performed better on the test than those who did not. People who walked for exercise reduced their risk of performing poorly by 40 percent; those who played tennis reduced their risk by 75 percent.

These findings tied in with results from phase one of a four-part study, in which medical center researchers examined the epidemiology of falls. In this work, investigators looked at 1,350 people randomly selected from the community. A significant association was observed between a poor performance on the central processing test and persons reporting either multiple falls or hip fracture. A poor performance was associated with a two-fold increased risk of a fall in one year and a 5.7-fold increased risk of having experienced a hip fracture.

“Again we found that central processing appears to be a very important, if not the most important determinant of people who fall,” Birge says.

That could mean, he says, that there is a physiological basis for the old saying that when people retire, they often “go to pot.” A study published last year in Science by Eugene Johnson, professor of pharmacology at the School of Medicine, showed that when neurons in the brain are not nurtured, they simply self-destruct. Perhaps adequate exercise, along with intellectual stimulation and other factors, is part of that nurturing process, Birge speculates.

“The brain may be somewhat like a muscle,” he says. “If you don’t use it, you lose it.”

People who exercise consistently are less likely to fracture their hips than their more sedentary counterparts.

of researchers from Jewish Hospital. Their work suggests that exercise improves the brain’s central processing time and speeds up reflexive action that can help prevent hip fracture.

The amount and type of exercise required to achieve this benefit is not yet clear, say the researchers, Stanley J. Birge, M.D., associate professor of medicine at the School of Medicine, and Sarah McGee, M.D., whose work is part of a major, four-phase study on falls and hip fracture funded by the National Institute on Aging. But simple stretching exercises, easily performed at home, may well do the trick.

People who exercise consistently are less likely to fracture their hips than their more sedentary counterparts.

This problem is likely to increase dramatically in the next 10 years, Birge says, since the over-80 population is the most rapidly growing segment of the population. Some estimates predict a startling 500,000 hip fractures a year by 1995.

In the past, many scientists believed that hip fractures were linked solely to osteoporosis. Studies have shown that bones weakened by osteoporosis are more likely to break when subjected to a fall.

Yet Birge and his colleagues felt that among older women, especially in the over-70 population, other factors might also play a part. For one thing, careful studies had already shown that bone density among hip fracture and non-fracture patients is similar. “So it’s difficult to attribute hip fracture just to thin bones, though clearly that is part of the problem,” Birge says. “Perhaps even more important in those over 70 is how they fall.”

From a study of some 60 elderly hip fracture patients and 55 control subjects, published last year in the Annals of Internal Medicine, Birge and other researchers found that impaired central processing of information was a very important risk factor for hip fracture. In fact, controls did 78 percent better than hip fracture patients on a test designed to assess the speed at which the central nervous system processes information.

Also, people who participated in some form of regular exercise performed better on the test than those who did not. People who walked for exercise reduced their risk of performing poorly by 40 percent; those who played tennis reduced their risk by 75 percent.

These findings tied in with results from phase one of a four-part study, in which medical center researchers examined the epidemiology of falls. In this work, investigators looked at 1,350 people randomly selected from the community. A significant association was observed between a poor performance on the central processing test and persons reporting either multiple falls or hip fracture. A poor performance was associated with a two-fold increased risk of a fall in one year and a 5.7-fold increased risk of having experienced a hip fracture.

“Again we found that central processing appears to be a very important, if not the most important determinant of people who fall,” Birge says.

That could mean, he says, that there is a physiological basis for the old saying that when people retire, they often “go to pot.” A study published last year in Science by Eugene Johnson, professor of pharmacology at the School of Medicine, showed that when neurons in the brain are not nurtured, they simply self-destruct. Perhaps adequate exercise, along with intellectual stimulation and other factors, is part of that nurturing process, Birge speculates.

“The brain may be somewhat like a muscle,” he says. “If you don’t use it, you lose it.”
Peanut oil is logical filler for breast implantations

Researchers at the School of Medicine’s Mallinckrodt Institute of Radiology are exploring peanut oil as an alternative to silicone in breast implants.

Because peanut oil is made up of triglycerides, the main component of body fat and breast tissue, it is a more logical filler for breast augmentation than conventional, silicone-filled implants, according to Judy M. Destouet, M.D., associate professor at the School of Medicine and head of mammography at Mallinckrodt.

Silicone implants obscure breast tissue during mammography, she explains, so patients who develop breast cancer after augmentation can show more advanced disease and spread of tumors into the lymph nodes.

According to national statistics from the American Society of Plastic and Reconstructive Surgery, more than two million women have already had breast augmentation; of those women, 10 percent will get breast cancer during their lifetime.

"Even though women are concerned that the implants obscure mammography, more than 100,000 women per year undergo breast augmentation, making it one of the most popular plastic surgery procedures today," says Leroy Young, M.D., associate professor of plastic and reconstructive surgery at the School of Medicine.

"If triglycerides truly work, and it's already proven itself in every test so far, there's no excuse to continue using silicone or saline to fill implants. This new material is ideal from every standpoint and could go a long way to solving the problem of obscuring mammography," adds Young.

Destouet also reports that women who have undergone breast augmentation should seek mammograms "that go beyond screening exams." She recommends tailored views in which the breast tissue is pulled forward and away from the implant. And she urges women with surgically enlarged breasts to inform the mammogram technologist of their implants and also to perform routine breast self-examination.

The researchers have demonstrated that x-rays easily pass through breast implants filled with peanut oil. Further studies are underway to test the biocompatibility of the new material. These studies also will determine whether implants filled with triglycerides cause cancer, cause allergic reactions, or alter the immune system.

New assistant vice chancellor for veterinary services arrives

Washington University has a new assistant vice chancellor for veterinary affairs and director of the division of comparative medicine. Jack R. Hessler, D.V.M., who arrived in St. Louis this past August, previously served as chairman of the department of comparative medicine at the University of Tennessee in Memphis and as chief of the veterinary medical unit of the Veterans Administration Medical Center.

In the field of laboratory animal medicine, Hessler is widely recognized as an expert in laboratory animal resource management and research animal facility planning. Much of his recent work has focused on design of environments for laboratory animals. He has conducted numerous studies related to pulmonary and circulatory physiology.

Hessler joined the University of Tennessee faculty in 1975 as an associate professor of physiology and biophysics and director of the Animal Resource Division. He received an additional appointment as associate professor of comparative medicine in 1977 and became chairman of that department in 1987.

A native of St. Louis, Hessler received a doctorate in veterinary medicine in 1963 from the University of Missouri. He completed post-doctoral training as a U.S. Public Health Service fellow in laboratory animal/comparative medicine at the University of Florida College of Medicine.

For the past seven years Hessler has served on the accreditation council of the American Association for the Accreditation of Laboratory Animal Care, and since 1972 he has been an ad-hoc consultant on animal resources to the National Institutes of Health’s Division of Research Resources. He is a diplomate of the American College of Laboratory Animal Science and a board of trustees member of the American Association for Laboratory Animal Science.
Two faculty members receive prestigious MERIT awards

Two faculty members have received prestigious MERIT awards for their research.

Philip W. Majerus, M.D., professor of medicine and biological chemistry, was awarded MERIT status for a five-year grant, totaling $2.3 million, from the National Heart, Lung, and Blood Institute of the National Institutes of Health (NIH).

Bradley T. Thach, M.D., professor of pediatrics, received MERIT status in conjunction with a five-year grant, totaling more than $740,000, from the NIH's National Institute of Child Health and Human Development.

Majerus is known for his research on the role of platelets in forming blood clots and for the discovery of mechanisms by which cells respond to hormones and other external agents.

He was the first to conduct clinical research indicating that daily low doses of aspirin can help prevent possibly fatal blood clotting in kidney dialysis patients, without harmful side effects. His study suggested that aspirin might prevent clotting among patients who had already suffered one such occurrence and indicated that healthy persons might take aspirin on a regular basis to reduce the possibility of a heart attack. A follow-up study conducted at Harvard University, published last year in the New England Journal of Medicine, confirmed Majerus' preliminary work.

Majerus is currently studying an endothelial cell protein called thrombomodulin, a natural anticoagulant molecule, and several new enzymes and metabolites he and his colleagues recently discovered. A magna cum laude graduate of the School of Medicine, he has been on the faculty since 1966. He is co-director of the Division of Hematology-Oncology, principal investigator and director of the Specialized Center for Research in Thrombosis, and a physician at Barnes Hospital.

Thach is a specialist in newborn medicine. His research focuses on the structure and function of the upper respiratory tract in infants, especially the reflexes and muscles that keep the upper airway open.

With his new grant, Thach plans to examine the mechanisms involved in initiation and recovery from apnea, a pause in breathing that, if prolonged, causes hypoxia, a severe oxygen deficiency that can lead to death. Previous studies indicate that the inability to recover from attacks of apnea-induced hypoxia may play a role in Sudden Infant Death Syndrome (SIDS).

He will also investigate how age affects the ability to recover from hypoxic apnea; spontaneous recovery from prolonged apnea by means of the gasping reflex; and regulation of the upper airway in infants during sleeping and feeding.

Thach also is a graduate of the School of Medicine, where he has been on the faculty since 1976. He is on staff at Barnes, Jewish, and Children's hospitals.

Silicone gel reduces scars

Just when silicone gel is under fire for interfering with mammographies in breast implants, someone comes up with a new use for it. Though they don't yet know why, researchers at the School of Medicine report that the topical application of silicone gel, in sheet form, effectively reduces the disfiguring scars that sometimes form after burns heal.

In the first controlled study of the subject, investigators measured improvements in all the scars they treated with small sheets of silicone gel.

According to Thomas A. Mustoe, M.D., raised scars, called hypertrophic scars, are often red, inelastic, and restrictive to movement. But with the help of silicone gel, these scars become flatter, lighter in color, and more flexible. "We saw dramatic unequivocal response in some patients," he says.

Mustoe, an associate professor of surgery in the plastic surgery division, says no one knows what causes raised scars. Because animal models do not exist—only humans develop such scars—there have been difficulties in gaining an understanding.

According to William W. Monafo, M.D., professor of surgery and a member of the research team, such scarring is "quixotic," neither predictable nor preventable. They are most severe, he says, among children and dark-skinned people and can result from deep wounds or incisions as well as burns.

The conventional treatment for the thick, red scars has been pressure, usually supplied by an elastic garment that often must be worn for nine months or more. Such suits are hot, uncomfortable, and difficult to fit to some parts of the body, especially joints.
Mustoe first learned of the silicone gel alternative during a 1986 visit to Glasgow, Scotland. Researchers working with the material there got their supply from the same company Mustoe was collaborating with in the United States on an unrelated project. He calls his discovery "pure serendipity" and still does not know what first gave doctors in New Zealand and the British Isles the idea to employ silicone in scar therapy.

Silicone gel differs from recently developed artificial skin that are designed to aid in the resurfacing of fresh burns and serve as a substrate for skin until the real thing can grow back. The gel is effective for reducing scars that form after healing is complete, Mustoe explains.

The pilot research by Mustoe, Monafco, and Sang Tae Ahn, M.D., a surgical fellow, published October 4 in the journal Surgery, relates experiences with 14 scars in 10 patients. Of the 14, a total of 11 were covered for 12 hours or more each day with sheets of silicone gel about one-eighth of an inch thick. The gel is tacky to the touch and as flexible as human skin, so it does not restrict movement. Held in place with gauze, adhesive tape, or bandages, the sheets were removed by the patients every day for cleaning. Similarly sized scar tissue adjacent to the covered areas or on anatomically paired regions served as the controls. All scars treated showed significant improvement after eight weeks of testing.

In one dramatic example, a 33-year-old man was treated for a thick red and tender burn scar that limited the extension of his neck. After part of the scar was covered for eight weeks with the silicone gel sheeting, it was flatter, lighter, and thinner. Elastometric measurements that gauged the scar tissue's flexibility nearly doubled. And all of the improvements in the scar were still present one month after treatment stopped.

Before the trials began, both test scars and control areas were photographed, biopsied, and measured for flexibility with a device adapted by team members especially to quantify the elastometric capacity of skin. The hand-held gauge applies constant tension to two points 10 millimeters apart, then registers the stretch in hundredths of a millimeter. Elasticity increased in all but one of the scars measured. Scar elasticity averaged about 12 percent in pre-treatment measurements and rose to roughly 18 percent one month after treatment was stopped. Normal skin displays elastometric values of 30 percent to 42 percent. The control scars showed no change.

Because of the increase in elasticity, Mustoe says the therapy may have special importance for treating scars of the fingers, hand, wrist, and anywhere such tissue restricts movement.

"Scars that improved in elasticity also improved in appearance," Mustoe notes. Patients and researchers observed improvements in five areas: texture, color, thickness, durability, and pruritis, or itching.

Side effects included only a rash, itching, and three instances in which the scars beneath the sheets softened. All of the side effects were alleviated by briefly removing the gel sheet.

The age of a scar had no measurable impact on the treatment's effectiveness. Location of the scar and age of the patient also had no effect, though Mustoe says larger samples in future trials will be required to identify the groups that benefit most.

The silicone is biologically inert, neither promoting nor retarding microbial growth. Because the basic material already has been approved for use inside the body by the Federal Food and Drug Administration, Mustoe expects this scar-therapy application to be generally available without the delay common in bringing new medical treatments to patients.

Thomas A. Mustoe, M.D., holds a piece of silicone gel. The gel helps reduce disfiguring burn scars.
Father’s drinking may harm junior’s thinking

Alcoholic mothers who often sacrifice their unborn children’s health to fetal alcohol syndrome may not be the only ones taking that horrific risk with the future. Groundbreaking investigations at the School of Medicine suggest that fathers who drink heavily prior to the conception of their children also might be instrumental in producing long-term toxic effects in their offspring.

The research shows that adult male rats sired by “alcoholic” fathers required significantly longer than their normal counterparts to acquire two learning tasks regularly used to test memory in laboratory rats. “They showed a basic flaw in their ability to learn,” says Theodore J. Cicero, Ph.D., who directed the study. On developmental measurements and in all other observations, the “paternal alcohol” offspring—never exposed to alcohol themselves—were normal.

“A lot of time and energy have been spent investigating the damage an alcoholic mother does to her offspring. Now we must begin to consider the father’s role,” says Cicero, a professor of neuropharmacology.

Over the past seven years Cicero has been exploring the effects on offspring of male rats given free access to a diet in which 35 percent of the calories were derived from alcohol. Cicero says such a diet makes them “heavily dependent and intoxicated much of the time, the equivalent of human alcoholics.” Tests of blood alcohol content in the animals revealed levels of 100 milligrams per 100 milliliters, an amount commonly expressed as .1 percent.

Because rats do not naturally like the taste of alcohol and eat less than normal when it is disguised in their food, control animals must be pairfed—given exactly the same number of alcohol-free calories and the same nutrients.

The chance to separate the effects of alcohol from the effects of the poor nutrition so often suffered by alcoholics is just one of the advantages available to the scientist who controls his experimental procedure in animals, Cicero points out. For the clinical investigator, the study of alcohol’s effects is complicated by issues of personality, genetics, and environment that the laboratory scientist controls.

For 39 days, the male rats ate a diet in which the alcohol content was gradually increased to allow adaptation, stabilized, then reduced to prevent withdrawal. Before being bred to normal females that had eaten only alcohol-free food, the male rats got no alcohol for two weeks to eliminate any withdrawal symptoms that might confound results. Fifteen rats were on the protocol, along with 15 control animals eating non-alcoholic rations.

Rat pups sired by both the alcoholic males and normal males were compared for body weight at several stages in their growth and the times at which developmental landmarks, such as eye opening, appeared, according to David F. Wozniak, Ph.D., a research instructor of psychology in psychiatry and co-investigator of the behavioral studies. In all cases, no significant differences were found. Wozniak also compared the pups on two sensorimotor tests. One test measured time spent on a steeply inclined screen; the other assessed their ability to turn 180 degrees on a gently inclined slope. Again, no differences were found between the test subjects and the controls.

But after the offspring reached maturity (75 days), the investigators trained them on a spatial learning task and found a reliable performance deficit among the male offspring of alcoholic sires. The animals were tested in a radial arm maze—a device in which a rat is thought to use various objects it sees in the test room as cues to recall which arm of the maze it has already traveled. In order to get a reward, the rat must learn to visit only previously unused arms of the maze. The paternal alcohol rats took significantly longer to learn that. In fact, Wozniak reports that normal rats mastered the task in an average of just over eight days; the offspring of alcoholic fathers required 12 days, nearly twice as long.

Once the animals had learned the task, both groups retained their lessons equally well. Female rats were also tested at an older age, but no deficits were found.

When the male rats were re-evaluated much later (seven to eight months of age) on another test of recent memory conducted in a T-maze, learning ability was still significantly impaired in the test animals. The deficit displayed by the male offspring of the alcoholic sires does not go away as they age. It is not “developmentally overcome,” in Cicero’s words.

The learning impairment also appears to be relatively selective. Wozniak reports that the lab animals are now being tested on tasks not related to spatial or working memory, and early results show no difference between the groups.

The mechanism by which the specific deficit occurs is not
yet clear, but the possibility exists that alcohol has a direct toxic effect on sperm, perhaps doing chromosomal damage. Rat sperm have a life of 42 days, long enough that the sperm responsible for conception were viable during the period of the rat's "alcoholism." The effect might translate into a learning deficit for animals conceived via alcohol-damaged sperm. That, however, has yet to be shown, and Cicero says that precisely defining the mechanism is one of the big tasks this research sets for investigators.

In addition, Cicero and Wozniak are following other avenues of investigation. They are replicating the entire study to further substantiate their results. And they would like to know how much alcohol is required to produce the effect. How long must a male rat go between ingesting alcohol and conception before the effect of the alcohol disappears? Is the risk diminished by long-term abstinence? Answering each of these questions will require the careful design of more studies.

Working in the laboratory of John W. Olney, M.D., a Washington University professor of psychiatry and neuro-pathology, Wozniak also plans to look for abnormalities in the brains of the paternal alcohol offspring. Potentially important to understanding the mechanism of the deficit, such abnormalities are likely to be "very subtle and difficult to localize," Wozniak says.

Cicero says his lab will use the model developed here to explore suspicions that the offspring of alcoholic sires also suffer from impaired immune systems and abnormal hormonal patterns as suggested by clinical observations and other animal research.

To effectively measure the implications of the current study for human beings, clinical investigators will have to do some rethinking, according to Jack Mendelson, M.D., professor of psychiatry and neuroscience at Harvard Medical School. "The studies and the controls will be more difficult to design for humans" Mendelson says, "but that is always the case. Most of what we know about many diseases—cancer and heart disease are examples—we learned using animal studies as guides. I look forward to applying Cicero's principles in my own work." He adds, "this is an extremely important development and spectacular science. That some changes affecting cognitive development are transmissible through the male will stimulate huge interest."

Cicero and his co-investigators, aware of the impact their work may have, spent two years double-checking results before presenting their data at the 19th Annual Meeting of the Society for Neuroscience in late October. Their evidence that alcohol consumption in rodent fathers produces a toxic effect in offspring is likely to focus the light of science on how male parents risk their children's development—one more way in which alcohol acts as a poison.

---

Hepner honored by American College of Health Care Execs

James O. Hepner, Ph.D., professor of health administration and director of the graduate health administration program at the School of Medicine, has assumed the office of chairman-elect of the American College of Healthcare Executives.

Hepner will serve a consecutive three-year term as chairman-elect, chairman, and immediate past-chairman with the college, a Chicago-based international professional society of more than 22,000 health care executives. The college works to enhance health care management through comprehensive programs in accreditation, professional assessment, education, career counseling, publications, research, and public policy.

Prior to taking the chairman-elect position, Hepner served as a member of the college's board of governors, and has served as a member of its council of regents. He was the first full-time university faculty member in the college's 56-year history to become a college regent and governor, and is the first to become a chairman officer. He also holds fellowship status in the college, the highest level of professional recognition.

Hepner joined the staff at the School of Medicine in 1967 as the first full-time director of the Health Administration Program. Prior to this, he served as the associate director of Jewish Hospital. He has been a consultant to the Department of Health and Human Services as well as the U.S. Air Force Surgeon General. He is a past chairman of the board of directors of the Association of University Programs in Health Administration and for five years was the director of the Interagency Institute for Federal Health Care Executives.

The author of five books, Hepner received the American College of Healthcare Executives' Silver Medal Award for outstanding contributions to the health care field and the Outstanding Health Care Leadership Award from the Hospital Association of Metropolitan St. Louis.
The evidence seemed so scientific, so foolproof, so convincing—until the evidence itself was put on trial. New York City police, who had picked up a neighborhood handyman for questioning about the stabbing deaths of a pregnant woman and her two-year-old daughter, were excited to notice a small speck of dried blood on their suspect’s watch. Was it from one of the murder victims?

Modern detective work is not always as elementary as it was in Holmes’ day. Today’s Sherlocks often use sophisticated DNA technology to solve violent crimes.
They were confident that DNA fingerprinting would give them the answer. A new forensic technique in which small amounts of blood, tissue, or semen can be used to produce a precise map, a so-called fingerprint, of a person's genetic material, DNA fingerprinting is often touted as a foolproof method of identification and has been used as evidence in more than 100 court cases in the United States alone. The technique has led to several convictions and even put a man on death row.

**What Were the Odds?**

When the laboratory results were in, one of the country's leading labs in DNA fingerprinting, Lifecodes Corporation, claimed that the DNA from the blood on Jose Castro's watch matched that of the murdered woman. Lifecodes said there was only a one in almost 2 million chance that the blood could be from someone else.

But Castro's defense attorneys, Peter Neufeld and Barry Scheck, were not willing to take Lifecodes' word for it. They had recently attended a scientific conference at which researchers discussed problems with DNA fingerprinting. In light of the concerns brought up at that meeting, Neufeld and Scheck questioned the acceptibility of the evidence during a special pretrial hearing.

The answers they uncovered were shocking. Lifecodes said the probability that the blood on Castro's watch might not have come from the murder victim was one in almost 2 million. But Philip Green, Ph.D., an expert in human genetics and statistics in the Department of Genetics at Washington University, recalculated the probability to be one in 24. If such statistical errors were made routinely, Green says, the wrong person would be convicted in one out of every 24 court cases.

This thought was so disturbing to Green and several other expert witnesses that they waived their customary witness fees and testified for free. And, as if the statistical problems were not enough, the researchers had many other questions about Lifecodes' laboratory methods.

After examining the company's published papers and laboratory records in the same way they would review a scientific paper for publication, expert witnesses for both prosecution and defense issued a single consensus statement during the hearing: "Overall, the DNA data in this case are not scientifically reliable enough," they said. "If this data were submitted to a peer-reviewed journal in support of a conclusion, it would not be accepted."

But was it reliable enough to send a man to jail, perhaps even sentence him to death? The judge said no, dismissing the DNA matching evidence in this particular case while upholding the reliability of DNA fingerprinting when practiced correctly. So the question remains: Just how correctly is DNA fingerprinting being practiced?

**DNA Fingerprints Not So Foolproof**

That Lifecodes is one of the country's leading DNA fingerprinting labs ought to indicate something, according to Eric Lander, a geneticist from the Whitehead Institute for Biomedical Research, who served as a key witness for the defense in the Castro hearing. "There is no doubt that DNA [testing] can be done right by scientists paying a lot of attention to it," he says. "But have the particular standards been developed to allow forensic use to go forward in labs that normally don't do that much DNA work? Well, it's not clear."

In the June 15 issue of Nature, Lander cited four other cases in which the DNA evidence was questionable. In one case, another leading DNA lab—Cellmark—offered evidence that a dead newborn found in a woman's car was her baby. Yet according to a physician's sonogram, the woman was pregnant with another child at the time the dead baby was born.

To find out just how accurately DNA fingerprinting is being practiced, the Orange County California Sheriff's Department crime laboratory sent 50 blood and semen samples drawn from about 20 people to each of three major DNA fingerprinting labs, asking them to determine which specimens came from the same people. Cellmark got one out of its 44 matches wrong and Forensic Science Associates missed one out of its 50 reported matches—not bad, but not foolproof. Lifecodes got 37 matches correct, but was unable to offer any conclusions about the rest of the samples. Such were the results of a technique Cellmark had once testified was so accurate that the odds of a mismatch were one in 30 billion, a technique that Time magazine heralded as a "foolproof crime test," and Newsweek described as "proof positive."

**DNA Prints No Better Than Their Makers**

One reason that judges, juries, the press, and the public-at-large have so readily accepted the claims of DNA fingerprinting is that they confuse DNA itself with the prints that are made from it.

While it is true that all people, except for identical twins, have a unique genetic makeup, that does not necessarily mean that this makeup will be accurately represented by a DNA fingerprint.
Unlike conventional fingerprints, which capture every swirl and pattern on a person’s thumb with a smudge of ink on paper, DNA fingerprints don’t even come close to capturing all of a person’s DNA, according to Green. What they reveal is only a few distinctive gene fragments, or alleles (about 0.0001 percent to 0.00001 percent of the total amount of DNA in a chromosome) that vary in length and show up at the end of the genetic fingerprinting process as a handful of dark bands on photographic film.

These bands, which look remarkably like the bar-codes read by computerized registers at the grocery check-out line, are obtained by cutting DNA with special enzymes, sorting the pieces with electricity, and marking their positions with genetic probes (see sidebar).

These same techniques have been used effectively to identify and chart the inheritance of human disease genes for more than a decade, according to Helen Donis-Keller, Ph.D., professor of genetics at the School of Medicine. Donis-Keller and her former colleagues at Collaborative Research in Waltham, Mass., used these DNA fingerprinting techniques—even some of the same probes—to identify the general location of the cystic fibrosis gene in 1985, and she still uses these markers and techniques in her lab today. Why then, is a technique that’s used so successfully in biomedical research encountering so many problems in forensics?

**DNA in the Real World**

One of the problems is that forensic scientists often have very small amounts of DNA to test. They may have only a speck of blood on a suspect’s watch or a small sample of tissue scraped from a murder weapon. Medical researchers, on the other hand, obtain DNA from cells grown in the lab, so they can make as much as they want. “If we drop it on the floor, we can go make some more,” Donis-Keller says. “In forensics, they often have a small sperm sample, some skin, dried blood, whatever. It’s a vanishingly small sample of DNA, so they have to do everything right the first time.”

Purifying forensic samples of DNA is also difficult because evidence left at the scene of a crime is often contaminated with bacteria, which also contain DNA. And forensic samples of DNA are often degraded by heat and other contaminants present in a non-sterile environment. “Imagine trying to purify DNA from a fender,” Donis-Keller says. “You know, it’s a terribly difficult undertaking.”
Researchers at the School of Medicine use a computerized gel-reading program that determines the precise, mathematical positions of DNA bands on a gel.

The biggest problem, she says, is that forensic labs do not necessarily play by the same rules observed by university scientists. Forensic labs have been working with this new, complex DNA technology in the dark, making up their own rules as they go along, Donis-Keller explains. "The most alarming part about this whole use of DNA in forensics is that there was a total lack of leadership in setting standards for forensic analysis using DNA." And it was not just the fault of forensic science, but also the fault of university scientists, law enforcement officials, and the government for not helping to develop those standards, she adds. "The Castro case has made everyone think twice about what they're doing and what the effect can be in the courtroom."

Comparing the bar-code-like bands from two genetic fingerprints isn't as easy as it looks. Bands that are not alike may appear to match simply because their positions on the gel are so close that it's hard to tell the difference without objective measurements. Some probes yield patterns in which all 50 to 100 identifying bands lie within only a small fraction of the length of a gel, making them nearly impossible to distinguish with the naked eye.

Forensic experts in the Castro case eyeballed their matches, leaving themselves wide open to human error, says Green. They also did not perform a "mixing experiment" to see if a 50:50 mixture of the two samples yielded the same pattern as each sample separately, he adds. Most molecular geneticists would not declare a match without a mixing experiment or at least—in the event that there were not enough DNA to conduct a mixing experiment—would run two known and identical samples of DNA side-by-side to make sure that their DNA bands match, and that the equipment is working properly, according to Green.

Forensic experts in the Castro case, on the other hand, did not use these internal controls to insure the integrity of their genetic fingerprints, Green says. And some of the prints indicated the presence of extraneous material, according to Green, who suspects that the sample may have been contaminated.

Guilt by Number

The Castro hearing is a perfect example of how math can be misused to prove a point. According to Green, a common misconception is that if there's a DNA match, the genetic fingerprints are unique and characteristic of a single individual. Yet the value of a print really depends on how detailed it is. "If it were a match at only one DNA position, or locus, well, that's not so impressive," he says. A match at several loci, on the other hand, is much more convincing.

To understand how unique a match at a single DNA fingerprint band is, forensic scientists draw upon population databases in which they've tested the probability that a person picked at random would match at that band. Using separate population databases for various racial groups, Blacks, Orientals, Whites, Hispanics, and others, they first determine the probability of a random match at a given band.
To determine the uniqueness of matches at several bands, Lifecodes simply multiplied the probabilities of a random match at each individual band—the way they would determine probability for a series of coin tosses, according to Green. In a coin toss, each toss has an independent probability. That is, a coin is neither more nor less likely to land heads if it landed heads on a previous toss. The chance that a coin will land heads is always 50:50, or .5, and the chance that a series of three coin tosses will all land heads is figured out by multiplying the probabilities of each individual toss: \( .5 \times .5 \times .5 = .125 \).

By multiplying the probabilities in this way, Lifecodes greatly loaded the odds, according to Green, who explains that such statistical methods cannot always be applied to human populations. Genetic matches can be considered independent only when the population is mating randomly, Green says. “If you look at the human population, that breaks down. In human society there are certain strata that influence who people marry, and there are subgroups within populations,” he explains. In the Hispanic population, for instance, there are Cubans, Mexicans, Puerto Ricans, and a number of other subgroups. The probability that if one DNA fingerprint band matches, others will too is much higher among people in the same subgroup, Green adds. A Swede with blonde hair, for instance, also is likely to have blue eyes. “We still need to learn more about population geneties to understand how rare DNA fingerprints and matchings really are,” he says. “And we probably need more conservative numbers so that we don’t inadvertently overstate the weight of the evidence.”

### In Castro’s Wake

Even though Castro eventually pleaded guilty on the basis of other evidence, his case blew the lid off DNA fingerprinting and will probably result in a slew of pretrial hearings and case reopenings. Shortly after the judge dismissed the evidence, Scheck and Neufeld formed a committee with the National Association of Criminal Defense Lawyers to help convicted people reopen their cases. Lifecodes spokesman Karen Wexler, on the other hand, cautions against throwing the baby out with the bathwater, pointing out that DNA evidence submitted by the company has been reviewed and accepted in hundreds of other court cases.

Meanwhile, scientists, law enforcement officials, forensic scientists, and the government are considering how to develop standards to regulate the technique. The Federal Bureau of Investigation has now taken the lead by sponsoring a series of meetings with researchers and laboratory representatives in an effort to arrive at a consensus. A leader in DNA fingerprinting, the FBI developed its own protocol only after intense evaluation by a team of 15 research scientists that included geneticists, computer scientists, and statisticians. The DNA test lab that resulted did not begin to accept criminal cases until it passed a series of proficiency studies. Since then, the lab has completed work on more than 200 cases, at least six of which have gone to trial.

The FBI uses a video camera to capture images of DNA fingerprint bars and then determines their positions with a computer that expresses location in terms of molecular weight. They also run known samples of DNA on several control gels to insure that the equipment is working properly.

“The Castro case has served to bring the entire forensic laboratory community closer together, because it makes it very clear why standards are such an important thing,” says John Hicks, deputy assistant director of the FBI’s laboratory division in Washington, D.C. “While there was already a lot of support within the community, and the community was generally moving in that direction, I think the Castro case just insured that if there were any doubters (concerning the importance of standards), they’re believers now.”

Castro’s home state of New York has certainly become a believer. Last month the state’s director of justice, John Poklemba, announced the state’s plan to establish a committee to set and monitor standards for DNA analysis, and to create a scientific board to examine test results before they end up in court. This month, the National Academy of Sciences began a comprehensive study of the technical, legal, and ethical issues surrounding the forensic use of DNA analysis, and Congress’s Office of Technology Assessment (OTA) is looking into the science of DNA fingerprinting.

Lander, who is helping OTA develop its report, cautions that standards, if they are to be developed, must be able to keep pace with an evolving technology. “I expect that what we call DNA fingerprinting five years from now will be a totally different method,” he says. “The new techniques are in the research laboratories now, and I think the same questions of how a new technology gets into the forensic lab will be played out again with the next generation of DNA fingerprinting, and the next one,” he adds. “I think that the Castro case has taught us a good lesson about the care that needs to be employed in defining standards in advance.”

---

**Helen Donis-Keller, Ph.D., uses DNA fingerprinting techniques to search for human disease genes in her lab at the Clinical Sciences Research Building.**
Library with a View

By Tom Heine

The new medical school library opened its doors to the public July 10. Almost immediately, students and faculty began making use of the research facilities and comfortable study areas. Patrons poked around and explored all the hidden nooks and cubbyholes. And who could resist riding the elevator to the top floor and peering over the railing to the atrium floor, a dizzying seven stories below?

Meanwhile, workers continue to put the finishing touches on the $15 million facility. Reference services offices will be built on the atrium level. Window blinds and some furnishings need to be installed. Signs and room numbers need to be posted. But when the last construction worker leaves, he will leave behind a library that is as beautiful as it is functional.
Visitors gain access to the library through the bright, airy Lehmann Atrium.
A circular staircase takes visitors from the atrium to the second floor and lower level.

The library's stacks currently house about 228,000 volumes and will be able to accommodate almost 200,000 more.

Study areas on the west wall command an impressive view of Barnes Hospital Plaza.
The archives and rare books reading room houses medical classics and information about the history of the medical center.

With more than 113,000 square feet of space, the library's collections can continue to expand well into the 21st century.
Guests enter the faculty center through an elegant foyer.

The spacious faculty center is a welcoming environment for informal faculty meetings and for special events.

Sunlight streams through the skylights of the Lehmann Atrium.

Library borrowers check books out at the circulation desk.
I've never been specifically interested in power,” says M. Kenton King, M.D. This simple declaration by a man who has served 24 years as dean of the Washington University School of Medicine may well be the key to his extraordinary success in a position that might seem to personify power. At a time when the average length of a medical school dean’s career is four years, King exceeded that average by 20 years. But it is not just the length of his service that is significant. More important are the respect and affection that his colleagues on the medical school faculty hold for him.
Drs. Kenton King (standing) and Carl Harford (seated) visit a bacteriology lab in the late 1950s.

Gerald Fischbach, M.D., head of anatomy and neurobiology, expressed this in a congratulatory letter to King on his retirement from office as of October 1. Quoting Mark Twain, Fischbach wrote:

“Praise is well, compliment is well, but affection—that is the last and final and most precious reward that any man can win, whether by character or achievement.” Then he added a personal comment: “You win on both counts.”

King attained this unique position in a highly competitive environment where cooperation and collegiality can sometimes be difficult to achieve. Rendering service, rather than wielding power, has always been the hallmark of King’s administration. During his years as dean, he was elected on an annual basis by members of the Executive Faculty; their votes are evidence of the confidence King consistently inspired.

This fall King retired after a term of office unmatched in the history of the medical school. Only one other dean, Philip Shaffer, M.D., served half as long as King did, and Shaffer served his 12 years in two separate terms. “I can’t take credit for increasing the number of students or producing new buildings,” King insists. The legacy he leaves the institution is far more complex and subtle.

His administrative style is cherished by those fortunate enough to have worked closely with him. On the many pages of tributes in a congratulatory book from colleagues past and present, certain key words occur again and again: fairness, patience, trust, integrity, wisdom, and humor. So highly is King’s personal word valued, that several colleagues remarked on how the usual paperwork involved in complex negotiations just wasn’t necessary during his tenure as dean. As Paul Lacy, M.D., former head of pathology, wrote, “there was no bureaucracy and no passing the buck; problems were resolved on mutual trust.”

Honored on September 15 at an elegant dinner where prominent colleagues paid tribute to his work, King responded to the occasion with characteristic wit and self-deprecating humor: “Of course, I really cannot take everything they said seriously.”

Yet, despite his innate modesty, King takes justifiable pride in the administrative style he honed during his years of service. Sidney Goldring, M.D., wrote that King’s quiet way of leading was “mastered to such perfection that your faculty frequently did not fully appreciate how they got to where they were going.” Like a seamless web, invisible but sturdy, King’s personal and professional style has nourished and inspired medical school faculty for a crucial generation of its history. Between 1965 and 1989, a time when there were enormous changes in and pressures on the institution, he provided the steadying hand of keen judgment and historical continuity. Chancellor William Danforth, who has known King since they were both interns on the medical service in 1951, said: “The King quarter century has been a golden era in the life of our Medical School ... Ken King has been the mortar that has made it all possible.”
It was quite natural for King to put his knowledge and understanding of the medical school's past to use in practical decisions about its present and future. He is well known for his near total recall, and this ability includes the rare virtue of institutional as well as personal memory. He never ignored or forgot lessons learned during difficult times in the medical school's past.

Visitors to the dean's office over the years will recall the double row of ten framed photographs that hung over his desk: the portraits of the deans who had preceded him. Their presence demonstrated his constant awareness of the men who had helped develop the School of Medicine from the time of its 1910 reorganization: George Dock, Eugene Opie, Philip Shaffer (the only man to serve two terms as dean, from 1915 to 1918, and 1937 to 1946), G. Canby Robinson, Nathaniel Allison, McKim Marriott, Robert Moore, Carl Moore, Oliver Lowry, and Edward Dempsey. A lesser man might have felt uneasy to have his predecessors literally looking over his shoulder; King, however, has always seemed at home in the company of his fellow deans.

Yet it is important to note that at the time of his selection as dean in 1965 he was, in fact, quite different from all his predecessors—most of whom had been elected from among the department heads at the School of Medicine and all of whom were senior professors.

King was the first and only full-time dean, and the Executive Faculty elected him to that office when he was only 40 years old. The custom of annually electing the dean was an essential part of the Executive Faculty system, a method of governance unique to the School of Medicine.

Established at the time of the school's reorganization in 1910, this body, composed originally of all department heads, has for nearly 80 years voted on all appointments, all major policy matters, and all major expenditures—in addition to electing its own dean. Though most of these actions require approval from the University's Board of Directors, it has been withheld only on very rare occasions. Thus, the Executive Faculty of the medical school has maintained a firm tradition of self-governance, an attribute that has helped attract new department heads.

Nonetheless, membership in the Executive Faculty has not always been an automatic guarantee that the colleague elected as dean would continue to enjoy their confidence.

With this fact in mind, and the knowledge that two other department heads had only reluctantly agreed to take on this position in the 1950s, the Executive Faculty turned to King in 1964 when Dean Edward Dempsey left. It was a time of turmoil, and King says with a smile: "I doubt that I'd ever have been asked to become dean if Ed Dempsey's departure had not been rather abrupt."

The choice of King to become acting dean in 1964 was both inspired and courageous. Breaking precedent, the Executive Faculty turned to this young physician/administrator, who had first come to St. Louis 13 years earlier, as an intern in 1951. Yet Oliver Lowry, M.D., (a former dean himself and a member of the Executive Faculty at this time) recalls that there was no sense of uncertainty about choosing King. He had been serving as associate dean since 1962 and had swiftly gained the senior faculty's confidence.

Named acting dean on October 5, 1964, King received the appointment as dean only five months later in March 1965. At that time Carl V. Moore, M.D., vice-chancellor of medical affairs, noted: "He has enjoyed the respect of the faculty for a long time . . . and has impressed everyone with his leadership and his quiet, effective way of getting things done." The style Moore remarked on at the start of King's appointment did not change over his 24 years in this position.

And though Moore did not live to see King through his term of office, a comment he made about retirement is pertinent: "When it comes time for a man to hang up his hat and quit, what will seem of greatest importance will not be the stature he has achieved in society . . . but the contributions he has been able to make to other people." During his years in office, King certainly succeeded in reaching Moore's high standard of measurement.

King grew up in Oklahoma City, Okla., and was only five years old when the stock-market crashed. In the early 1930s, his mother went to work to supplement the family income as a social worker with the County Welfare Department, and ended up running the department, though she didn't have a degree in the field. Still, money was tight, and King remembers: "It never occurred to me to ask my parents for the money to go to medical school—nor would I have had the nerve to ask."

Instead, after two years of college at the University of Oklahoma, he shipped out as a Navy ensign to the Pacific Theater on the U.S.S. Vincennes, spending 16 months there—including the battle of Okinawa which, he says, "Two of my sons regard as the crowning achievement of my life."

It was while he was on board a ship in the Pacific that he decided to go to medical school, and, like many young men of his generation, King attained this educational goal through the support provided by the G.I. Bill. As he recalls, it supplied books, tuition, and $75 a month; his rent was $35, which left him $10 a week to live on—something he accomplished without much difficulty. He attended the Vanderbilt School of Medicine and received his M.D. in 1951.

On his first tour of duty in St. Louis, King served as an intern and assistant resident on the ward medical service at Barnes Hospital from 1951 to 1953, during Wood's tenure as chief of medicine, returning to Vanderbilt as assistant resident from 1953 to 1954. He considers his house officer years as the best in his life, bar none: "Your whole life is spent improving what you do, and on top of that, you're helping people."

Much of the pleasure he took in work was due to the influence of Wood, whom he counts as "number one in my life." He well remembers preparing cases to present to Wood first thing in the morning, and recalls how Wood always gave full attention to what he or others said. Invited back to St. Louis to serve as chief resident under Wood in 1954, King became a fellow in medicine in 1955. From 1955 to 1957, King spent two years at Johns Hopkins as a research fellow in microbiology with his mentor.

Moore, who succeeded Wood as chief of medicine, worked with Robert Shank, M.D., to lure King back to St. Louis as physician-in-charge of the student health
service and instructor in medicine and preventive medicine. In 1958, he became an associate professor of medicine, the same year that three articles he and Wood wrote on the pathogenesis of fever were published. All the available evidence pointed to a future career in internal medicine.

But his colleagues must have sensed other talents in King early in his tenure here. In 1960 he was appointed acting head of the Department of Microbiology for a year, and in 1961 he became an assistant dean. By 1962 King was associate dean for student affairs and chairman of the committee on admissions—a dual responsibility which gave him special pleasure, because he was able to see students through the selection process and into their internship placements.

King well remembers the day in October 1964 when he was asked to leave the Executive Faculty meeting so that members could take a vote; on his return, the faculty asked him to preside over the group as acting dean. "It was quite a shock to a 40-year-old associate professor," he recalls.

Fortunately, Moore was there to tutor King in the first year of his administration—along with the remarkable triumvirate who had run the medical school for decades: William Parker, registrar; Louise Jacoby, administrative assistant to the dean; and Helen Kaiser, the financial affairs officer. King recalls with a smile, "It was five years before Mr. Parker trusted me with a master key." Moore, former dean and the first vice-chancellor for medical affairs, had much wisdom to impart—and King was grateful for his counsel.

Always unassuming and unpretentious, it is not in King's character to speak of himself in glowing terms—except when he is asked about his work as a house officer: "I was very good;" he says with visible satisfaction nearly 40 years afterwards.

But by 1964 he already had exhibited qualities for which the medical school had dire need in a difficult time: steadiness, patience, modesty, and keen judgment. As his longtime colleague Samuel B. Guze, M.D., former vice-chancellor and department head of psychiatry, says flatly, "Ken would have made a superb psychiatrist; he has an uncanny ability to size people up."

That he was willing to use this talent in the service of the medical school for so long has been to the great benefit of many. As William Landau, M.D., head of neurology, said at this past year's graduation, King's "gift of himself to the institution for more than a quarter century is the best endowment we ever received."

King's willingness to listen to others helped him make well-informed decisions.

Fortunately, this remarkable endowment will continue to be available to the medical school. Although giving up full-time administration will allow King to spend more time with his wife, June, and their five sons, he will continue to serve the medical school in a variety of ways—both formal and informal. He has agreed to chair a number of committees, including the Committee on Medical Education. He also plans to begin a number of writing projects on medical history—which he has observed so keenly from various vantage points.

And because the wisdom that comes from such long experience as his is enduring, colleagues who learned to rely on his keen judgment continue to seek his counsel. King's very first appointment on the Monday after he retired from the dean's office was with his successor, William Peck, M.D., who holds the combined offices of vice-chancellor and dean. When asked what King's role will be in the new administration, Peck replies, "He will play a continuing advisory role in the governance of the institution; he knows the school, the people, and has the knowledge of years."

Members of the Executive Faculty have made sure that King will be among them whenever they convene in the Shaffer Conference room; his portrait now hangs opposite that of his predecessor, Shaffer. And an elegant faculty conference room on the 7th floor of the new medical library has been named in his honor. Yet more important than any physical evidence of respect and affection is the heritage King has left to future deans.

Writing about medical education, the well-known essayist (and former dean himself) Lewis Thomas, M.D., observed:

"The worst of all jobs is that of the dean. . . . He carries, on paper, the responsibility for the tranquility, productivity, and prestige of all the . . . departments in his bailiwick, and when things go wrong at the outskirts . . . the blame is swiftly transported toward the center . . . and straight to the dean."

Over his term of 24 years King always managed to make the best of what Thomas called "the worst of all jobs"—and that transformation alone is a rich legacy to his successors.
Corneal transplants in the age of AIDS

We are witnessing in our own lifetimes the evolution and mutation of pathogens, especially viruses, at an alarming rate. The discovery of new pathogens, such as the AIDS virus and the Hepatitis B virus, pose difficult decisions regarding serologic screening for corneal transplantation.

When Eduard Konrad Zirm performed the first documented corneal transplant in a human in 1906, he himself obtained the donor material and judged its adequacy for transplantation.

A half century later, the American Academy of Ophthalmology and Otolaryngology formed the first Committee on Eye Banks, with the purpose of generating national standards. And, in an effort to further regulate and certify these standards, the Eye Bank Association of America was formed.

The first meeting in which medical standards were discussed was held in April 1977. It resulted in a published document outlining training and education of medical personnel within the Eye Bank, assurance of donor quality control, sterility control of the Eye Bank Laboratory, assurance of equitable distribution of tissue, and a system of inspection of Eye Banks assuring continuing maintenance of standards.
Today, with more than 30,000 corneal allografts performed each year in the U.S. alone, the Eye Bank Laboratory serves to procure and evaluate suitable donor corneas. The importance of medical standards in the evaluation of these donor tissues has been further emphasized by reports of transfer of infection via corneal transplantation. To date, improved methods to detect infections and contamination of tissue, long-term storage media, more accurate assessment of corneal viability and physiology, and improved antisepsis of donor tissue represent some of the many challenges of modern eye banking as we approach the 1990s.

Improved methods to detect infections and contamination of tissue, long-term storage media, more accurate assessment of corneal viability and physiology, and improved antisepsis of donor tissue represent some of the many challenges of modern eye banking as we approach the 1990s.

Jay S. Pepose, M.D., Ph.D., is associate professor of ophthalmology and assistant professor of pathology, and medical director of the St. Louis Eye Bank.

AIDS-related disease related to corneal transplantation. There are eight cases of inadvertent corneal transplantation from cadaveric donors that tested positive for antibodies against HIV. All corneal recipients remained healthy and tested negative for HIV infection up to three years following transplantation. In contrast, two of the recipients of kidney transplants from the same HIV-positive cadaveric donor in which two of the corneas were harvested tested positive for HIV antibodies and showed symptoms of acute infection with AIDS.

Despite the lack of evidence of transmission via penetrating corneal grafting, Eye Banks in the United States now routinely perform serologic screening of all potential corneal donors, using an enzyme-linked immunosorbent assay to detect the antibodies against HIV-1, prior to the release of tissue for transplantation. Cadaveric sera are also screened for Hepatitis B Surface Antigen. Tissue from cadavers known to be high risk for HIV infection are not released for transplantation, regardless of the results of serologic testing. The Eye Bank Association of America also has a long list of contraindications for transplantation that includes many disorders of the central nervous system, infections, malignancies, and intraocular diseases.

The discovery of new pathogens poses difficult questions and challenges to medical standards that revolve around medical, legal, societal, cost-benefit, and public health issues. Should the availability of a serologic test, which may or may not be FDA approved for use in blood or sera from the living (for pathogens that may be only loosely associated with specific diseases), be immediately used to screen cadaveric sera for potential cornea donors? Should the test first be applied to cadaveric sera, to assess its sensitivity and specificity (which may not always be the same as for testing samples from living individuals)? Should the pathogen first be demonstrated in corneal tissue, and how should we determine which microbial agents deserve serologic screening or testing by other methods? Should the eye bank contact the family, spouse, or significant other(s) of cadavers testing seropositive for antibodies to HIV, and is there an obligation to perform confirmatory tests on the sera?
Success and the California garage

by Greg Holzhauer

Maybe there's a link between business success and California garages. Steven Jobs, the Apple Computers wizard, built the first Apple computer and the foundation stone of a megamillion fortune in his California garage. Allan H. Rappaport, M.D., J.D., didn't do badly, either. Starting from the garage and basement of his San Francisco Bay Area home in 1975, with a capital base of only $500, he went on to build the nation's largest provider of emergency-room services—National Emergency Services, Inc.—that last year operated some 300 facilities in 40 states and grossed $85 million.

That's not bad for a Toledo, Ohio native who's only 43 and has never had any formal business training. Then again, he traveled about two million miles during the 10 years he was working to build the company; spent about 10,000 hours working in emergency rooms himself; and, if he were needed for some problem in one of his hospitals anywhere around the country, often found himself on a late-night flight from California to show up bright and early the morning after a client's call. And when Rappaport felt he needed a law degree to better understand the legal complexities of his growing emergency-room business, he added law school to his busy schedule.

W ell, no one ever said doctors weren't motivated, or that it would be easy building a nationwide business. But through it all, Rappaport says, he never lost sight of the patient-care side of his work. "When I started medical school, I set the goal of taking care of people. And for a long time I did that directly. Now, even though I'm not in direct practice anymore, I feel like I'm still fulfilling that original goal. Other doctors have the emergency-room services to many non-urban areas. Rappaport has also participated in the revolution of emergency-room care. When he started, it wasn't even recognized as a specialty discipline; today, it's not only a recognized discipline and a source of good outpatient care, but also a creative marketing tool for hospitals. After all, says Rappaport, not even the best-designed advertising campaign can produce patients for a hospital as well as a satisfactory emergency-room experience.

Rappaport's company is a classic example of man-meeting-market. While moonlighting in a San Francisco-area emergency room during his residency, Rappaport realized that there was a lack of structure within most hospital emergency rooms. What was needed, he felt, was a company that could provide a staff of doctors who wanted to specialize in emergency room care. He had no business plan, no marketing plan, and risk capital of only $500. But he also had a phone and some drive.

He felt that hospitals, especially those in rural areas, would be most interested in weekend coverage of the ER. His first client was just such a hospital in Fredericktown, Mo., an institution Rappaport had some history with during his medical school days. As a small hospital in a town not too far from St. Louis, it was ideal from Rappaport's point of view: "Fredericktown was close enough to the Medical Center to appreciate the kind of
professional job we had in mind, and it was far enough away from St. Louis that they didn’t have any program of their own. I managed to sell them on my vision of an organized emergency-room program featuring doctors who wanted to be there on weekends vs. staff doctors who didn’t.”

And so the business started. Rappaport kept his basement headquarters in California and gradually established regional offices—first in St. Louis, and later in Ohio, New York, Florida, Texas, and Virginia. “What got this company off the ground was that I was compulsively available to any client at any time. If a client called me one day with a problem that needed my attention, I could be there the next day. One reason I got an Ohio hospital was because the doctors in the emergency room walked out on three hours’ notice and I got a call at my parents’ house, where I was visiting, asking if I wanted to cover the emergency room.

“Initially I was the marketing department, the recruiting department, everything. For the first 10 years of the company, I worked a minimum of 100-hour weeks, and if I was needed in some hospital in Iowa, Missouri, or Ohio, I could be there—and I was there—the next morning.”

Rappaport rubs his eyes at the still-vivid memory of all those cross-country red-eyes and smiles the sardonic smile of a Johnny Carson talking about alimony.

“Establishing a business like this required a hands-on approach. It required working many shifts in the ERs myself to understand all the nuances: the relationship of the doctors with the nurses, the technical problems of the equipment, the relationship of the emergency room with the rest of the hospital. Initially, I thought this business would be an aside to my radiology practice. But it came to be far more than that, and I found myself traveling the country setting up our network of emergency rooms in 40 states. Luckily, the pleasure beyond that perspective. The ER, since it interacts with more departments than any other single department in a hospital and must therefore have a broader perspective than any other, needs somebody who has solid experience in seeing the problems and opportunities of an emergency room. If we move far beyond ERs, we might lose the management edge we’ve received dealing with so many different people offset the long hours and the many stresses involved.”

In the past five years, as the company has continued to grow, Rappaport has decentralized the business, cut back on his hours, given up his hands-on ER work, and turned toward long-range planning for the company as a traditional chairman of the board. The company has acquired some other service providers and has moved into markets other than hospitals, including about 50 U.S. military facilities. While he likes the idea of new business opportunities, he doesn’t want to take National Emergency Services too far beyond its roots in emergency-room care.

“We’re specialists in one area of hospital management and, as such, we can see problems and opportunities that a more general hospital management company might not see. I don’t want to move too far beyond that perspective. The ER, since it interacts with more departments than any other single department in a hospital and must therefore have a broader perspective than any other, needs somebody who has solid experience in seeing the problems and opportunities of an emergency room. If we move far beyond ERs, we might lose the management edge we’ve received dealing with so many different people offset the long hours and the many stresses involved.”

Rappaport may, however, get involved in other ventures. Indeed, the idea of operating his own Bay Area restaurant is one that’s been with him for some time.

“Our system sees one-and-a-half million patients a year, and I feel that we’re bringing good health care to areas that might not otherwise have had it.”

Like many businessmen who have spent a great deal of time on the road, Rappaport developed a love of food over the years that has taken him far beyond the culinary world of his native Toledo, Ohio. “That’s one of the great things about having been involved in this business. I was exposed to many cultures all over the country that I never would have been exposed to had I stayed in practice in San Francisco. There’s probably nothing better than to travel the world and to savor local cuisines. Sometimes food reflects the style of a particular area, whether that’s New York or the almost Third-World-like feeling of much of California. When you sample the food of a place, you’re truly sampling the culture.”

Can he resist putting that background to work in his own place? He admits that he’s intrigued by the idea of operating a restaurant. “It would be a creative outlet for me, a creative sideline to what has been a fairly rigid career so far—medical school and business. In medical school and in business, you can’t experiment to the extent you can in a restaurant. Cooking, I feel, is an art. And although I realize that most restaurants are not big money-makers, I think putting together a restaurant would give free rein to my creativity.

“I’m not a visionary in the sense of being a poet or a sculptor, but in the area of dining I’ve squirmed away ideas from years of great meals on the road. So yes, I would like to open a truly fine restaurant in the Bay Area. But it’s at least two years off—two years of traveling and talking to chefs and clarifying ideas in my mind.”

28
Academic societies narrow the gap between students and faculty

by Robert Lowes

Medical school may be the one place where a future physician loses sight of his career goal. For much of the first two years, the medical student is sequestered in lecture halls or the library—far from the real-life world of medicine. He is learning to follow in the footsteps of his professors, but they are distant figures at the lectern. The student is just a face in a sea of faces.

Academic societies offer safe harbor. Over dinner, at the ballpark, or on the deck of a Mississippi River excursion boat, students get to know faculty on a first-name basis. And speakers at society functions expose students to issues—medical and otherwise—that don't get covered in Biology 501: health care for the indigent, eugenics, wine tasting, and the destruction of tropical rain forests.

More than 90 percent of the medical student body belongs to one of the School of Medicine's three academic societies—the Joseph Erlanger Society, the Carl and Gerty Cori Society, and the Oliver Lowry and Carl Moore Society. The Erlanger and Lowry-Moore societies were organized in 1986; the Cori Society followed in 1987.

Voluntary in nature, the societies also include approximately 75 faculty members and a small but growing number of School of Medicine alumni. Each society meets off-campus four to five times a year, typically for dinner and an after-dinner speaker. Some gatherings, such as a riverboat cruise or a picnic, are pure R & R.

"They've been an enormous success," says William A. Peck, M.D., vice chancellor for medical affairs and dean of the School of Medicine, who is a former co-chair of the Lowry-Moore Society. "I think it's one of the freshest ideas here I've seen."

The guiding hand in the formation and growth of the societies is Gerald D. Fischbach, M.D., Edison Professor of Neurobiology and head of the Department of Anatomy and Neurobiology. Before he came to the School of Medicine in 1981, Fischbach helped launch academic societies at the Harvard School of Medicine, where he was professor of pharmacology.

"The prominent feature of this school and other schools has been a distancing between the students and faculty," says Fischbach, a co-chair of the Erlanger Society. "And with a heavy emphasis on research and patient care, there's very little opportunity for interaction."

The societies counter this trend, says Fischbach, by allowing faculty and students from all four years to gather informally as peers. "It's a good place for students to talk about career goals and awakening interests," he says. "And we've begun to invite alumni and part-time faculty so the students get a feeling for practicing medicine in the community."

Students say they find professors more accessible at relaxed society functions. "You don't feel the need to impress a teacher, as if he were quizzing you," says Claire Brennan, a third-year student from Hartland, Wis., who helps organize Cori Society activities.

The Erlanger Society opened its 1989-1990 aca-
academic year on September 28 with a feast of boursin chicken, rice pilaf, and apple crisp dessert in the new School of Medicine library. Societies also dine at the university's Whittemore House, area restaurants, and more often than not, faculty homes.

A core group of students in each society helps plan yearly activities, including the selection of speakers. The Cori Society, for example, has heard talks over the past two years on such subjects as genetic engineering, religion and medicine, and the 1988 presidential election (holding forth on the last topic was former U.S. Senator Thomas F. Eagleton). Student organizer Brennan says she prefers subjects that depart from the purely scientific fare presented in the lecture hall.

Faculty leaders in the societies say students benefit professionally by grappling with a broad range of issues, including those which involve medical ethics. "We were worried that medical students sit in class all day long and are not exposed to other forms of education," says Philip D. Stahl, Ph.D., the Edward Mallinckrodt Jr. Professor and head of cell biology and physiology, and co-chair of the Cori Society.

Academic societies at the School of Medicine are taking education in a new direction—mentoring. Students in the Erlanger and Cori societies are divided into groups of four or five and assigned to a particular faculty member. The students may visit the faculty member's house for lunch or accompany him on hospital rounds.

"Essentially, anything goes," says Harvey R. Colten, M.D., Harriet B. Speicher Professor and head of pediatrics, and co-chair of the Cori Society. "Any agenda is fair game."

Diana Chen, a second-year student from Rolla, Mo., is enthusiastic about her mentoring relationship with Colten. "It's great to get to know a doctor on a more personal level," says Chen. "He's what all of us would eventually like to be."

Watching Colten in action, she says, has taught her a lesson that sometimes gets lost in "pure course work"—physicians care as well as cure. Despite the temptation to succumb to a numbing routine, says Chen, Colten "has maintained his compassion and shows a personal interest in how his patients progress."

Faculty members learn lessons from students, too. "Students always bring a fresh perspective," says Colten. "It's a chance to look at things we take for granted."

Adds Fischbach: "It keeps you young."

The three academic societies are themselves young organizations still building on initial successes. In past years, the societies have depended on contributions from each of the 19 medical school departments and the Society for Barnes Hospital. But with the encouragement of the Washington University Medical Center Alumni Association, the School is now allocating to the societies $5,000 from unrestricted contributions.

Fischbach says he also would like to see academic societies engage in more community service and play a formal role in the education of medical students. Regardless of what lies ahead, though, the academic societies already have met one goal: The distance between students and teachers is narrowing. And when student and teacher pass each other in a hospital corridor a week after an amiable society dinner, the chances are they'll say hello and chat.

At that moment, a student no longer feels lost in the crowd.

**CLASS NOTES**

'30s and '40s

Frederick Lee Liebolt, M.D. '30, of New York City, gave the commencement address at the University of Arkansas, Fayetteville.

Edgar L. Engel Sr., M.D. '36, has retired. His son, Edgar L. Engel Jr., M.D. '81, who served his obstetrics and gynecology residency at Barnes Hospital, has taken his father's place.

Walter S. Strodte, M.D. '48, has been appointed medical director of the Kidney Stone Center of the Pacific for 1990. He is currently chief of urology at the Straub Clinic and Hospital in Honolulu, Hawaii.

'50s and '60s

Donald H. Tilson Jr., M.D. '55, was certified in occupational medicine by the American Board of Preventive Medicine in January 1989.

Roger L. Mell, M.D. '65, president of the Southern Medical Association, opened the first general session of the association at its 83rd annual scientific assembly in Washington, D.C.

Michael Roy Treister, M.D. '67, was recently elected vice president of the Jewish Vocational Service, a social service agency that provides educational and vocational counseling, job placement, and rehabilitation and skill training services to more than 13,000 people annually. It is an affiliate of the Jewish Federation of Metropolitan Chicago.

'70s and '80s

Paul A. Mennes, M.D. '70, has been appointed chief of the Department of Medicine at St. Luke's Hospital in Chesterfield, Mo. An internist specializing in nephrology, Mennes joined St. Luke's medical staff in 1977.

Toby Simon, M.D. '70, was inaugurated president of the American Association of Blood Banks this past October.

C. Leon Partain, M.D. '75, of Brentwood, Tenn., was named a fellow of the American College of Radiology.

Horace M. Perry III, M.D. '75, recently received a grant from the American Federation for Aging Research for his study of the mechanisms that contribute to osteoporosis. He is an associate professor of medicine at St. Louis University.

Jo-Ellyn M. Ryall, M.D. '75, is currently speaker of the Missouri State Medical Association's house of delegates and is an alternate delegate to the American Medical Association from Missouri. She married Charles A. Niekamp, Jr. in April 1989.
Steve Meador, M.D. '81, and Kathy Meador, P.T. '82, just had their second child on September 30, 1989. Her name is Stephanie Ann.

Steven R. Pollei, M.D. '82, was appointed assistant professor of neuroradiology and head of ENT radiology at the University of Utah Medical Center. He is also director of magnetic resonance imaging at the Salt Lake City Veterans Administration Medical Center.

Michael B. Kastan, M.D. '84, was recently appointed assistant professor of oncology and pediatrics at Johns Hopkins University School of Medicine.

Randall W. Tobler, M.D. '84, is a new member of the St. Louis Metropolitan Medical Society.

Carol (Adams) Gleason, P.T. '70, recently returned from New Zealand, where she worked for six months at Balcutha Hospital.

Terrence S. Early, M.D., FHS in psychiatry and assistant professor of psychiatry at the School of Medicine, received a Young Investigator Award of $30,000 from the National Alliance for Research on Schizophrenia and Depression.

Howard J. Eisen, M.D., FHS, and his wife, Judith E. Wolf, M.D., announce the birth of their son, Jonathan Ezra Eisen on August 20, 1988.

Harry L. S. Knopf, FHS in ophthalmology, served as visiting faculty this past September aboard the Project Orbis plane in Rijeka, Yugoslavia. While aboard this flying ophthalmic teaching center, he lectured about cataract surgery and intraocular lenses. Via televised live surgery, he demonstrated modern surgical techniques and assisted local surgeons who were attending the sessions to update their knowledge of extracapsular cataract extraction with lens implantation. Knopf also participated as one of the guest speakers at a symposium on anterior segment surgery on the Isle of Krk in Yugoslavia.

William R. Platt, M.D., FHS in pathology, and his wife, Jeannette, celebrated their 10th anniversary this past March. He is working on his third edition of Color Atlas and Textbook of Hematology and is grandfather to grandsons Robert and Daniel.

IN MEMORIAM

Oliver Abel III, M.D. '55, died August 5, 1989.
Bryce H. Bondurant, M.D. '43D, died August 20, 1989.
Stanley Forrest Hampton, M.D. '34, died August 24, 1989.
Clinton W. Lane, M.D., emeritus professor and former chairman of dermatology, died September 16, 1989.

The Hot Docs have provided the School of Medicine with big band music for more than a decade. The group enters its 11th year in 1990.
The World is Out of Joint

Orthopedics, to be blunt,
Was a course all students seemed to want
But when the final tests were graded,
Mine was said to be “F-rated”

My answers were, I’m sure, objective
Each question I placed in perspective
Was it the Prof or I who was in error?
I’ll let you judge—what could be fairer?

The Prof said: “Use your brain, don’t sprain it:
‘Carpal tunnel’—please explain it.”
“It was built for trains in Eastern Europe”
Was the first reply I could conjure up.

“Now, for this next one, be explicit:
The acetabulum, what is it?”
“In the ancient days of Donatello,
‘Acetabulum’ was a bordello.”

He next asked: “What is ‘torticollis’?”
My answer, I considered flawless
After thinking on it a few seconds,
“A lady of the evening beckons.”

He winced and shook and then he blurted:
“Now, the deltoid . . . where is it inserted?”
I knew that one. I was delighted:
“Between Eastern Airlines and United”

Things were now becoming hectic
The Prof was turning apoplectic

He screamed: “Try this, it’s not the easiest
Just where will you find the ‘trapezius’?”
I laid on him a first-class zinger:
“In every circus, he’s the ‘swinger’”

“O.K. you’re an athletic buff . . .
What is a rotator cuff?”
“A worn-out shirt that one retrieves
By reversing frayed ends of both sleeves”

By now there was a moratorium
On quiet in the auditorium

“What’s a ‘wry neck’?” “It’s been said
That it’s a narrow loaf of bread.”
“And would you tell us: what’s a femur?”
“Easy . . . it’s a female lemur”

“We’d like to know: what’s a ‘meniscus’?”
“A male athlete who throws the discus”

Now chaos ruled the whole community
He said: “Your final opportunity:
A ‘transverse process’ . . . explanation?”
“It’s a kind of sex change operation”

You’ll note that each interrogation
I answered without hesitation
And since justice always wins out finally
I’ve succeeded, speaking “spinally”

For, despite his clearly unfair tactics,
I’ve done quite well in chiropractics.

Ben Milder, M.D. ’39
(Milder is an ophthalmologist in the St. Louis area.)
Green ashes turned brilliant yellow this past fall in the park across from Washington University Medical Center.
The windows of the new medical library reflect Barnes Hospital. See photo essay on page 14.