OUTLOOK

The Youngest Among Us
Dr. Peterson does his famous anatomy shirt "striptease." See story on page 22.
On the Cover:
More and more babies are surviving after being born at weights as low as a pound. But what are their chances of really making it? See story on page 16.
McDonnell Foundation Gives $1.8 Million to Establish New Genetics Center

The School of Medicine recently established a new genetics center that will take part in one of the most challenging projects in the biomedical sciences: complete analysis of the human genome.

Made possible by a $1.8 million donation from the James S. McDonnell Foundation, the Center for Genetics in Medicine is located at the School of Medicine and involves collaboration of most of its departments, as well as the university’s computer science department.

“Washington University is in a position to contribute significantly to human genome studies,” says David Schlessinger, Ph.D., professor of microbiology and immunology and director of the new center. “The McDonnell Foundation’s support allows us to build on recent developments here in Maynard Olson’s laboratory which suggest a systematic approach to mapping the human genome. We can now test that approach.”

Olson, who is professor of genetics and associate director of the new center, has developed techniques to clone and purify much larger unique fragments of human DNA than was previously possible. The potential of the work has already been widely discussed in the scientific literature.

The human genome project is so massive that most scientists doubt that it would be possible to undertake successfully with existing technology and limited resources, Schlessinger points out. However, he says, new technology—particularly Olson’s technique for cloning large fragments of human DNA in yeast cells—may make the project more feasible.

“This technology provides a possible route to bridge what has been a gap between human genetics studies at the family level and laboratory studies of small bits of DNA,” he comments.

In addition to the work of Olson’s group, a special collaboration forged with RIKEN, Japan’s Institute of Physical and Chemical Research, permits access to that institute’s DNA sequencing facility. “The Japanese are significantly advanced in developing technology that determines the sequence of nucleotides that comprise the human genome. We will combine our skills in cloning and mapping with their ability in sequencing,” says Schlessinger.

Revealing the human genetic structure could enable scientists to discover the genetic basis for some 3,500 diseases already known to be caused by defects in genes, and conceivably offer ways to correct those defects. It would also add significantly to knowledge about normal embryonic development, function of the nervous and immune systems, and about very complex diseases, including heart disease and cancer as well as such serious behavioral disorders as schizophrenia and alcoholism.

The effort to fully understand the genetic structure of humans is vast: scientists believe that the human body contains at least 100,000 genes situated on its 46 chromosomes. Each gene is made up of many thousands of base pairs—chemical units that link in pairs to form long double-helical chains of DNA, the body’s carrier of genetic information. The ultimate goal of human genome projects is sequencing the staggering total of some three billion base pairs in the genome.

The Center for Genetics in Medicine has been designed to contribute pilot studies for the massive endeavor. It will include two units: a core facility that will focus on state-of-the-art cloning, mapping and related technology; and a developmental facility that will be devoted to improving technology. The center will store a library of cloned human DNA, and the computer science department will contribute extensively to the project by developing software for handling the massive amounts of data acquired.
New Blood Sampling Method for Quick Prenatal Diagnosis

Another method of prenatal diagnostic testing is now available to expectant mothers.

The technique, funicentesis, allows a pure blood sample to be drawn from the umbilical cord of a fetus and tested for genetic abnormalities and other conditions.

The procedure is in some cases more accurate than indirect methods of prenatal testing such as amniocentesis and chorionic villus sampling (CVS), and offers a more rapid diagnosis than amniocentesis, says Erol Amon, M.D., assistant professor of obstetrics and gynecology at the School of Medicine. Amon has performed the procedure 24 times during the past year.

"Funicentesis is the safest, quickest way to draw a pure, uncontaminated blood sample from a baby before birth," says Amon, a physician at Barnes and Jewish hospitals, sponsoring institutions of the Washington University Medical Center. "It's often more accurate than either amnio or CVS, because you're analyzing blood cells which are clearly representative of the fetus. Amniotic cells or bits of placental tissue obtained through CVS are sometimes not representative of the fetus because of contamination by maternal cells or biological errors in development."

Funicentesis can be done at any time during or after the 18th week of pregnancy. Chromosome results can be available in about 48 to 72 hours. Cells obtained through amnio, on the other hand, can take from one to four weeks to grow. And villus tissue, although obtainable during the first trimester, can take up to a week to produce sufficient cell growth for accurate analysis of abnormal conditions. The rapid analysis made possible by funicentesis is especially useful during the later stages of pregnancy, when cells drawn from amniotic fluid may take longer to grow, and vital information about the baby's health might not be available to mother and physician prior to birth. It can also be used as a back-up method in the few cases in which amniotic or CVS cultures fail to grow or have questionable results.

Using ultrasound as a guide, a fine needle is passed through the mother's abdomen and inserted into the vein in the umbilical cord, and a blood sample is drawn. The procedure is relatively painless and takes anywhere from 10 minutes to an hour, depending upon the location of the placenta and the umbilical cord and the mother's weight. The basic cost for a blood sample and chromosome diagnosis is about $750, the same as amnio and CVS. Funicentesis can be performed on an outpatient basis in many situations.

Amnio can identify about 200 fetal abnormalities; CVS between 80 and 100. Funicentesis detects only a few genetic abnormalities—its full range is still being explored—but it has many other important uses. Fetal blood sampling can determine if certain infections such as rubella or toxoplasmosis are threatening the fetus, and can prevent unnecessary cesarean sections by assessing fetal oxygen levels, blood count and platelet count. "In the past, if we thought the baby was weakened by an insufficient oxygen supply or a low platelet count and couldn't stand the stress of vaginal delivery, we might do a cesarean," says Amon. "With funicentesis, we can find out vital information before labor and in many cases avoid unnecessary c-sections."

Funicentesis can also determine if the fetus is getting the proper amount of medication for heart irregularities and other problems. "We haven't done it here yet, but there are cases on record where the mother is given medication that will cross the placenta and reach the fetus," says Amon. "In these cases, fetal sampling allows drug levels to be monitored to make sure the baby is getting the proper amount." In the future, it may be possible to inject drugs directly into the vein in the umbilical cord to treat fetal heart irregularities.

Funicentesis can also be used to transfuse blood di-
rectly into the fetal bloodstream in cases of severe anemia, Rh disease, or other blood diseases.

Fetal blood sampling via the umbilical cord has been possible for about ten years. However, the previous method, fetoscopy, carried a four-to-five-in-100 risk of fetal loss. Recent advances in ultrasound technology combined with operator experience with in-utero procedures makes funicentesis much safer. Presently, funicentesis carries less than a one-in-100 risk of fetal loss, while CVS ranges from one-in-100 to one-in-200. The risk of fetal loss with amnio is about one-in-1,000.

As with amnio and CVS, funicentesis might be appropriate when the expectant mother is 35 or older; when she has had a previous child with a chromosome abnormality such as Down syndrome; or when she or her mate carries a chromosome translocation or a sex-linked disease such as hemophilia.

The procedure, sometimes called percutaneous blood sampling or cordocentesis, is also available at St. John’s Mercy Medical Center.

“Funicentesis is another valuable tool in helping physicians and mothers decide the best ways to manage pregnancy, labor and delivery, and can alert pediatricians as to what’s going on before delivery so that the best possible care is available to the child from the moment of its birth,” says Amon. “Furthermore, it will enrich our understanding of fetal biology and development, and extend the world of fetal diagnosis and treatment.”

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**Medical Student Discovers the Hari-Kari Nature of Nervous System Cells**

Research by third-year graduate student David Martin suggests that some cells have suicidal tendencies that must be constantly repressed by a death-preventing factor known as nerve growth factor, or NGF.

Without NGF, these self-destructive cells would kill themselves, according to Martin, who explains that cell death is important and often desirable during growth and development. The human hand, for example, is paddle-shaped at first, forming fingers only after the cells between them die. Cell death also plays a major role in the development of the nervous system, which loses half of its cells before it is complete.

Scientists have long wondered how this systematic and organized death of cells occurs. Do cells simply wither away when their number is up, or do they play an active role in their own demise? Working in the lab of Eugene Johnson Jr., Ph.D., professor of pharmacology, Martin set out to explore this question with NGF, a protein that has been recognized for years as a critical ingredient for the survival of certain neurons.

He began by growing the nerve cells of rats in a NGF-containing nutrient solution, then removing the NGF. He observed that whenever he removed NGF, the nerve cells died between 24 and 48 hours later. NGF was obviously required for the survival of these cells, but why?

One possibility is that NGF supports critical life functions, so that nerve cells passively waste away when deprived. On the other hand, NGF might repress suicide so that the nerve cells actively destroy themselves in the absence of this factor.

To distinguish between these two possibilities, Martin treated the nerve cells with drugs that blocked their ability to make protein. These treated nerve cells did not die when deprived of NGF, indicating that nerve cells take an active role in killing themselves, rather than wasting away passively. “The fact that neurons failed to die when unable to synthesize RNA and protein suggests that NGF normally suppresses the synthesis of ‘killer proteins’ which are designed to kill the cell when trophic factor becomes insufficient,” according to Martin’s paper.

The next step, Martin says, is to identify and characterize these killer proteins. Such information may lead to a better understanding of certain diseases of the nervous system, such as amyotrophic lateral sclerosis, or ALS, which some believe results from a growth factor deficiency. Other neurogenerative diseases may also be due to an inappropriate activation of the death response. Martin suggests that an understanding of the death response and its regulation might eventually lead to cures for diseases where cells die at inappropriate times, or fail to die when they should.

When deprived of nerve growth factor (NGF), nerve cells shiver and die (top right) in contrast with nerve cells that have an ample supply of NGF (top left). But when protein synthesis is blocked (lower left) and NGF is removed (lower right), the nerve cells live.
**McDonald Receives $900,000 Grant to Study Cell Growth Factors in Lung Disease**

A respiratory and critical care specialist at the School of Medicine has been awarded a $900,000 five-year grant to study the role of cell growth factors in fibroproliferative lung diseases.

The grant, from the National Institutes of Health, was awarded to John A. McDonald, M.D., Ph.D., director of the respiratory and critical care division at Barnes Hospital in the Department of Medicine.

Fibroproliferative lung diseases, such as pulmonary fibrosis and adult respiratory distress syndrome, are characterized by excessive amounts of scar tissue in the lungs. McDonald’s research focuses on the role growth factors play in regulating fibronectin—a connective tissue protein important in lung scarring following injury. He and co-investigator Edmund C. Crouch, M.D., Ph.D., associate professor of pathology and director of anatomic pathology at Jewish Hospital, are trying to determine the mechanisms by which growth factors increase excessive scar tissue production of connective tissue proteins by lung cells.

An associate professor of medicine and assistant professor of biochemistry, McDonald has been on the faculty at the School of Medicine since 1979.

**Becker Steps Down as Head of Ophthalmology, Kaplan Steps In**

Henry J. Kaplan, M.D., former professor of ophthalmology at Emory University School of Medicine in Atlanta, became the new head of ophthalmology at the School of Medicine this April.

Kaplan replaces Bernard Becker, M.D., professor of ophthalmology, who will continue to teach and conduct research. Becker, who headed the department for 34 years, is well known for his research into the causes and control of glaucoma. His work established the basis for wide use of the drug acetazolamide for the control of this leading cause of blindness.

Kaplan has been the director of research in the department of ophthalmology at Emory since 1984. His work focuses on the regulation of the immune response of the eye, and on how viral infections such as herpes simplex and AIDS affect the eye. He has done extensive work on the understanding and treatment of uveitis—an inflammation of the pigmented layer of the eye—and other intraocular inflammations, including retinitis.

A graduate of Columbia University, Kaplan is a recipient of the Alcon Research Institute’s Scientific Award for 1987, and currently serves as chairman of the Visual Sciences Study Section at the National Institutes of Health.

**New Coronary Research Unit**

The Center for Cardiovascular Research at the School of Medicine recently received a $1 million gift from Allen Portnoy and his wife, Saretta, to establish a new coronary artery disease research unit.

The gift was made in honor of Alan N. Weiss, M.D., associate professor of medicine, who has helped improve the characterization of ischemic heart injury with ultrasound.

The Saretta and Allen Portnoy Coronary Artery Disease Research Unit will focus on understanding and treating atherosclerosis and thrombosis. The Center for Cardiovascular Research, of which it is a part, was established in 1986 to help translate advances in basic science to progress in the prevention, diagnosis and treatment of cardiovascular disease.
Ophthalmologists Warn That There's Much More Than Splendor in the Grass

The grass may not always be greener on the other side, but it is certain to contain some debris—stones, twigs, pieces of metal or other small objects—that can put out an eye if they are sprayed up by a nylon line lawn trimmer or lawn edger, ophthalmologists at the School of Medicine warn.

Operating at speeds of 6,000 to 14,000 r.p.m., these increasingly popular power mowers not only threaten the eyesight of the people operating them, but also jeopardize the vision of any bystanders within a few hundred feet. “If you live in the suburbs, it’s like a shooting gallery on Saturday afternoon,” says Anthony J. Lubniewski, M.D., a third-year ophthalmology resident at Jewish Hospital, who notes that these two types of grass cutting devices were responsible for approximately 1,250 eye injuries in 1985—a shocking increase from the 136 similar injuries reported in 1979.

Lubniewski and assistant clinical professors of ophthalmology R. Joseph Olk, M.D., and M. Gilbert Grand, M.D., presented five cases of such traumatic eye injury and made recommendations to protect users and observers during the annual American Academy of Ophthalmology meeting last December. There, they demonstrated how nylon line fragments and debris can be projected at high speeds and cause injury, placing both operators and bystanders at risk. They also illustrated how these injuries are a double jeopardy, that is, if the primary impact does not totally destroy the eye, the resulting infection can.

To protect oneself and others from eye injury this spring and summer, Lubniewski suggests that users first make sure that their trimmers and edgers are in working order, then clear the area of bystanders and any noticeable debris. Users should wear polycarbonate safety goggles that wrap around the head, and prevent clouding with an anti-fogging agent sold in ski and optical shops.

Bill Clark, Ph.D., uses chinchillas for research, because their auditory systems closely resemble those of humans.

Bill Clark Takes Research Out to the Ballpark

The deafening noise of fans rooting for the home team may well have given the Minnesota Twins a physiological edge during the 1987 World Series, says a hearing researcher.

Extraordinarily high noise levels at the Hubert H. Humphrey Metrodome in Minneapolis, site of four of the seven World Series games, may have handicapped the St. Louis Cardinals by interfering
with player communication, concentration and performance, says Bill Clark, Ph.D. During the series, Clark, a scientist with Central Institute for the Deaf and the Department of Otolaryngology, measured and compared noise levels at the Metrodome and St. Louis’ Busch Stadium.

Noise levels at the Metrodome were twice as loud as those in St. Louis, and probably contributed to the Cardinals being “soundly defeated” by the Twins, he reported Feb. 4 at the midwinter meeting of the Association for Research in Otolaryngology. What’s more, Clark says, the roar of the Metrodome crowd almost certainly caused temporary hearing loss in unprotected fans, and could lead to permanent hearing loss in athletes, concessionaires and others who work in the Metrodome and are repeatedly exposed to excessive noise levels.

“The only term to use is deafening,” says Clark of the Minnesota crowd’s clamor. “During the times when the level was highest, that is, when the Twins were scoring runs and were in the process of beating us, the noise levels were so high that it was impossible to hear the person screaming right next to you.”

Using a dosimeter—a computerized sound level meter that stores one-second averages—Clark logged an average noise level of 94.4 decibels, 90.4 percent of the federally allowed dose, in game six at the Metrodome. Levels declined to a sedate 77-90 decibels when the Cardinals were ahead, but jumped to 95-109 decibels when the Twins took the lead in the later innings. The maximum level was 114 decibels, and levels exceeded 95 decibels 28.2 percent of the time. The Twins won game six, 11-5.

In contrast, during game four in St. Louis, the average noise level for spectators was 90.6 decibels, only 49.3 percent of the allowable dose. The maximum level was 117 decibels, and levels above 95 decibels occurred for 13 percent of the game, which the Cardinals won 7-2.

Because noise levels are controlled so strongly by the course of the game, Clark says, the fairest comparison is to measure noise levels in the first 40 minutes, before anything critical to the game’s outcome occurs. In St. Louis, the average of the first 40 minutes was 83 decibels, as opposed to 92 decibels in the Metrodome. “Perceptually, 92 decibels is twice as loud as 83 decibels, and it is reasonable to conclude that, under similar circumstances, the noise level in the Metrodome is twice as loud as in St. Louis.”

According to measures recorded by Clark, as well as by Minnesota experts, Metrodome noise levels approached and at times exceeded federal workplace standards. That means that baseball and football players, and any other employees regularly exposed to Metrodome noise, are at risk of noise-induced permanent hearing loss. Spectators probably don’t need to worry about permanent hearing loss, he says, but that doesn’t mean they shouldn’t be concerned.

“The average individual probably won’t sustain any significant injury,” Clark says, “but that doesn’t mean that there are no ill effects.” He estimates that most spectators at game six went home, with a 20-25 decibel temporary hearing loss.

The danger of that temporary loss is not the hearing—that will return within a day or two—or the side effects of ringing and pressure in the ears. It’s the cumulative effects.

“Each additional event that causes a temporary change in hearing also causes a permanent change in the inner ear. Hearing ability begins to deteriorate when a certain percentage of cells in the inner ear have degenerated.”

If you like baseball, or rock concerts, or loud bars, should you be concerned?

“That’s a very difficult question to answer,” Clark says, “because it depends upon the individual. It’s the total dose of noise you get in your lifetime that’s important. So if you work in a quiet environment, you don’t need to be quite as concerned as your neighbor, who might work in a noisy foundry or automobile factory. It’s a matter of degree.”

The ear responds to noise in much the same way that skin responds to the sun, Clark notes. “We know that excessive exposure to sunlight can cause skin cancer, but nobody’s saying we should stay in the dark all the time. We just need to avoid too much sun, and use sunscreen protection when we’re out.” The same common sense, he says, applies to excessive noise.

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**Correction**

The name and title of the director of the Head Injury Resource Center of the Irene Walter Johnson Rehabilitation Institute appeared incorrectly in a photo caption of last issue. The correct spelling and title are: Bruce Crosson, Ph.D., research assistant professor of neurology and neurological surgery.
Ask Taffy Parker when she first noticed her husband's illness, and she immediately recalls not only the date but the exact moment. It's not surprising. Although Alzheimer's disease begins insidiously, the first full recognition of its symptoms often have an unnerving twist—an unforgettable experience for both patients and relatives.

It started in 1983. Grant and Taffy Parker were leaving on their annual winter trip to Florida. As usual, Grant had cashed a check for the three-week excursion. But when the couple arrived at their vacation spot, the cash was missing from Grant's wallet. Assuming that their money had been stolen, the Parkers decided to use credit cards for the rest of the trip. Later, when they returned to St. Louis, their bank statement showed that Grant had withdrawn the cash three weeks earlier and re-deposited it the same day. The intelligent, normally exacting, 61-year-old aeronautical engineer had no recollection of the transaction. Suspecting that
A Costly Epidemic

As scientists make research advances, social and economic forces are at work, shaping how the Alzheimer's epidemic will affect this country into the next century.

- Approximately 4 million people in the United States have SDAT.
- Early in the next century, the number of people with SDAT is expected to reach 5 million.
- The care of just one person in the advanced stages of SDAT costs $25,000 to $30,000 per year.
- Because the disease often progresses slowly, it may last 10 to 20 years, stretching government and family resources.
- The State of Missouri's annual Medicaid bill for nursing home care is $200 million. More than half that amount can be attributed to the care of SDAT patients.
- The United States currently spends $40 to $50 billion dollars annually on health care for SDAT.

Why is this disease reaching such devastating proportions? Part of the problem is that research efforts lag behind the increasing number of SDAT cases as the proportion of elderly in our population continues to grow. (SDAT primarily affects adults in the 65-and-older age group.) Also, until the mid-1970s, the disease was misunderstood and its impact was grossly underestimated.

One Missourian was key in raising national public awareness. In the early 1970s, United States Senator Thomas Eagleton took an assignment as Chairman of the Senate Subcommittee on Aging, which led to the first congressional hearings on SDAT. According to Senator Eagleton, the hearings were prompted by the obvious need to address the effects of SDAT. "Nothing up until that time had ze­

Quently. There was too little research to the magnitude of the problem was that the disease wasn't being dealt with adequately. There was too little research money going into it." As a result of those hearings, the first significant amount of federal funds were targeted for SDAT.

Most medical experts agree that research dollars are essential if this country is going to be successful in offsetting the ramifications of SDAT. Researchers in Missouri, however, have been particularly frustrated by the state's refusal to recognize the costly effects of SDAT. "Missouri has been notorious for avoiding funding any kind of research," says Leonard Berg, M.D., director of the Alzheimer's Disease Research Center (ADRC).

Why has the Missouri legislature moved with such reluctance? "Missouri on the whole is a cheapskate state," says Senator Eagleton. "Missouri appropriations in such areas as education, healthcare, the homeless, AIDS—any of those social categories—will uniformly be in the bottom 10 or 15 [states] in the country.

"The Missouri legislature and the Missouri governors do not believe in significant state expenditures on a whole host of social areas," he adds. "Whenever there are two candidates for governor, the first thing either of them do—before the campaign even starts—is take a pledge of no tax increase. That creases the revenue stream and ends the discussion almost there from the state point of view. We may have some dribbles of dollars, but nothing of deep significance."

Researchers were encouraged recently by at least one piece of Missouri legislation: Senate Bill 200, passed in June 1987, which allocated $200,000 per year for medical research. Berg estimates that from that money approximately 10 pilot projects costing $20,000 per project will get underway. According to Berg, these pilot projects represent essential groundwork for any major research. "In order to qualify for major funding, either from the government or a large foundation, researchers have to demonstrate some pilot work to prove that they have expertise in that area," he says. "It takes time to land money just for that pilot work. That's why this state research bill is so important."

Berg also equates more money with better research. "A big problem is getting people into the research business," he says. "We need more capable thinkers, which will lead to more breakthroughs.

Berg is encouraged by any shift in attitudes toward funding research. "I hope steps like these mean a recognition of the problem," he emphasizes. "And we will be seeing even more money pumped into the search to find better answers."

something was terribly wrong, Taffy prompted her husband to see a physician.

In 1984, Leonard Berg, M.D., professor of neurology and director of the Alzheimer's Disease Research Center (ADRC) at Washington University and Barnes Hospital, diagnosed Grant with Dementia of the Alzheimer Type (DAT), the term most medical experts now use to describe the degenerative brain disorder that is commonly referred to as Alzheimer's Disease.

Unfortunately, Berg could offer little hope for curing, even halting, the slow progression of nerve cell death that was taking place in Grant's brain, impairing not only his memory but his total intellectual range of function. To date, there is no effective treatment for reversing DAT or the more common form of the disorder in people older than Grant—Senile Dementia of the Alzheimer Type (SDAT). And until a few years ago, medical practitioners had little knowledge about the disorder or how to diagnose it.

Today experts are beginning to unravel the mystery of this complex disorder and offer hope to the nearly three million people in the United States who have been diagnosed with the condition. In September 1987, Washington University Medical Center became part of a nationwide multicenter drug trial to test tetrahydroaminoacridine (THA), an agent which has stirred interest in the scientific community and the public with its promising but premature results.

How does the drug work? Researchers believe that THA promotes the effects of acetylcholine, a chemical messenger that is lacking in the brains of SDAT patients. The acetylcholine deficiency could contribute to poor functioning of brain cells. In healthy people, adequate amounts of acetylcholine are transmitted from one brain cell to another, then broken down by the enzyme cholinesterase. THA, an anticholinesterase, counteracts this process by stopping the enzyme from breaking down whatever acetylcholine is released. In SDAT patients, even though their overall "supply" of acetylcholine is diminished, what remains can act longer. "We're not absolutely sure if that's how THA works," says John Morris, M.D., assistant professor of neurology, ADRC investigator and director of the THA study. "But that's the principle behind the trial." "We can't get overexcited about THA," he cautions.

"We also know that many other neurochemical substances besides acetylcholine are deficient in SDAT. However, even if
the drug is not as beneficial as original reports have indicated, this nonetheless represents the first study on a national basis for the treatment of SDAT—an important step.

Drug trials like the THA study would not even be possible if it were not for the ADRC's establishment of diagnostic criteria and standards for diagnosing the disease that help ensure that suspected symptoms are not part of normal aging or other illnesses with similar manifestations.

The center's system for staging the illness into mild, moderate and severe categories has become a widely accepted model throughout the world, allowing researchers to compare data on SDAT as the disease progresses with the help of a psychometric battery test devised by Martha Storandt, Ph. D., professor of psychology at Washington University.

As clinical trials move forward, ADRC investigators continue to delve further into the most fundamental components of SDAT—its complex genetic links. For years medical practitioners noticed that in some cases of SDAT, the disorder shows up among other family members—usually in about 50 percent of each generation's offspring. In recent years, scientists have turned their attention to chromosome 21, the chromosome which in excess (that is, a set of three rather than the normal complement of two) causes Down's Syndrome—a type of mental retardation. One interesting connection between chromosome 21 and SDAT: virtually all people diagnosed with Down's Syndrome who live past the age of 30 develop Alzheimer's Disease. "In this special group of patients, the extra chromosome 21 apparently predisposes people to developing Alzheimer's Disease at a relatively early age or invariably," says Morris.

Researchers are also intrigued by the chromosome's relationship to amyloid, a protein found in one of the hallmarks of Alzheimer's Disease: neurotic plaques. Plaques are pancake-shaped structures that form in SDAT patients' brains and have long been considered a possible key to the cause of Alzheimer's Disease. Because amyloid protein, a chief component of plaques, recently has been linked to a gene located on chromosome 21, an excess of this protein in Down's Syndrome patients (who have an extra amyloid gene) may relate to the early formation of neuritic plaques and, hence, Alzheimer's Disease. Additional evidence that chromosome 21 may be important for Alzheimer's Disease comes from studies of certain families with a strong history of the illness. "Thus, there is much to suggest that chromosome 21 may be associated with the illness," says Morris. "But hereditary or genetic causes alone probably are not sufficient to cause SDAT. More likely, people inherit a genetic pattern—possibly involving chromosome 21—that will make them more susceptible to developing the illness once the real causative factor, or factors, are involved."

Researchers suspect a number of environmental factors to be involved, among them viruses and toxic agents. "SDAT usually begins in late adult life, after a lifetime of exposure to multiple factors," Morris explains. "A virus can infect someone at one age and not cause a disease until much later. For instance, shingles are actually due to the chicken pox virus. The chicken pox virus, which infects children, can remain in the nervous system for 50 to 60 years and can later reappear as a skin eruption, or shingles."

Such theories open new avenues for scientists at the ADRC, which has a flurry of projects underway that relate to SDAT, from biostatistics and image analysis of the brain to neurobiological and clinical investigations.

In one pilot project, William Snider, M.D., is trying to answer one of the most basic questions related to SDAT: why would cells in an otherwise healthy person die? Previous research has already shown that certain cells in young animals will die when deprived of Nerve Growth Factor (NGF), a protein that stimulates some populations of cells. Dr. Snider is pursuing experiments with NGF, hopefully to learn how the extent of NGF deprivation affects cells in mature animals and ultimately to provide a model of cell loss in Alzheimer's Disease and other degenerative disorders.

In a related study, Eugene Johnson, Jr., Ph.D., and colleagues Megumi Taniuchi, Ph.D., M.D., John Schweitzer, M.D.,
Leonard Berg, M.D., tests the short-term memory of a patient by asking him to remember a fictitious name and address. Ten minutes later, the name and address have been forgotten.

and Qiao Yan, Ph.D., have been studying NGF’s effect on the central nervous system. Their research shows that NGF is a transporter in brain cells that are responsible for memory. Although they doubt that NGF has anything to do with the actual etiology of SDAT, it’s possible, according to Johnson, that NGF may be a potential treatment agent which could be used to slow down or prevent the death of these brain cells.

The key to understanding SDAT may come from knowing its progression within the brain—where it starts and how it spreads. Joseph Price, Ph.D., an expert on the neuroanatomical organization of the brain, is scrutinizing the distribution of Alzheimer’s Disease brain lesions, including neuritic plaques and another change of dying nerve cells termed the neurofibrillary tangle. He is particularly interested in the locations of the plaques and tangles in the earliest stages of Alzheimer’s Disease compared to the occasional presence of these lesions in healthy, aged individuals. Ultimately, he hopes to find the dividing line between what constitutes pathology and normal aging.

Studies may also help physicians treat other mental disorders. Eugene Rubin, M.D., Ph.D., assistant professor of psychiatry, is interested in the personality changes that occur with SDAT and how they may relate to other psychiatric disorders. “The very interesting behavioral and personality manifestations that are associated with SDAT have recently become much more intriguing to many of us, partially because the psychiatric manifestations are sometimes as devastating as the memory impairments in terms of family stress,” he says. “Now that we’re learning more about SDAT, we know that it’s more than progressive memory loss. It’s a total robbing of a person’s personality accompanied by psychotic symptoms. The psychopathology may well respond to different types of treatment than the memory impairment. With the new types of medicine that are coming into trial, we’re being very careful to evaluate their effects on memory and psychopathology.”

In his research, Rubin and his colleagues have described some characteristic personality changes, including passive, withdrawn and in later stages—agitated and self-centered behaviors. They are also looking at delusions, paranoia and hallucinations that occur in SDAT patients.

Where will it all lead? The insights are just beginning. Most researchers express excitement about SDAT research, but reserve any optimism about treatment breakthroughs in the near future. As far as Berg is concerned, the research is long overdue. “SDAT is a devastating disease physically, financially and emotionally,” he says. “It’s the most major and costly epidemic we’re dealing with in the United States today.”

Colleague William Landau, M.D., Andrew B. and Gretchen P. Jones Professor and head of neurology, concurs: “As the numbers of the elderly in the population increase, the eventual cost of this disease is going to make the impact of AIDS seem trivial.”

For patients like Grant Parker, the future seems brighter, but time is the questionable variable. Researchers don’t like to speculate about when a cure, or even an effective treatment, will be available.

As for Grant, he has his own outlook for the future. A step-by-step perspective: “I’m just taking it day by day, by day.”

For further information about SDAT or available support programs for SDAT patients and their relatives, contact the St. Louis chapter of the Alzheimer's Disease and Related Disorders Association (ADRDA) at 432-3422. It operates 40 local support groups that include financial and how-to-cope programs.
A new study shows that there may be more people than we thought...

IN

TRAUMA'S WAKE

BY TONY DIMARTINO

It can start as far away as a jungle in Southeast Asia, or as close as a deserted parking garage at the local mall.

While combat-wounded Vietnam veterans are more likely than anyone else to suffer from post-traumatic stress syndrome, or "post-Vietnam syndrome," a new study shows that this disorder is as prevalent among civilians exposed to attack as it is among non-wounded combat veterans. In both these groups, the frequency of the disorder was 3.5 percent, while among wounded veterans the frequency shot up to 20 percent.

The 2,500-person study, conducted by researchers at the School of Medicine, also suggests that people with a history of childhood behavioral problems are more likely to be exposed to traumatic events that might lead to post-traumatic stress disorder, and are more likely to develop symptoms after being exposed to trauma. According to the survey, people with the disorder are also likely to have a variety of other psychiatric problems.

"The biggest surprise was that in non-wounded combat vets, the risk for post-

Photos courtesy of Wide World Photos.
traumatic stress disorder was no greater than the risk for people who'd been exposed to trauma in the U.S.," says John E. Helzer, M.D., professor of psychiatry and director of the study. "I would have expected, because of all the media attention focused on the problems of Vietnam vets, that non-wounded combatants would have had a much higher rate than civilians. But it was only wounded vets that had very high rates of post-traumatic stress disorder—possibly because many vets may still be suffering considerable physical disability from their wounds and are constantly reminded of the trauma they experienced."

Post-traumatic stress disorder, or PTSD, was officially recognized by the American Psychiatric Association in 1980 after veterans' groups and mental health personnel worked for recognition of a "post-Vietnam syndrome." A compromise between these groups and the association was reached that recognized a new disorder affecting not only veterans but anyone subjected to severe and sudden psychological stress due to "an event that is generally outside the range of usual human experience." People exposed to trauma are diagnosed as having PTSD if they reexperience the trauma in dreams, flashbacks or thoughts and if they feel emotionally detached or numb. They must also show at least two of the following symptoms: hyperalertness (jumpiness), sleep disturbance, guilt, impaired concentration, avoidance of situations that stir memories of the traumatic event and worsening of symptoms in situations that resemble it. At least four of these symptoms must occur as a result of a single traumatic event before a diagnosis of PTSD is made.

"Since 1980, PTSD has been studied in war vets, residents of communities exposed to disaster and trauma victims," says Helzer. "But very little has been published about its prevalence in the general population. We wanted to find out who has it, how common it is and what its symptoms are, what kind of events precipitate it, and with what other disorders it tends to appear. To do this, we needed to reach a large number of people selected without regard to their exposure or nonexposure to traumatic events."

Helzer and his colleagues had their chance to learn more about PTSD when the National Institutes of Health sponsored a nationwide, five-center study of the prevalence of psychiatric disorders in the United States. Washington University included PTSD among 40 other disorders in its survey, and the findings about PTSD were published in the Dec. 24 issue of the New England Journal of Medicine.

Among a random sample of 2,500 St. Louisans surveyed, the prevalence of a history of PTSD was 1 percent in the total population, about 3.5 percent in civilians exposed to physical attack, 3.5 percent in non-wounded Vietnam veterans and 20 percent in vets wounded in Vietnam.

The St. Louisans were questioned three times during 1981 and 1982. In the first interview, respondents were asked about military service and the era in which they had served. Those who had served in Vietnam were asked if they had been in combat or had been wounded. During the third interview, all 2,500 respondents were asked whether they had experienced an event that frightened them so much that they had one or more of PTSD's symptoms. Events accepted as traumatic were grouped in seven categories: combat, serious accident, physical attack, natural disaster, being threatened or almost seriously injured or witnessing someone's being killed or injured. The rapidity with which symptoms began after the event, their duration and frequency were also determined. In all three interviews, in order
to estimate the risk of the development of the disorder as a result of exposure to the specific traumas of combat, being wounded in combat and being mugged, respondents were asked if they had been mugged or beaten in the previous six months.

Only five men and 13 women per 1,000 met the criteria for PTSD. Among males diagnosed as having it, only two types of events accounted for the disorder: combat and seeing someone hurt or die. The most common specific event accounting for cases among women was physical attack, including rape. Events cited by five women that the researchers had not anticipated as causes were discovering a spouse’s affair, being poisoned and having a miscarriage.

The occurrence of symptoms among people who have been exposed to trauma is a lot more common than the occurrence of the full disorder. Even though most people who had been exposed to trauma didn’t meet the criteria for a full-blown case of the disorder, 15 percent of them had some symptoms, although half of those had only one symptom. The average number of symptoms was 2.3 for men and 2.5 for women—well below the four symptoms required for a diagnosis of PTSD. For men, Vietnam combat was the event most likely to cause symptoms—no combat-related symptoms were reported by veterans of other wars. For women, seeing someone hurt or die and surviving a threat or close call were about equally likely to produce symptoms.

The symptoms most commonly experienced were nightmares, hyperalertness, and trouble sleeping. Two symptoms included in the survey because they were thought to characterize the syndrome among Vietnam veterans—emotional numbness and guilt at having survived or having done the things necessary to survive—were rare, even among combat vets.

In half of those with symptoms, the symptoms lasted less than the six months specified as the minimal period defining chronic PTSD. However, in about one third, symptoms persisted for more than three years, especially among combat veterans and women who had been physically attacked.

The study revealed that behavioral problems before the age of 15—such as stealing, lying, truancy, vandalism, running away, fighting, misbehaving at school, early sexual experience, substance abuse, school expulsion or suspension—increased the likelihood of exposure to trauma. Those surveyed who reported childhood behavioral problems were more likely to have been beaten or mugged in the previous 18 months and more likely to have seen combat in Vietnam. According to the survey, having had four or more early behavioral problems predicted both having been beaten or mugged in the previous 18 months (6 percent versus 2.5 percent of those with fewer behavioral problems) and having seen combat in Vietnam (100 percent versus 59 percent).

Among both those attacked and those in combat, those who had a history of childhood behavioral problems were also more likely to develop PTSD after being exposed to trauma. This finding supported earlier studies on veterans of both World War II and Vietnam that indicated that combatants with preservice personality disorders were more likely to be psychologically disabled after experiencing trauma. Among those surveyed in Helzer’s study with fewer than four of the above childhood behavioral problems, 14 percent reported symptoms of the disorder, and slightly less than 1 percent met the full criteria. Among those with four or more behavioral problems, 29 percent reported symptoms and 6 percent met the full criteria. This could mean that persons with childhood behavioral problems have a greater likelihood of experiencing trauma later on, that childhood problems predispose people to react to trauma with symptoms, or both, says Helzer.

He also found that persons with PTSD are twice as likely to have some other psychiatric disorder as are persons without it. An increase in the proportion who had another diagnosis was also associated with an increase in the number of PTSD symptoms. More than 70 percent of those with six or more symptoms of PTSD also had another disorder, and nearly 80 percent of those with the full syndrome had the two disorders that are most common in those with post-traumatic stress are the obsessive-compulsive disorder and chronic depression. But both of these disorders are similar to symptoms of PTSD, says Helzer. Obsessive-compulsive disorder can be diagnosed on the basis of the same obsessive reenactment in dreams and thoughts of the trauma that is a symptom of PTSD, and chronic depression shares with PTSD the symptoms of sleep disturbance and inability to concentrate.

“Before the survey, most of what we knew about PTSD was based on information from people who sought treatment for it,” says Helzer. “But people who are being treated for the disorder may tend to be the most severely affected ones—presumably, those that are most bothered by the symptoms are those most likely to come in for treatment. In some cases, questions of secondary gain may be involved—such as lawsuits or workman’s compensation or issues of that kind—so in studying only those in treatment, one is faced with the difficulty of interpreting to what extent symptoms might be exacerbated by those other issues.

“We believe that this survey addresses some of the skepticism about the disorder. The fact that the inquiry was not addressed to a sample known initially to be at special risk for PTSD and that PTSD was treated as just one of many disorders inquired about, probably protected us from biased reporting. Now that the existence of PTSD has been recognized in the general population, another important step will be to follow people with the disorder to see how they respond to various treatments. “Even in combat vets, symptoms of PTSD tend to disappear anywhere from nine months to three years after exposure to trauma,” Helzer says. “We need to form a baseline notion of how much we can help with both talk and drug therapy, and how much of the disorder clears itself over time. Only then will we be able to judge how well the various therapies are working.”
A Reason for
CARLEY
BY KATHY WILL

Angela Nadler knew from the day she found out she was pregnant that there was a reason for her daughter, Carley, to be here.

So when Carley was born 11 weeks early at a weight of only 630 grams—about one pound, seven ounces—Angela and her husband, Mark, did not lose hope.

The Nadlers were told that Carley had a 30 percent chance of surviving, and that if their daughter were one of the lucky ones, she would be in the hospital for a long time.

Carley is one of a number of children who just 10 years
ago were considered previable, or unable to live outside the womb. The aggressive management of these babies in recent years has proven this untrue. Since 1981, the survival rate at Washington University Medical Center has tripled for babies born between 600 and 700 grams, and gone from 0 to 13 percent for infants born between 500 and 600 grams.

These children present a serious challenge to both physicians and parents, none of whom are totally prepared to care for these youngest among us, according to F. Sessions Cole, M.D., associate professor of pediatrics and director of newborn medicine at the School of Medicine and Children's Hospital.

"The parents of these children are going through a unique situation," he says. "No other series of parents prior to several years ago has ever experienced a six- or eight- or 10- or 12-month hospitalization that begins with an infant who is apparently different from any other concept of a baby which the parent has ever known before. "It is a major crisis for parents, and it's not just a crisis the day the baby's delivered. It's a crisis which continues not only for the entire hospitalization, but frequently considerably beyond."

Because the lungs, brain, heart, skin and immune system of these very small babies are so far from ready to function outside the womb, they require the development of new medical technologies to deal with the unique problems of their prematurity, Cole adds.

"With children who are slightly bigger, we have often been able to apply existing technology and they have done well," he says. "But these children of 500 to 700 grams require the development of new technologies to address what is essentially a whole new biology."

Not Ready for Air Breathing

Looking back upon her daughter's birth, Angela recalls: "I heard her cry just before they put the tube in, then they took her away."

Like most newborns her size, Carley had difficulty breathing on her own and was placed on a ventilator, which breathed for her by blowing tiny puffs of air in and out of her lungs. Carley was on the ventilator for two months and on supplemental oxygen for 76 days because her lungs were not yet supplying her blood with the normal concentration of oxygen.

As a result, her chest showed many of the changes that occur in chronic lung disease—a painful and costly complication that appears to be associated with long-term ventilation and oxygen therapy. Chronic lung disease occurs in about 25 percent of very premature babies and leads to death in about 4 percent. Fortu-
nately for Carley and the other children who survive this complication, human lungs do not develop fully until the eighth year of life. So unlike adults with chronic lung disease, children who develop ventilator- and oxygen-related lung disease generally recover by their third or fourth year.

One theory being explored at the School of Medicine is that chronic lung disease in very low birth weight babies is due to oxygen toxicity. In the lung, oxygen produces toxic byproducts known as oxidants, which are ordinarily disarmed by metal-containing enzymes called antioxidants, according to Jonathan Gitlin, M.D., assistant professor of pediatrics. Very low birth weight babies lack these protective enzymes, Gitlin says, and without them oxygen is poison to lung tissue. As the lungs become damaged, they are less able to supply the blood with oxygen, the patient requires more supplemental oxygen and a vicious cycle of oxygen dependency begins.

Gitlin and members of his research team are trying to learn more about when these enzymes are made during fetal development, and how this process is controlled. So far they have identified two such enzymes and are studying their genes in the hope that they may one day be able to manipulate production of enzyme.

Another method that may lower the incidence of chronic lung disease is to reduce the amount of time spent on the ventilator and on oxygen by replacing missing surfactant with surfactant from animals or human amniotic fluid, according to Gitlin, who worked on surfactant replacement therapy as a postdoctoral student at Harvard. Poured down the trachea in a single, liquid dose, the replacement surfactant adheres to and forms a thin coating on the surface lining of the lungs, Gitlin says, decreasing the need for ventilation and oxygen and lowering overall mortality. But while a synthetic version of surfactant should be commercially available within the year and many neonatologists are enthusiastic about its use, surfactant replacement therapy is still two to three years from becoming widely available. And it is being rapidly outdated by prenatal interventions that speed up a fetus’s own production of surfactant.

One such intervention is to stop the mother’s labor with drugs and administer steroids, which cause the fetus to make surfactant more quickly. If a mother’s labor can be delayed by at least 72 hours, according to Gitlin, the premature fetus can make enough surfactant to catch up with that of babies born full-term. Yet the use of steroids is not without risk, especially for the mother.

The ideal solution would be to learn how to manipulate surfactant production on the molecular level. If researchers could figure out how the body regulates surfactant production, Gitlin speculates, they might be able to design a drug that would turn on surfactant production earlier than usual in fetuses at high risk for premature birth.

The Threat of Brain Hemorrhage

Carley was very fortunate not to have suffered a large intraventricular brain hemorrhage—a life threatening and potentially damaging complication that occurs in the vast majority of babies her size.

"With the tremendous increases in survival rates among these little babies, we’re also seeing an enormous number of these hemorrhages," says Joseph Volpe, M.D., Stein Professor of Developmental Neurology, and an authority on brain hemorrhages in premature infants. "And the incidence increases with lower birth weight, approaching 70 percent in babies weighing one and one-half pounds."
Premature brains are prone to hemorrhages because of the rich blood supply that feeds their still multiplying and maturing brain cells, he explains. Known as the germinal matrix, the area of the brain that contains these differentiating cells is sustained by blood vessels that are poorly supported by the surrounding tissue and especially sensitive to a lack of oxygen. These vessels disappear as the baby approaches full-term, according to Volpe. Therefore, brain hemorrhages are rare among fully developed infants.

Another possible reason for the hemorrhages is that the brains of very premature infants may not be protected against blood pressure variations, Perlman says. Low blood flow may injure brain tissues, and hemorrhages may result when flow increases, he explains. “In adults, blood flow through the brain should be fairly constant, or autoregulated. We feel that the circulation for the newborn brain is ‘pressure passive,’” he says.

For years Volpe and Perlman have used modern monitoring technologies to analyze cerebral blood flow as a likely cause of brain injuries. In the course of their studies, they learned that more than 90 percent of the patients with fluctuating patterns of blood flow and pressure suffered brain hemorrhages in the first days of life, while less than 10 percent of those with stable patterns had hemorrhages. Perlman and Volpe further observed that the patients with the fluctuating patterns seemed to be breathing out of synchrony with their ventilators. To test whether or not breathing against the ventilator could be causing the fluctuations in cerebral blood flow, Perlman and Volpe designed a study in which they eliminated all attempts to breathe against the ventilator. They did this by inducing muscle paralysis during the first 72 hours of life in infants whose blood pressure fluctuated more than 10 percent. “In a high-risk group where we previously would have had 80 hemorrhages, we were down to 20,” Perlman says. Moreover, the hemorrhages that did occur were small, not “clinically significant,” according to Volpe.

Apnea and Bradycardia

After three and one-half months in the intensive care unit at Children’s Hospital, Carley was sent home on a monitor that would alert her parents if she stopped breathing.

Like most very premature babies, Carley experienced episodes of apnea and bradycardia, in which her breathing ceased and her heart rate fell to dangerous levels.

Apnea and bradycardia are very common among preterms, says Bradley Thach, M.D., professor of pediatrics. When a child stops breathing during apnea, he must regain his breath within 30 or 40 seconds or he will turn blue, go limp, experience a drop in blood pressure.
(bradycardia) and require resuscitation. That is why the parents of very low birth weight babies are taught cardiopulmonary resuscitation, or CPR.

Because apnea comes on so suddenly and is life-threatening, it is believed to be a possible cause of Sudden Infant Death Syndrome, or SIDS, which claims twice as many preterm as full-term babies and is the leading cause of death for all babies after the first week of life.

Thach, who has been trying to characterize and classify episodes of apnea, has observed apnea to be associated with swallowing activity. Furthermore, he has found feeding to be a triggering factor for many spells.

Hypothesizing that apnea might be the result of an exaggerated airway protective reflex—the response that ordinarily keeps people from choking—Thach measured this reflex in premature and full-term infants by dropping a spot of liquid in the back of babies' throats while they slept. He found the protective reflex of preterm babies to indeed be more pronounced than those of full-terms.

But while Thach and others are gaining new insights into the causes of apnea, they are as yet unprepared to offer any solution to the home monitor, which is not free from false alarms. "We used to think that these home monitors would drive parents crazy," he says. "But in actuality, they're a real reassurance."

**Weak Immune System**

During her sixth week in the hospital, Carley was found to be in a severely depressed immunological state known as hypogammaglobulinemia.

Almost every aspect of the immune system works less efficiently in very low birth weight newborns, leaving them highly susceptible to infections, according to Dr. Stephen H. Polmar, M.D., Ph.D., professor of pediatrics and of microbiology and immunology.

Their white blood cells, for example, not only move less rapidly to sites of infection, but are also less effective in killing bacteria. This may be because their white blood cells are more like those of a fetus than an adult, according to Cole, whose own work involves the function of one specific white blood cell—the macrophage.

Fetal macrophages play a different role from that of adult macrophages, according to Cole. While the main role of the adult macrophage is to kill bacteria, the fetal macrophage is actually inhibited in its response to bacteria and more heavily involved in cleaning up dead cells during the organ remodeling that occurs in development.

Very premature babies are also low in antibodies and other proteins that help them recognize and destroy invading cells. These protective proteins are ordinarily transferred from mother to child midway through pregnancy, a process which is interrupted by premature birth, according to Polmar. Very low birth weight babies typically have less than half the amount of antibodies of babies born full-term, although they will eventually make enough of their own after about three months, Polmar says.

Until then, most of these babies are in the highly sterile and isolated environment of the intensive care unit, and any infections that do occur can be managed right away.

Still, 2 to 5 percent of very low birth weight babies encounter life-threatening infections after the third or fourth week of life. At Children's Hospital, a number of these serious-risk babies—among them, Carley—have been spared through gammaglobulin replacement therapy in which they received antibody-containing purified gammaglobulin, a blood protein. Polmar cautions, however, that this therapy should not be given to all very low birth weight babies, but should be reserved for those who clearly would suffer life-threatening infections without it.

**Premature Skin Too Fragile**

The lungs, heart, brain and immune systems are not the only underdeveloped organs that complicate the care of very low birth weight babies like Carley. Their skin is also fragile and significantly different from the skin of older infants, according to Cole.

Tape, used to attach needles and monitor leads to the skin of older infants, can rip the skin right off of a very low birth weight infant. The wound weeps fluid, is highly susceptible to infection and interferes with the ability of the infant to maintain body temperature. This sensitivity has challenged neonatal intensive care units to develop new monitoring tools that do not require tape on the skin and to develop other methods of protecting the skin.

Warming tables used to incubate older infants are inadequate, as even minor drafts created by a person walking past can cause the baby's body temperature to drop substantially. Very premature infants are now placed in double-walled isolates that prevent any kind of cooling from outside, Cole relates.

**Bonding Delayed**

Bonding with the parents is also interrupted by very premature birth, as these infants are on the average hospitalized for six months to a year. "How does one successfully involve a parent in the care of an infant who is so small and so sick for such a long time that it's difficult to understand whether the infant is going to live or die, much less respond," Cole asks.

Cole and his staff encourage parents to bring items to their children, as well as to become actively involved in their care. Angela Nadler visited her daughter twice a day, with Mark accompanying her in the evenings after work. They talked to her, held her and played tapes made by Carley's brothers. "It was a real learning period; we were up and down constantly," Angela recalls. "All I wanted was for her to be alive and come home with me."

**Follow-up**

Having addressed some of the more immediate problems of survival and bonding, neonatologists are now beginning to look at the long-term effects of their therapies on these children's quality of life.

Follow-up studies of premature infants of even higher weight show that one-third will encounter medical complications of prematurity, and about 10 percent will face major medical problems that include lung disease, blindness, deafness or neurological abnormalities. Similar follow-ups are now being done on very low birth weight infants to determine the effectiveness of current treatments in light of final outcomes.

Yet for Mark and Angela Nadler, the fact that Carley is now at home with them is outcome enough. Last December, the smiling 16-month-old sat on Santa's lap at a special neonatal alumni Christmas party for more than 250 happy "outcomes" of the neonatal care unit at Children's Hospital in St. Louis.
Mention the name of Roy Peterson to just about any graduate of Washington University School of Medicine during the past 30-plus years and you'll elicit some similar themes in response: humor, dedication, respect of his peers, commitment to students, bow ties and T-shirts.

Bow ties and T-shirts? The internal character attributes are easily associated with the career-spanning work of Roy Reed Peterson, Ph.D., professor of anatomy at the School of Medicine, who retires from full-time teaching this July after 35 years at the university. But what does his external attire have to do with anything?

Quite a bit, when you consider how it reflects an internal attitude on life and the teaching profession that has earned Peterson an unprecedented five "Teacher of the Year" awards since 1973.

"I've done things that are outlandish at times because I think students learn better when they have a smile on their face," says the 63-year-old professor. "If you can communicate with humor—and it's not at someone's expense except maybe your own—it gets things across more readily."

Peterson's choice of neckwear may not have been inspired as a teaching aid—although he has somewhat unsuccessfully tried to teach a few adventurous students to tie a traditional bow tie—but it does reflect his attitude on life.

"They don't flop and get into the cadavers—or in my soup," says Peterson, who's acquired two to three dozen bow ties in his years at the university, most sewn by his wife, Dixie, from remnants of her own print dresses.

His collection of T-shirts screen-printed with body parts has introduced many a first-year medical student to gross anatomy. On the first day of class, Peterson wears layers of T-shirts depicting the skin, organs and skeleton, removing them in explanation of the course.

"The T-shirt striptease is a matter of getting students to relax," says Peterson. "I say, 'This is what we're all about, layer for layer. What we do in the lab is take it apart. It's a lot of work. But look what you get.' Then I show them the doctor T-shirt."

Considering that the gross anatomy course may mark the new medical student's first encounter with a cadaver, the light-hearted introduction seems to ease inherent tension.

"The anatomy lab is not the most attractive place in the world," says Frank Keeley, a second-year student, "but you always got the feeling that Dr. Peterson was really interested in teaching students... Anatomy is one thing you dread when you come into medical school. He makes it one of the best first-year courses."

Adds Dixie Anderson, M.D., class of 1971, an associate radiologist at Washington University Medical Center: "As a teacher, he's everything a teacher should be. He's competent and reliable. He tells you when he doesn't know an answer and then pursues it.... "The enthusiasm of a first-year medical student is Roy Peterson. You don't find many people who maintain that type of enthusiasm in a medical school."

Peterson credits the students with his unusual zeal.
"The driving force that makes it worth doing each year is contact with new people with different ideas," he says. "They ask in new ways and keep me questioning. They make it new all the time, despite the fact that I teach a subject that's over 400 years old."

Teaching has been Peterson's primary focus at the university for many years now. That may make him something of an anomaly on a medical school campus where research and publishing are stressed.

"If a professor is involved in research, he can look at teaching as a chore. He (Peterson) was a real supporter of students," offers Philipp E. Bornstein, M.D., class of 1967, a psychiatrist in private practice who serves as clinical assistant professor of psychiatry at Southern Illinois University School of Medicine in Springfield, Illinois.

"The teaching is a personal affair," explains Peterson. "If you're so engrossed in one thing, you can't take the time to organize something else. You can't put yourself into it and don't get the rewards back from it. It's a matter of what gives a person gratification."

It took Peterson many years to discover his academic niche—although as a child growing up in Kansas City, Missouri, his interest in nature was apparent at an early age.

Peterson recalls dissecting a gopher at the age of 12 after it had been shot on his uncle's farm in North Dakota. "I developed a great interest in biology with both living and dead animals," he says.

By the time he reached college age, Peterson had decided to study electrical engineering but soon found that course was not for him. "I stumbled in math, so I got into biology and comparative anatomy," he recalls. "I liked to see how specimens were put together and how they work. It was like taking a clock apart."

While an undergraduate student in comparative anatomy at Kansas City Junior College in Kansas City, Missouri, Peterson still lived in the family home. But that didn't stop him from conducting experiments to supplement his textbook education.

"My mother never knew what she'd find in the bathtub. It might be a dogfish or a cat specimen," says Peterson, who took great pride in extracting the skeleton of a dead alley cat.

Following a two-year stint in the Army and marriage following the war, Peterson decided to complete his undergraduate de
While Peterson became a strong proponent of teaching principles rather than details in anatomy, he also became a firm believer in the use of cadavers rather than plastic models or diagrams.

Peterson became involved with both the St. Louis Local Anatomical Board and the Missouri State Anatomical Board to help develop Washington University's body donation program. It became legal to donate one's body to medical science in the state of Missouri in 1956. At the time, the number of unclaimed bodies received by the university had greatly decreased.

"I still felt the students needed exposure," says Peterson, who spoke to local civic groups about the need to donate bodies to medical science.

"People donate their bodies with the full knowledge that we're going to take the body apart, but they're contributing something priceless to a person's education," says Peterson.

The university's body donation program has become so successful that Washington University shares cadavers with other medical schools, unless specifically instructed to use the body only at this university. After supervising the donation program for many years, Peterson says he would not hesitate to donate his own remains.

"It might be difficult for my colleagues in the department," he says. "I might ask that my body be used elsewhere."

Through his work with the body donation program, Peterson has established relationships with other areas of the university, which are often staffed by former students.

Charles Kilo, M.D., class of 1959, co-founder of the Kilo Diabetes and Vascular Research Laboratory, recalls his former professor. "He was very patient, very thorough and very understanding of students," says Kilo. "I recall how cooperative he's been in obtaining tissue from patients who've died. . . . He was always very serious and very knowledgeable in his work. He has the respect of faculty members and a lot of respect from students.

Kilo's son, Charles J. Kilo, a first-year medical student, nearly echoes his father's words. "He (Peterson) has a great understanding of anatomy. He takes the time to explain things to you, especially when you're doing cross-sections."

Work with cross-sections has been a specialty for Peterson, who has published numerous papers, a textbook and a workbook on the subject. His latest work in the area is in developing computer software programs of cross-sections for students' study use.

These days you're liable to find Peterson seated in his office on the ninth floor of the McDonnell Building with an Apple Macintosh computer at either side. Although he has retired from full-time teaching, Peterson plans to continue to teach gross anatomy six weeks each year and to work on more computer software programs for students.

When he's not in the office—he and his wife plan to travel in a recreational vehicle, possibly visiting their four grown children and seven grandchildren scattered from coast to coast—his door will continue to remain open to students.

"I don't think of him as just being a good teacher because he was someone who could tell you where a nerve was," says Bornstein. "He stands out from the others with his humanity. He attended to the student as an individual. He always made you feel like you were welcome in his office. It was almost like he was sitting there waiting for you."

That interest in his students' education and in their individual well-being may have saved many a discouraged student from abandoning the study of medicine, according to Richard P. Bunge, M.D., professor of anatomy and neurobiology at the School of Medicine and a 17-year colleague of Peterson.

"He's always been very close to students and willing to listen," says Bunge. "He's always there to help them—in the lab or in the office. I'm sure he's saved some students from departing from medicine and even from this world."

It would be difficult to determine the number of students who've been influenced by Roy Peterson during the last 35 years. When he began teaching gross anatomy, 86 students made up a class; now classes are filled with 126 students.

Many of those students have gone on to fulfilling professional careers; some, it is sure, have accomplished great things. Peterson, however, takes no credit for their successes.

"I'm honored that I had the opportunity to interact with them," he says. "The only credit I could take was if contact with me influenced in any way the way they interact with others. Their minds were already shaped before I got my hooks into them."
Why would an established businessman say goodbye to his family and friends, give up autocrossing, bike racing, skiing and guitar and leave a comfortable house in sunny California to rent a cramped room from a little old lady in Albany, New York, who barely speaks English and talks to her dog, but never to her boarders?

These were some of the questions Charles Chandler, M.D. ’88, initially found himself asking when he became a freshman medical student at Albany Medical College at the age of 30.

Since then, he’s transferred to Washington University School of Medicine and plans to start one of the “longest residency programs that exist” (cardiothoracic surgery) when he graduates this spring. He will be 34-years-old. “There are many who would think that very foolish,” he says. “But if my math is correct, I’ll be 10 years older 10 years from now regardless of what I’m doing.”

Ten years ago Chandler wasn’t the least bit interested in medical school. A 1976 graduate of the University of California at Davis, where he spent more hours on his bicycle and playing the guitar than he did studying—although he did graduate with honors—, Chandler began his career in sales and retail management for CBS. But when the same 40-hour week that had at first allowed him to pursue his many hobbies started to become too comfortable and not challenging enough, he became interested in stocks and commodities and, eventually, real estate.

Chandler and his brother, Chris, who’s now a legislator for the State of California, incorporated themselves and began to build small, first-buyer, single family homes near their hometown of Yuba City.

Then, during a family celebration of the birth of Chris’ first child, the next door neighbor, who is a physician, noticed the baby’s abnormally yellowed complexion. She was later diagnosed with a congenital liver disease known as biliary atresia, in which the bile ducts are not formed properly. At that time liver transplants were not an option for children her size, so she underwent the Kasai procedure—an operation in which the surgeon attempts to create alternate bile drainage with a piece of bowel.

Although Chandler had never had the 100 percent commitment required for medical school, the idea of a career in medicine had always been there. His great uncle, a thoracic surgeon, had been dean at the school of medicine at Stanford for 25 years, intriguing Chandler at family reunions with tales of surgical cures. Several of his cousins and fellow biology majors during college had also gone on to medical school, so “the idea of medical school was lurking in the background all along.”

Charles Chandler and his daughter, Rachel.

When the hospital calls you on your birthday at five in the morning to tell you that your brother needs to get down to the hospital because his child just died, you think twice about your own life,” he says. “The impact of my niece’s death slapped me in the face and led me to re-evaluate just what it was that I was doing with whatever abilities and talents I had.”

It was then that he realized that he wanted to become a physician, “to make a lasting impact, a contribution of value.” The immediate problem, then, was how to accomplish that goal with seven-year-old grades and a “very strange preface to medical school.”

Chandler spent a year at the University of California at Davis, where he completed premed requirements and participated in a clinical research project that was presented at the American College of Surgeons meeting in 1986.

He was accepted and attended Albany Medical College for two years, until his persuasion towards family practice shifted to tertiary care. Now at the School of Medicine, Chandler was one of 17 seniors elected to the Alpha Omega Alpha Honor Society this year. He is the only transfer student at the School of Medicine to receive this honor.

While it was difficult to adjust to student life at first, Chandler finds that being an older student is actually an advantage in his case, because he is much better focused than he was during his college years. He’s decided upon surgery as his future focus, because “it’s an obvious means of effecting change in people’s lives,” he says. More specifically, Chandler would like to practice pediatric surgery in which “the problems are more discrete and repairable, and there’s an opportunity to make a difference.”

Now that Chandler doesn’t have much time for bike racing or autocrossing, he spends most of his leisure hours with his wife, Rebecca, and their one-year-old daughter, Rachel.
The Pen and The Scalpel

Ask Tony Fathman, M.D. '64, what he does for a living, and he'll answer quite frankly that he's a doctor. But ask this same fervent and gregarious urological surgeon about his life, and you'd better be prepared to sit and listen for awhile. If you're lucky, he might even recite one of his poems, play one of the songs he's composed or hand you an autographed copy of his recently published children's book: Talt the Christmas Star.

An eighth generation descendant of Thomas Jefferson, Fathman is a man of many interests—so many, in fact, that he rarely has time for more than five hours of sleep each day. In addition to a successful career as a urological surgeon, Fathman is a jazz pianist and composer, a poet and author. He also plays the saxophone with a local group—the Booze Arts Quintet, dry-fly fishes, windsurfs, picks wild mushrooms and cooks homemade soup. And to top it all off, he's the father of two graduate school-age daughters.

As regards his career, Fathman says that he wanted to be a doctor since he was a young boy growing up on the family farm in Clarksville, Missouri. After graduating from the School of Medicine in 1964, he completed his internship with the Navy in Philadelphia and served in Vietnam for a year, returning to complete a urological residency at Barnes Hospital in 1972.

Fathman, who is chief of urology at St. Luke's Hospital in St. Louis, says he likes urological surgery because it not only requires the skill and decisiveness of a surgeon, but also the intellect and contemplative powers of a diagnostician. His progressive approach to the field has earned him presidential titles for both the Missouri College of Surgeons and the St. Louis Urological Society.

Fathman's musical pursuits began at the age of six, when his father sold one of the family cows to buy a piano. Adding the saxophone to his repertoire, he played in the high school band and performed for the United Service Organizations every Friday and Saturday night. At Grinnell College, he played with the famous saxophonist Herbie Hancock. Now he plays for the...
Booze Arts Quintet, a local group of professionals who play jazz music together for their own enjoyment and for benefits.

Fathman's writing aspirations evolved in more recent years. "One of the things that started this whole creative effort is that, especially as a surgeon, we're craftsmen in that we're always doing someone else's operation;' he says. "I enjoyed music, but was always playing someone else's songs. I don't know what happened to me several years ago, but I started getting creative urges and started to write—mostly poetry.

Then, one night Fathman took his nephews and some children from his church to see Halley's Comet. Fathman's 9-year-old nephew, James Wilke, was impressed with the fact that so many people came out on such a cold night to see something to him seemed an unimpressive sight. On the way back he asked his uncle if the Star of Bethlehem was a comet. Fathman admitted that he didn't know.

Later, Fathman realized that he hadn't really answered the question. "All of this sort of got fermented away, and then one night I woke up in the middle of the night, and there was this story;' he says, "just like I'd read it a couple thousand times before.'

When he told the story at his church for the hanging of the greens party last year, everyone liked it so much that he asked a fellow congregation member, Mary Lynn Brophy, if she would do illustrations for a book.

The result—3,000 copies of *Tali the Christmas Star*, which was printed locally and distributed and sold through the church and local bookstores. "We actually made money on it;' Fathman says proudly. He later wrote music to go along with it for a Christmas Eve pageant at church, which he directed while he was on call.

Fathman does not feel that his numerous creative and recreational outlets have ever interfered with his ability to be a good doctor, although he admits they might have been hard for his family to live with at times. "I've been known to wake my wife up in the middle of the night to listen to a new song or poem however, best describes how Fathman views his own life and would like to be remembered:

He played the piano,
Every Saturday night,
An old man with silver hair,
Whose hands brushed the keys with care,
Memory shown in his eyes.

He played the piano,
Every Saturday night,
He'd lived in the home so long,
His family and friends were gone,
All he had left were the songs,
That he played with delight.

The old folks would gather there,
Each one had a special chair,
Now and then one would pass on,
One couple danced along,
As the old fellow played their song.
One night the old man was gone.

They play the piano,
Every Saturday night,
Successions of younger men,
Hired by the home and then,
Gone, when the small hand strikes ten.

They play the piano,
Every Saturday night,
To honor his memory,
A habit that used to be,
Though most have forgotten the songs,
That he played with delight,
But they play the piano,
Every Saturday night.
Yesterday and Today: School of Medicine Alumni Share Their Thoughts About the Role of Women in Medicine

When Armin C. Hofsommer, M.D. '22, became the first woman to enter the School of Medicine in 1917, the admitting dean told her that he was taking her in because the men were at war, but that when they came back, he would kick her out. Once in, she was not allowed to attend urology classes and was unable to obtain an internship in St. Louis, because no hospital would accept her.

Similarly, when the school's first female surgical resident, Jessie Ternberg, M.D., professor of pediatrics and head of pediatric surgery, arrived at Barnes Hospital, the assistant administrator refused to sign her in until after he double-checked with the department. "It was the pits then," Ternberg recalls. As a resident, she had to find a place in the nurses' dormitory. As a member of the surgical staff, she was not issued a locker in the operating room changing area for more than three years. And because she wore the same pink attire as the nurses, male interns frequently tried to order her about when they first entered the operating room.

The only female surgeon at the medical center for almost 20 years, Ternberg was elected President of the St. Louis Surgical Society in 1980. This created a controversy over whether or not she should be allowed in the private men's Racquet Club to attend the meetings. She was eventually allowed in, but there was no ladies room for her to use.

Hofsommer and Ternberg are examples of real pioneers, women who were willing to give up almost everything to make their marks in a world where women had not gone before, and were not necessarily welcome.

Today women make up 31 percent of the first-year class at the School of Medicine and about 10 percent of the surgical residents. This new breed of female physician is not only more likely to be accepted by her male counterparts, but also less likely to view her career as the end-all and only important thing in her life.

Because there are more of them, today's women in medicine are a resource to one another for moral support. While she did not experience the same general lack of acceptance that her mother encountered, Helen Hofsommer Glaser, M.D. '47, now a psychiatrist, was one of only six women in her class and therefore had few cohorts. Because the medical school dormitory was not open to women, Glaser and the other women in her class were forced to find housing wherever they could, and were therefore unable to benefit from the camaraderie that develops when classmates live together. "What I see and envy about women medical students today is that they have female colleagues; they have each other. There are more female role models and female faculty members to look up to," she says. "They have a kind of support we didn't have."

"Professional women have become more open about supporting one another and less self-conscious about being labeled a feminist for doing it," adds Dixie Anderson, M.D. '71, associate professor of radiology. The American Society of Women Radiologists, for example, is an excellent forum for encouraging young women to get involved in..."
mainstream radiology and to address issues such as the pregnant radiologist. The group, for example, recently came up with a special maternity apron that will protect fetuses—even during fluoroscopy.

"Being a woman in medicine is not a problem," according to Pamela Grow, M.D. '85. "But it's a whole new kettle of fish when you start raising kids." Women physicians of Aff-Drum's generation either forsook or delayed marriage and childrearing until after they completed their training. "When I interviewed for my internship, I was told that they didn't want to waste an internship on me if I was going to get married," Aff-Drum recalls. "You're stuck in a catch-22," according to Penelope Shackelford, M.D. '68, professor of pediatrics and of microbiology and immunology. "You know when it's the best time to have children and you hear your biological clock ticking. But once you enter the system, there's pressure to go on and not interrupt your training." Today, more and more women like Grow are electing to raise children during medical school or during their residencies. And a growing number are joining large group practices such as health maintenance organizations, which give them more time to be with their families.

Women physicians of previous generations did not feel so free to demand time for their personal lives. Because she felt "like an interloper taking the place of a man," Carol Williams, M.D., a graduate of the obstetrics and gynecology residency program, says "I found it difficult to even make a small compromise with the professional life, or I'd feel like I was wasting myself."

Such feelings can be attributed, in part, to the lack of acceptance which women physicians initially encountered from men.

Hofsonmer, who liked to be fashionable, was ridiculed by some of her professors for wearing the hobble skirts of her day. Ternberg says she will never forget her first College of Surgeons meeting, where she was classically ignored. "I've never felt less like a human being than I did then," she says. "I got the feeling I was invading their stag group." Her response was to "ignore it, smile and let it go by over the head," because, "in my own mind I knew I was doing what I wanted to do."

Women rarely encountered such a lack of acceptance from their patients. Aff-Drum found being a woman to be a definite advantage when she was working for the county health department. Because she knew about cooking, she could talk to parents about custards, chicken and how to prepare formulas. And she was more atune to detecting hazards in the home.

Female medical students today do not feel discriminated against by their peers, although they admit that being female may have some influence over their choice of specialty. And while the higher echelons of academic medicine are still predominated by men, there are significantly more women in higher places than there used to be, according to Shackleford, who cites the university's Deputy Vice Chancellor for Medical Affairs, Virginia Weldon, M.D., as an example.

Williams, who was the first woman president of the St. Louis Medical Society, says that when she first sat on the council in 1972, she felt very alone as the only female. Some of the council members initially found it amusing to tell sexist jokes during the meetings, but after about six months they accepted her as a peer. "I met some men who were bound and determined to put me down, and we ended up friends," she says. "It's been very satisfying to see some men start out one way and end up on the other side of the fence."

Anatomy Fund Named for Roy Peterson

The School of Medicine is establishing a fund in the name of Roy Peterson, Ph.D., professor of anatomy and neurobiology, to honor excellent students in anatomy and to devise new ways of teaching anatomy. All contributions to this fund are tax deductible. Checks should be made out to Washington University School of Medicine and sent to: Gerald Fischbach, Ph.D., Department of Anatomy and Neurobiology, Washington University School of Medicine, Box 8108, 660 S. Euclid Ave., St. Louis, MO 63110.
Glenn C. Conroy, Ph.D., shows Monty Levy a human heart on a tour of the gross anatomy lab during the School of Medicine's first Parent Day, held this past March. The event-filled weekend, which was sponsored by the Office of Medical Alumni and Development Programs, drew parents from 25 states across the country. A total of 77 families participated in the activities, which included faculty-hosted tours and scientific programs, a student-faculty panel discussion about the basic science curriculum and student life, and a student-hosted party.

**CLASS NOTES**

**'20s and '30s**

Edwin Greer, M.D. '26, had a stroke and has been hospitalized for more than a year.

Henry Kirby, M.D. '33, still has an active solo general practice in Harrison, Arizona. He fills his leisure hours quail hunting and breeding English Setters. He has been a coroner for 25 years and on the school board for 11 years.

Ralph Knewitz, M.D. '33, writes that now that he is retired, he likes to travel in the United States, eat baby frog legs and one pound catfish sandwiches on Wednesdays, and play the nickel slot machine.

Richard Sakimoto, M.D. '33, a clinical associate professor of obstetrics and gynecology at the University of Hawaii, enjoys deep sea fishing.

George Wulf Jr., M.D. '33, has been teaching and enjoying the Florida Keys since he retired from obstetrics and gynecology 10 years ago.

Paul Buss, M.D. '34, and his wife, Martha, a 1934 graduate of the nursing school, recently co-authored a book titled *The Devil You Say?: A Perspective in Behavior* by Vantage Press. The Buss's reside at 15401 Williams, #92, Tustin, California 92680.

Paul Kunkel, M.D. '34, was recently awarded the Laureate Award in medicine by the Connecticut Chapter of the American College of Physicians. Kunkel has practiced internal medicine and cardiology in Danbury, Connecticut for 30 years, where he has served as chief of medicine and chief of staff at Danbury Hospital.

Morris Berk, M.D. '36, retired from his position as assistant chief of medicine at Martinez V.A. Hospital and his appointment as assistant clinical professor of medicine at the University of California—San Francisco Medical Center.

O. Elliott Ursin, M.D. '36, and his wife had a very interesting and instructive tour of the British Isles last June and July. Their new address is 7400 Crestway, Apt. 704, San Antonio, Texas 78239.

Harry Baers, M.D. '38, married a French woman, Nelly Bright, after the death of his first wife, Donna. He is now living in France and has a house in Hawaii.

J. Wallace Findley, M.D. '38, retired from the V.A. Hospital in Leavenworth, Kansas in 1974. Since then, he has pursued his interest in photography, teaching the basics of photography and darkroom work to a group of senior citizens. He also listens to shortwave radio and does some tatting.

Lawrence Kotner, M.D. '38, retired and is working for Jewish Hospital, where he supervises medical residents in private physicians' offices.

Alexander Mueller, M.D. '38, is practicing full-time in Santa Monica, California. He is also on the clinical faculty at the University of California—Los Angeles.

Roscoe Ackerly, M.D. '39, is married and had two sons (one is deceased). He made several nice trips—both air and sea—before retiring in 1981. He hasn’t traveled since, due to disabilities.

**'40s and '50s**

Grace Bergner, M.D. '43 M, retired from her internal medicine practice last July. She enjoys gardening.

Edward Dunn, M.D. '43 M, has four children, three grandchildren and one great granddaughter. Now that he’s retired, he likes to hike, especially on the Appalachian Trail.

Benjamin Greenwood, M.D., '43 D, has been retired for six years. He is into professional grade wood turning and cabinetry and likes to cruise the Great Lakes.

Stanley Kanter, M.D. '43 M, is an assistant clinical professor at Harvard Medical School and on staff at Massachusetts Mental Health Center. He writes that he has been fortunate with his family, friends, patients, colleagues and the stock market.

Leonard Kent, M.D. '43 M, retired from internal medicine five years ago. He and his wife, Irene, now have one of the largest Bromeliad nurseries in the world.

Gene Klingberg, M.D. '43 M, retired from West Virginia University School of
Medicine in 1987, where he was chairman of pediatrics for 22 years and had a new developmental center named after him. His wife, Jean, died two years ago. He married Rita last year.

Elmer Miller, M.D. '43 M, has had three sets of coronary bypasses, but writes that he is doing fine and promises to attend the 50th class reunion in 1993.

George Scheer, M.D. '43 D, retired this past December after 37 years as an orthopedic surgeon. Now he has more time for his hobbies—woodworking and fishing.

Robert Tichenor, M.D. '43 D, is retired from family practice. He keeps busy breeding and showing German Shepherd dogs.

James Davis, M.D. '45, Ph.D., recently had a professorship established in his name at the University of Missouri-Columbia's School of Medicine—The James O. Davis Distinguished Professorship in Cardiovascular Research. Davis is internationally recognized for his work in the area of high blood pressure and congestive heart failure. He is an elected member of the National Academy of Sciences and a founding member and former president of the International Society of Hypertension.

Albert Rauber, M.D. '46, retired last June and excavated dinosaurs in South Dakota that same month. He is an emeritus professor of pediatrics at Emory University School of Medicine in Atlanta and Honorary President of the Georgia Chapter of the American Academy of Pediatrics.

Duane Warden, M.D. '48, an obstetrician and gynecologist, writes that he makes enough to pay his malpractice insurance. He also keeps busy breeding cattle.

William Sawyer, M.D. '54, left his position as dean at Wright State University School of Medicine to become President of the China Medical Board of New York, Inc., a foundation that promotes medical education in the Far East.

'60s and '70s

Harold K. Kanagawa, M.D. '61, recently opened the Cardiac Catheterization Laboratory and Cardiac Rehabilitation Center at St. Mary's Hospital in Jefferson City, Missouri. It is the first of its kind in the Jefferson City area.

Bruce Dunn, M.D. '62, has a private urology practice in Santa Cruz, California and is chief of staff at the Dominican Santa Cruz Hospital.

Steven Teitelbaum, M.D. '64, was the first non-orthopedist to receive the Kappa Delta Prize for his work on the molecular basis of bone absorption. He is the Wilma and Roswell Messing Professor of Pathology at the School of Medicine.

Roy Treister, M.D. '67, an orthopedic hand surgeon in Chicago, has been elected a Fellow of the American Academy of Orthopedic Surgeons.

Hunter Heath III, M.D. '68, is a consultant in endocrine research at the Mayo Clinic and professor of medicine at Mayo Medical School and Mayo Graduate School of Medicine. His hobbies include private and sport aviation, wilderness canoeing and skiing.

Clifton Harris III, M.D. '70, has moved to Visalia, California and is now associated with the Sierra Medical Group.

Robert Paul, M.D. '72, has been selected chief of staff at Mercy Hospital in Fairfield, Ohio.

Bruce Ransom, M.D. '72, moved to Yale University, where he is an associate professor of neurology. He recently founded a new medical journal dealing with neurological ills. The first issue of Glia came out this past March.

Allan Shapiro, M.D. '73, closed his art gallery and moved to Springfield, Missouri to help organize a regional pediatric cardiology program for Southern Missouri.

Marshall Cyrlin, M.D. '75, was recently awarded a grant as principal investigator for a National Eye Institute-sponsored advanced glaucoma intervention study.

'80s

Steven Meador, M.D. '81, and Kathy (Huff) Meador, PT '82, had a son—Andrew Steven—last December.

Julie Bosler, M.D. '87, married Byron Reeder last December. They live in Jacksonville, Florida.

FORMER HOUSE STAFF NOTES

Richard Klein, M.D., FHS in hematology and oncology, left private practice three years ago. He now directs Employee Health Services at Bristol-MYERS Company in New York City. He still teaches medical oncology at Cornell University Medical College.

Barbara Ellzey, M.D., FHS in internal medicine, married James Twyman last July. They tied the knot in Graham Chapel at Washington University and honeymooned in Paris, London and Dublin.

Keith Henry, M.D., FHS, and Carol Nelson, M.D. '78, had their second son on November 19, 1986. His name is Nathan Lee. Keith was appointed assistant professor of public health and medicine at the University of Minnesota. He directs AIDS clinics at St. Paul Ramsey Medical Center and at St. Paul Health Department.

Dwight Campbell, M.D., FHS in orthopedics, was inducted as a Fellow in the American Academy of Orthopaedic Surgeons.

IN MEMORIAM

Mrs. C. F. Schneider, formerly Virginia Lee Garrett, a graduate of the School of Nursing, died February 9, 1988.
Next Year's Tuition Makes Cents to Students

In an unprecedented attempt to relieve students of at least some of the financial burden they incur during their medical education, the School of Medicine has reduced its tuition by 5 percent for the 1988-89 academic year. The decrease will affect students in all four medical school classes, bringing the cost of medical school tuition to $13,400 from the current $14,400.

The School of Medicine's tuition charge has traditionally been well below the average tuition level of other private medical schools in the U.S. In ranking the tuition of 52 private medical schools from highest to lowest, the School of Medicine ranked 31st in 1985-86, 32nd in 1986-87 and 39th for 1987-88. Last year tuition increased by only 3 percent above the previous year, and no tuition increase was levied this year.

Of the 550 medical students currently enrolled at the School of Medicine, 416 receive some sort of financial aid. As a result, students in last year's graduating class incurred an average debt of $34,885, which compares favorably with the indebtedness of all U.S. medical school graduates, including those from the 75 state-supported medical schools where tuition costs are considerably less than at private medical schools.
Very premature babies are so sensitive to temperature variations and drafts that they must be kept in special double-walled isolates. See story on page 16.