Joseph J.H. Ackerman, Ph.D., professor and chair of the Department of Chemistry, Irene E. Karl, Ph.D., research professor of medicine, and Richard S. Hotchkiss, M.D., assistant professor of anesthesiology, examine a nuclear magnetic resonance (NMR) probe in the High Resolution NMR facility in the chemistry department. The physical chemist, metabolic specialist and intensive care unit doctor, respectively, have used NMR to change the way the medical community views bacterial sepsis, the leading cause of death in surgical intensive care units and neonatal units. Their work is the first detailed look at sepsis in a live physiological system.

Challenging conventional wisdom

Researchers dispute cause, treatment of often fatal condition

Three researchers at Washington University have teamed together to change the way scientists and physicians view an often fatal condition known as bacterial sepsis.

Sepsis is the result of infection and has been defined as the presence of bacteria and/or their products in the bloodstream. It is the leading cause of death in surgical intensive care units and neonatal units. Within the United States alone, 400,000 patients develop sepsis annually, and about 100,000 of them die. The condition is particularly deadly among patients who are immunocompromised, or otherwise in poor health.

Common signs and symptoms are a high fever, rapid heart rate and respirations, high level of lactate in the blood and altered mental state. It is a multisystemic disorder that, once developed, shuts down one vital organ and body system after another.

Scientists and physicians disagree on the cause and treatment of the puzzling condition. There are two distinct and prevailing theories on its cause: one is deficient oxygen delivery to the body's cells. Their work is the first detailed look at sepsis in a live physiological system.

But now the three Washington University researchers — a physical chemist, an intensive care doctor and a metabolic specialist — have disputed these theories in a study of a rat sepsis model and have offered their own theory. The three are Joseph J.H. Ackerman, Ph.D., professor and chair of the Department of Chemistry and research professor of medicine in the School of Medicine, Richard S. Hotchkiss, M.D., assistant professor of anesthesiology and Joseph E. Karl, Ph.D., research professor of medicine.

‘Hypotheses don’t hold water’

Using nuclear magnetic resonance (NMR), a molecular imaging technique, the researchers examined in vivo rat hind limb muscle of septic rats and reported no marked decreases in cellular energetics, no steep decline in blood flow, and no evidence of oxygen deficiency to the body’s cells. Their work is the first detailed look at sepsis in a live physiological system. Their findings challenge conventional wisdom in treating the condition and have opened up new considerations for future treatment.

“We have solid evidence in this rat model that shows the two common hypotheses don’t hold water,” says Ackerman. “There are a number of key compounds used to run the energy-requiring processes of the cell, and when we look at those with NMR, we find the scoreboard in the cell looks fairly normal for these compounds. NMR gives very sensitive flow measurements as well as identification of the energy compounds. Despite the fact that sepsis caused major dysfunctions in the animals — they get extremely sick and ultimately die — in terms of cell energetics and blood flow, things look fine.”

The scientists and collaborator Sheng-Kwei Song, Ph.D., research associate in anesthesiology at the School of Medicine, and Irene E. Karl, Ph.D., research professor of medicine.

Miller receives medical imaging research grants

Helen Thomas, UPI

White House bureau chief, to give lecture

United Press International (UPI) White House Bureau Chief Helen Thomas will deliver the CHIMES lecture at 11 a.m. Wednesday, Jan. 27, in Graham Chapel. The lecture, which is part of the Assembly Series, is free and open to the public.

Thomas was a panelist in the third presidential debate of 1992 held at Michigan State University. A 30-year veteran of the White House press corps, she is the most experienced reporter covering the presidency.

During her career, she has interviewed seven presidents from John Kennedy to George Bush. Thomas, who is known for her tough questions and aggressive style, was the only print journalist traveling with then President Richard Nixon to China on his breakthrough trip in January 1972. Later she traveled to China with Secretary of State Henry Kissinger, as well as with Presid
Medical Update

Atkinson and Gordon elected fellows of science association

John P. Atkinson, M.D., has been elected to the rank of fellow by the American Association of Anatomists as part of the American Association of Anatomists (AAS). The association gives this honor to members "whose efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished." Atkinson, a professor and chairman of the Department of Internal Medicine and professor of molecular microbiology, was named for his pioneering research in immunology, for exemplary professional leadership in the field of rheumatology, and for inspiring contributions as a teacher. He structures function and genetics of the complement system of the innate immune system. His research has played a key role in defining how the complement system is activated and in looking for ways to control the damage complement proteins sometimes cause to human tissues. Atkinson discovered a complement protein, C9, and membrane cofactor protein, MCRP, responsible for protecting body cells from their own immune system. MCRP is used to protect transplant organs from rejection or to block the body from killing its own tumor cells.

Jeffrey I. Gordon is professor of molecular biology and pharmacology, and director of the molecular biology and pharmacology division. Gordon became head of the Department of Molecular Biology and Pharmacology in January 1991 and has received several awards for his research, including the American Gastroenterological Association Distinguished Achievement Award.

Sobel named president-elect of cardiology organization

Burton Sobel, M.D., professor and chairman of the department of medicine and director of the cardiology division at the Washington University School of Medicine, has been named president-elect of the American Producers of Cardiology. A national organization devoted to excellence in fulfillment of the promise of cardiology, the organization is responsible for advancing educational responsibilities of academic cardiology programs. Sobel was elected to the position by the group's 118 members, all of whom are directors of academic cardiology programs around the country. He began serving the one-year term on Jan. 1, 1993. He will then serve as president for one year, succeeding Yale University's Barton Zierath. The association serves as a sounding board for the field of cardiology by regularly soliciting opinions from its members about issues facing the field. Its function is to anticipate changes in clinical and academic cardiology, to recognize important clinical advances, and to recommend ways to effectively train clinical and investigative cardiologists. Its goal is to keep the cardiology field responsive to trends and to facilitate interaction with other medical groups. The organization, currently in its fifth year, is expected to publish its research from time to time.

Volunteers needed for study of treatment for non-insulin dependent diabetes

School of Medicine researchers need volunteers to participate in a study of a drug that may be effective in treating some individuals with non-insulin dependent diabetes and impaired glucose tolerance. The drug, terbutaline, is similar to adrenaline, a naturally occurring hormone, and can be inhaled in response to stress. The drug has been safely used to treat asthma and similar conditions. In addition, previous studies in men have shown that terbutaline can enhance insulin action.

Jeffrey I. Gordon

Sobel has received numerous honors, including the 1992 James B. Herrick Award of the American Heart Association, the 1987 American College of Cardiology Distinguished Scientist Award, the 1984 American Heart Association Scientific Council's Distinguished Achievement Award and the 1981 Heart Research Foundation's International Recognition Award. In addition, he was named counselor for the International Society for Fibrolysis and Thrombolysis in 1992, and has served as a counselor for the American Society for Clinical Investigation and for the American Federation for Clinical Research.

He has published more than 600 scientific journal and textbook articles and has written the editorial boards of several scientific journals. He has served on more than 20 national advisory committees for the National Institutes of Health and other organizations and has been a visiting professor or lecturer in the United States and abroad on more than 65 occasions.
when a call for assistance comes, William A. Murphy, 46, gives close attention to his daily responsibilities as a soft-spoken professional and becomes a sixth sense.

But this is no comic book fantasy. The calls come from real-life law enforcement authorities who know that because of his experience and expertise, Murphy can read volumes in the X-ray films of bones where other people see only a skeletal structure.

"Bones are like fingerprints," says Murphy, by day a professor of radiology at the School of Medicine's Mallinckrodt Institute of Radiology. "No two people have the same bony architecture. A person's genetics are expressed in facial features, in fingerprints and in bones. Each is unique to the individual." He explains that bone, the most durable human tissue, also stores information about an individual long after all other traces have disappeared.

Working with death investigators from local, state, national and international authorities, Murphy most frequently examines X-ray films of remains. By getting bones to tell everything they know, Murphy identifies the victims of foul play and quantifies their injuries for the police.

"Much of my forensic radiology work involves identifying people who have died," he says. "Of course, I can't just pick a person. The death investigators usually have a presumptive identification; they come to us for precision." He works mostly by comparing X-rays of the evidence with earlier, pre-mortem X-rays that have been scouted out by law enforcement officers or sometimes by Murphy himself.

In 1987, he identified a female victim in Philadelphia's gritty Grishen case, using only limb bones found in a freezer in the murderer's kitchen. Hendrik faked mentally handicapped women into his home, then enslaved and tortured them until they died. Murphy was able to specify that the limbs belonged to a particular victim, and his report served as a link between the murderer and the victim.

"Most remains are relatively complete skeletons, but even with only a few bones, there are lots of opportunities to get matching films," he says. And, surprisingly, perhaps two-thirds of the population has had a radiographic study—usually consisting of more than one X-ray film—within the past year, Murphy says. In most jurisdictions, hospitals are required to retain all X-rays of their patients for five years. Many private practices keep films for the life of the practice.

Still, Murphy says, getting a match is "sometimes easy, sometimes not." Complicating the issue is the need for identical alignment of the bones in both sets of X-rays. Examinations on the pre-mortem and post-mortem films also must be alike before a comparison can be made. Getting equivalent exposures can be especially tricky because films made in life were produced with tissue on the bone. Films of remains often record only the bone, with no surrounding tissue to influence the exposure.

Before Murphy makes an identification, every element of the films he reviews must match. "No discernance can go unexplored," he says. He uses the shape and size of bones as well as the patterns in the cortex (the outer layer) and trabecula (the interior meshwork of interconnecting bone spicules, or tiny cross lines within bones).

Sometimes, a single observation tells Murphy that he has a positive identification. For example, "two identical pieces of metal, such as a surgically implanted screw, in exactly the same place just wouldn't occur by chance," he says. Even with that kind of evidence, he still checks other clues for corroboration before making a positive identification.

Michael Graham, M.D., medical examiner for the City of St. Louis, says he has learned to recognize expertise perhaps once a month to establish identifications, interpret X-rays, determine the presence and nature of injuries suffered by a victim or the length of time between injury and death. "He tells us who people are and how they died," Graham said. Graham rarely uses Murphy's written report. "When you have the best," he says, "there's no reason to change."

Murphy's interest in forensic radiology began during a three-week course in forensic radiology at Mallinckrodt Institute in 1969, when he served as an externship in the Philadelphia medical examiner's office. That experience intrigued him, and ever since, word of his abilities has been spreading.

In addition to identifying bodies, Murphy separates humans from the non-human. In 1978, the Louis County sheriff, involving a family dog that repeatedly brought home bones, Murphy was able to classify the bones as human remains and set the length of time between injury and death. "Once you know the anatomy, separating the human from the non-human is not difficult," although some animal bones may closely resemble human bones, he says.

A third aspect of Murphy's work in forensic radiology involves documenting injury. During the era of "deathbed television," when amateurs attempted wild and dangerous stunts to get attention, Murphy documented the fatal injuries sustained by a parachutist who tried to land on the Gateway Arch. The sky diver touched down successfully but was blown off by a puff of wind. The would-be star slid down one leg of the arch to a horrible death.

That experience intrigued him, and ever since, word of his abilities has been spreading.

Three times each year, Murphy lectures on his forensic work as part of a course titled "Medical-Legal Death Investigation," offered by the Medico-Legal Society of America. In one session, the course draws pathologists, coroners, medical examiners, and police investigators from around the country. He has taught in courses for more than 900 students at each session. Exposure there is one way in which his renown as a forensic radiologist has spread.

He contributes all of his professional time and expertise in forensic radiology as community service. Except in those cases that involve major travel or other large expense. Murphy doesn't charge for his services, even if he must drive to Illinois or to an outlying Missouri county. "It's my way of putting something back into the community," he says. "Everybody can find a way of using his skills to contribute to the community. That's all I'm doing."

If the work produces no monetary remuneration, each case supplies professional satisfaction. And, there are less tangible rewards. Murphy recently has been approached to bring his expertise to bear on a case in which anthropologists are trying to determine the remains of an individual unearthed in the American west. Preliminary studies show an age for the specimen of about 8,000 years.

Even more exciting is Murphy's invitation to consult as a paleoradiologist on the mous case of the "Ice Man" of the Tyrolean Alps. Found almost perfectly preserved, the Ice Man has been dated to about 5,250 years ago, meaning that he lived in about 3,500 B.C. The specimen has been dated to late Neolithic by means of carbon dating techniques and an almost pure copper age, with which he has worked. Murphy already has made a first trip to Innsbruck, Austria, and plans to spend a year involved in an investigation to determine the Ice Man's skeletal structure and where it fits in the human perspective.

Because one of Murphy's avocational interests is in history, the two new endeavors promise to provide him with a welcome opportunity to learn more about antiquities.

"This brings me face to face with the Ice Man, opens up a whole new territory," he says.

Paleoradiology and forensic radiology are all in addressing the same problem: the detection of breast cancer has meant a subsequent increase in awareness of the importance of mammograms in the early detection of breast cancer. Murphy's work has had a subsequent increase in responsibility for Murphy and his colleagues.

For the past two years, Murphy has served as program chairman for the annual meeting of the Radiologic Society of North America (RSNA), responsible for the scientific program. In that position, he organizes 70 radiologists, 3,000 abstracts and oversee 1,350 presentations.

The RSNA gathering is the world's largest medical meeting, attracting more than 50,000 registrants. Regularly held in Chicago, it fills every hotel room in that city and offers up to 4,000 exhibits. Murphy was at work planning the scientific presentations for 1993.

Do professional responsibilities of this magnitude leave any time for anything else? "Oh yes," says Murphy, "I'm a family man. I am a husband and father. My family often travels together."

The Ниineman of his experience and expertise, Murphy can read volumes in the X-ray films of bones where other people see only a skeletal structure.

"Bones are like fingerprints. No two people have the same bony architecture."

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Steve Kohler
Lectures

Thursday, Jan. 21

Noon. Dept. of Genetics seminar, "Genetic Sequence Analysis in Cancer," Robert H. Wattenhofer, prof., Dept. of Genetics, WU School of Medicine. Library, Room 816 McDonnell Medical Sciences Bldg.

4 p.m. Dept. of Chemistry colloquium, "Chemical Radical in Atherosclerosis," Gayle J. Heinecke, prof., WU Dept. of Medicine Lipid Research Center. Room 311 McMillen Laboratory. Coffee: 3:40 p.m. outside Room 311.


Friday, Jan. 22

Noon. Office of Minority Student Affairs and the Office of Medical Education and Associated present the Dr. Martin Luther King Jr. Noonday Seminar, "Why Spousal Abuse and Domestic Violence are Civil Rights Issues for All People," with panellists Larry Davis, assoc. prof. of civil rights issues; and Calvin B. Terrell, asst. president, The Clayton Consulting Group. Wohl Hospital Bldg. Aud. For more info., call 935-8533.

Monday, Jan. 25

4 p.m. Graduate Program in Immunology Grand Round, "Biology of MHC Molecules," Helde I. L. Ploegh, prof. of biology, Center for Cancer Research, Massachusetts Institute of Technology. Third Floor Aud. St. Louis Children's Hospital Campus.

4 p.m. Social Thought and Analysis lecture, "The Relationship Between Language and Earnings," El Chiswick, Dept. of Economics, U. of Illinois. Room 149 McMillan Hall.

Tuesday, Jan. 26

1:00 p.m. Conference Room, 3rd floor, East Building.

4 p.m. Molecular Microbiology seminar, "Adenovirus Proteins That Counteract Immunosurveillance," William Wold, chair, Dept. of Molecular Microbiology and Immunology, St. Louis University School of Medicine. Cori Aud., 660 S. Euclid Ave.

Wednesday, Jan. 27

1:30 p.m. Annual Colloquium. WU presents the CHIMES Lecture with Helen Thomas, WP One White House bureau chief. Graham Steen, prof., of Communication, Room 301 January Hall.

4 p.m. Dept. of Biochemistry and Molecular Biophysics seminar, "Biochemical and Molecular Analysis of the Mouse Lamina C, John H. Lawrence, prof., and chair, Dept. of Biochemistry, of Arizona, Tucson. Cor. Aud., 660 S. Euclid Ave.


4 p.m. The Joint Center for East Asian Studies at Washington University and the University of Missouri-St. Louis present a colloquium, "Japan: The Domestic Politics of Internationalization," Frances McAlpin, professor of political science, U. of California, Los Angeles. Room 301 January Hall.

Thursday, Jan. 28

4 p.m. Division of Hematology-Oncology seminar, "Chromosomal Function in Mouse Mammary Tumor Virus Infection," Susan Ross, prof., Dept. of Biological Chemistry, U. of Chicago, College of Medicine, Chicago. Room 8841 Clinical Sciences Research Center.

Saturday, Jan. 23

Monday, Jan. 25

4 p.m. Dept. of Chemistry seminar, "Spermidine and Identical Rotational Bands in Nuclear: Chance Cancellerations or a New Nuclear Symmetry?" Bill Kiley, prof., Dept. of Physics, Florida State U. Room 311 McMillen Laboratory. Coffee: 3:40 p.m. outside Room 311 McMillen.


Friday, Jan. 29

Dept. of Cell Biology and Physiology, "Mannose Dynamics in the Macrophage. John H. Heuser, prof. of Cell Biology and Physiology, WU School of Medicine. Room 423 McDonnell Medical Sciences Bldg.

4 p.m. Dept. of Music lecture, "The Use of Choral Instruments in Classical and Early 17th-century Music," Paul O'Dette, lutenist. Room 8 Belflower Hall.

Performances

Friday, Jan. 22
8 p.m. Performing Arts Department presents "Washington University Dance Theatre." (Also Jan. 23, same time, and Jan. 24, 2 p.m. and 7:30 p.m.); Room 199. Olin Library, Special Collections. Cost: $7 for the general public; $5 for seniors, students and WU faculty and staff. For more info., or reservations, call 365-8543.

Saturday, Jan. 23
8 p.m. Edition Theatre presents "Blue Rider Theatre per- forming "Fiege: The Last Portrait." (Also Jan. 24, same time.) Drama Studio, Room 208 Mallinckrodt Center. Cost: $12 for the general public; $10 for seniors, students and WU faculty and staff; and $8 for the general public; $5 for seniors, students and WU faculty and staff. For more info., or reservations, call 365-8543.

Films

Friday, Jan. 22
7 and 9:30 p.m. Filmboard Feature Series presents "The Player." (Also Jan. 30, same times.) Room 100 Brown Hall. Cost: $3.

Monday, Jan. 25
7 and 9:30 p.m. Filmboard Classic Series presents "Breaks My Face." (Also Jan. 26, same times.) Room 100 Brown Hall. Cost: $5.

Wednesday, Jan. 27
7 and 9:30 p.m. Filmboard Feature Series presents "Virtuous Sin." Room 219 South Ridgley Hall.

Thursday, Jan. 28
7 and 9:30 p.m. Filmboard Feature Series presents "Raising Cain." (Also Jan. 30, same times, and Jan. 31, p.m.) Room 100 Brown Hall. Cost: $3.

Midnight. Filmboard Midnight Series presents "Heathers." (Also Jan. 30, same times, and Jan. 31, p.m.) Room 100 Brown Hall. Cost: $3.

Exhibitions

"Bruce Neuman: Light Works." Exhibit opening: 7 p.m. Jan. 29. Exhibit continues through March 21. Washington University Gallery of Art, upper gallery, Steinberg Hall. Hours: 10 a.m. - 5 p.m. weekdays, 12-1 p.m. weekends. For more info., call 365-5490.

"Selections From the Gift of Mr. and Mrs. Edward Groszman," Through Jan. 29. Olin Library, Special Collections. Level 3. Hours: 8:30 a.m. - 5:30 p.m. weekdays. For more info., call 365-5495.


"Washington University Art Collection: 1998. Olin Library, Special Collections. Level 3. Hours: 8:30 a.m. - 5:30 p.m. weekdays. For more info., call 365-5495.

Steinberg Hall. Hours: 10 a.m. - 5 p.m. weekdays, 12-1 p.m. weekends. For more info., call 365-4523.

Calendar guidelines

Events sponsored by the University — its departments, schools, centers, organizations and its recognized student organizations — are published in the Calendar. All events are free and open to the public, unless otherwise noted.

Calendar submissions should state time, date, place, sponsor, title of event, name of speaker(s) and admission cost. Quality promotional photographs with descriptors are welcome. Send items to Marie Doss at Box 1070 (or via fax: 935-4259). Submission forms are available by calling 935-8533.

The deadline for all entries is noon Tuesday two weeks prior to the date of the event. Entries after the deadline will not be published. The Record is printed every Thursday during the school year, and it is distributed during the summer. If you are uncertain about a deadline, holiday schedule, or any other information, please call 935-8533.
Grant brings saxophonist Oliver Lake home to create new work and teach about jazz

Jazz saxophonist Oliver Lake, a native of St. Louis and a member of the acclaimed New York City-based World Saxophone Quartet, will be in residence at Washington University this year.

The University's African and Afro-American Studies Program and Edison Theatre have received a $134,090 grant from the National Endowment for the Arts to support Lake's activities during his first year as a University faculty member.

Lake will return to Washington University for the entire academic year to create a new work based on the Black experience, which he will present at an April concert with other artists, including pianist Kirk Lightsey, whom Lake describes as his "true musical partner." Lake and Lightsey have performed together since 1984.

During his stay in St. Louis, Lake will also conduct master classes and workshops, participate in programs designed to help individuals understand his work and jazz as well as perform with artists from St. Louis and elsewhere. The University's partnership in the Oliver Lake project is the Missouri Historical Society, the Forum for Contemporary Art, the New Theatre and Grand Center.

"An award of this size demonstrates Wallace Reader's Dignity's belief in the importance of this project to our community and in building an audience for jazz and brings national attention to St. Louis and its contribution to this American art form," said Jo Ann Collins, the African and Afro-American Studies administrator who wrote the grant application.

Washington University is one of eight colleges and universities that recently received grants totaling $580,310 from the Lila Wallace-Reader's Dignity Partners Program, which is administered by the Association of Performing Arts Presenters of Washington, D.C. The arts partners program supports strong working partnerships between organizations, artists and community groups. In 1991 the arts partners program awarded the University a $3,680 planning grant for the Lake project.

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University announces 1993-94 tuition, fees for undergraduates

Undergraduate tuition and fees for the 1993-94 academic year will be $16,918, an increase of $776 from the $16,142 charged last year. In percentage increase from last year, according to Chancellor William T. Dade.

For 1993-94, tuition will be $17,668, a 5.7% increase from last year's $16,892. The increase reflects a decrease in federal aid. About 60 percent of the average student's total costs come from federal, state and institutional sources, with awards averaging approximately $16,918, and include a required $168 service fee.

Tuition and fees for 1992-93 are $16,918, and include a $168 required student activity fee.

For 1993-94, typical room and board charges will be $5,574. The total 1993-94 charge (tuition, fees, room and board) is 4.7 percent greater than the corresponding charge in 1992-93.

In a letter to parents, Danforth said the University has "been able to attract an outstanding faculty and maintain a relatively low student-faculty ratio, while offering a quality of education and programs to allow students maximum freedom of opportunity."

However, he said the cost of providing this quality of learning environment and for quality and laboratory research. Additionally, "governmental support of student aid has not kept pace with need or with inflation." Danforth emphasized that the University has "envisioned by Washington University's Danforth Foundation, as a non-partisan effort to debrief the outgoing administration and make way for a new transition."
Robert Dyows, D.M.D., professor emeritus of dental health professions, received the American Academy of Periodontology's Distinguished Research Award. He also received the Guggenheim Fellowship to direct the Globe's Summer Acting Festival. For his work at the Shakespeare Globe, he directed "Othello." He also has been invited to give a lecture titled "On Directing Shakespeare.""...
Hilltop Campus

The following is a list of positions available on the Hilltop Campus. Information regarding the required qualifications may be obtained in the Office of Human Resources, Room 215, Seeley G. Mudd Hall, or by calling 932-5900.

Department Secretary, Part-time
930466. Requirements: Bachelor's degree in computer science; demonstrated experience in coding and debugging C programs; knowledge of the UNIX environment including TCP/IP networking; knowledge of object-oriented programming technologies such as C++; knowledge of PC programming environments and Windows; experience implementing client-server applications. Resume and three letters of recommendation required.

Programmer
930091. Libray Requirements: Bachelor's degree in computer science; demonstrated experience in coding and debugging C programs; knowledge of the UNIX environment including TCP/IP networking; knowledge of object-oriented programming technologies such as C++; knowledge of PC programming environments and Windows; experience implementing client-server applications. Resume and three letters of recommendation required.

Researcher
930110. Development Services. Requirements: Bachelor's degree in science, liberal arts background preferred; strong research and writing skills. Application, resume and three letters of recommendation required.

Library Technical Assistant (Binding)
930116. Libray Requirements: Two years of college or equivalent work experience; physical stamina (including lifting boxes filled with books); ability to work with materials in foreign languages; reading knowledge of one foreign language preferred; typing 30 wpm with accuracy. Clerical and technical tests and three letters of recommendation required.

Administrative Assistant
930125. Chemical Engineering. Requirements: High school graduate, some college preferred; 50 wpm with accuracy; as much as five years office experience would be beneficial, especially with interaction with other people. Some supervisory experience is required. Clerical tests and three letters of recommendation required.

Administrative Assistant
93026. Materials & Development Programs. Requirements: Associate's degree or equivalent knowledge; specialized secretarial and business training; detail work experience necessary; five years general office experience; familiarity with computer grammar and punctuation; ability to deal with multiple good, telephone manner; mature, well groomed appearance; personality; must be able to work occasional evenings and weekends, ability to work with people and parents. Clerical tests and three letters of recommendation required.

Reference Librarian, Part-time
930128. School of Business. Requirements: Master's degree in business administration or equivalent for all operations in the library during the weekend; implement and interpret policy. Working hours each semester: noon to 6 p.m. Saturday; 1 to 6 p.m. Sunday; and 3:15 to 7:15 p.m. one weekday. Resume and three letters of recommendation required.

Administrative Coordinator, CRO Program
930210. Research Office. Requirements: Minimum of two years of college, bachelor's degree preferred. Support the director of the medical school's corporate relations office; prepare and assemble scientific and marketing information, drafting correspondence, managing manuscripts and data management procedures; employing data base searching and data base management skills. Must be capable of smooth written and verbal interaction with medical school faculty, research and development, and outside organizations (funders and licensing) staff, and representatives from R&D or legal departments of companies. Initiative and judgment and mature communications skills required. Deadline is March 15. Send resume and three letters of recommendation to: Associate Vice Chancellor for Research, Washington University, Campus Box 8013, 724 S. Euclid Ave., St. Louis, Mo. 63110.

Director, Sponsored Projects Services
930310. Research Office. Requirements: Bachelor's degree. Supervise and develop policies and procedures; coordinate central functional areas of management of public funds by universities, government contracting practices, government and private foundation grants and resources; supervise and direct research support of research universities. Supervision of personnel to grade personnel, evaluate personnel and provide input with faculty, administrators, agency personnel, monitors and analysts. Clerical and technical tests and three letters of recommendation required.

Clerk I, Surgery, Part-time
930420. Schedule: 18 hours a week, flexi- ble hours. Requirements: High school graduate, one or two years experience preferred. Must be able to work independently and in team. Requires typing speed of 20 wpm. Will perform a variety of basic clerical and office-related duties.

Medical Secretary I, Pediatrics
930451. Requirements: Bachelor's degree graduate/equivivalent with a thorough knowledge of medical terminology; capable of operating routine office equipment; good interpersonal and medical technical skills. Experience in pediatric environment very important. Must be able to lift 50 pounds; valid driver's license required.

Departmental Accounting Assistant, Neurology
930459. Requirements: One year college. Prefer individual with knowledge of Washington University Systems (Payroll, FIS, Grant Management); good math aptitude; accuracy and attention to detail; a moderate typing speed, familiarity with word processing; medical experience. Will be responsible for ordering all medical supplies and services.

Doctor of Medicine, PhD
930317. Office of Financial Aid. Requirements: One year of college-level study, typing 40 wpm with accuracy; ability to work with people and parents. Clerical tests and three letters of recommendation required.

Technical Assistant, Neuroscience
930325. Requirements: Associate's degree or equivalent knowledge; specialized secretarial and business training; detail work experience necessary; five years general office experience; familiarity with computer grammar and punctuation; ability to deal with multiple good, telephone manner; mature, well groomed appearance; personality; must be able to work occasional evenings and weekends, ability to work with people and parents. Clerical tests and three letters of recommendation required.

Assistant Receiving/Clerical Assistant
930357. Office of Financial Aid. Requirements: One year of college-level study, typing 40 wpm with accuracy; ability to work with people and parents. Clerical tests and three letters of recommendation required.

Evanston Campus

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