On Campus

Far Fewer Sleepless Nights

NEW GRADUATE FELLOWSHIPS RELIEVE SOME PRESSURE by Diane Manuel

Michele Coleman TAPPED MANY SOURCES TO SUPPORT HER GRADUATE STUDY.

Linda Cicero

MICHELE COLEMAN SPENT MORE SLEEPLESS NIGHTS than she cares to remember during her first year as a graduate student in experimental physics. ■ To qualify for a research and teaching funding package from her department, she had to take three intensive physics and math courses each quarter, in addition to putting in 8 hours of work each week in a research group and doing another 12 hours of tutorial work. It all added up to 80 hours on the job each week, with only four or five hours of sleep per night. ■ By the third quarter, discouraged and convinced that she was on the verge of flunking out, Coleman went to see Walter E. Meyerhof, who was then chair of the admissions committee for physics.

"He said, 'What would help? If you didn't have to teach this quarter?'

"And I said, 'Yes!'

"So he talked to the right people and found some research funding and got me excused from teaching for one quarter. And he gave me tremendous emotional support and encouragement, too. I remember leaving his office feeling just great, like I could conquer the universe."

The relief that Coleman experienced that day, knowing she could begin to commit full time to her studies, undoubtedly will be shared by some 300 future scholars who will qualify as Stanford Graduate Fellows under the initiative proposed by President Gerhard Casper [see letter, page 27]. At a time when federal support for the sciences and engineering is evaporating about as fast as the liquid nitrogen in Coleman's lab, the new fellowships are designed to augment federally funded research assistantships.

Students who are nominated by their departments and selected by a faculty committee will be given a tuition voucher of $12,000 and a stipend of $16,000 for each of three years. They can take the money to the lab or research group of their choice, rather than having to select a research project or adviser based on available funding.

Amanda Peet, a theoretical physicist who received her Ph.D. from Stanford in 1994 and currently is a postdoc at Princeton University, says her life would have been significantly easier if she'd had "free" money as a graduate student.

"As it turned out, my thesis advisers and the physics department had to move heaven and earth to find funding, to make sure I could stay in their research group," she says.

Peet, a native New Zealander, spent her first year at Stanford searching for external funding, but came up against two stark realities. Not only was there less money nationwide for theoretical physics – as opposed to experimental physics – but there were virtually no fellowships for foreign students.

The new Stanford fellowships – which will be open to foreign students – are the talk of graduate lunch tables and labs these days. The prospect of portable funding has a tantalizing appeal, particularly for those in the

exploratory years of graduate study.

"I didn't know what I wanted to do when I came to Stanford," Coleman recalls, "but I certainly didn't have a burning desire to do low-temperature physics."

After spending a quarter with John Lipa's low-temperature research group, however, she knew she'd found her academic home.

Today Coleman has staked out Lab 028, deep in the basement of the Varian physics building. White crystals envelop the pipes that connect a tank of liquid nitrogen to a conglomeration of thermometers, ion gauges, heaters and surgical tubing that are attached to what looks like a giant blue thermos bottle. She spent a recent afternoon twiddling dials and logging temperatures in her lab book as she monitored her confined helium experiment.

"When you do experimental physics, you find that you can go for days or weeks or months without thinking about the physics of what you're doing," she says. "We spend most of our days thinking about what kind of screws we're going to use and how we're going to put grease on them. Probably half of what I do is plumbing."

Coleman was collecting data from her "cold" experiment to take to an international physics conference in Prague. Her work already has been published in the prestigious journal *Physical Review Letters,* and making the right contacts at the conference could open postdoc doors.

Coleman began saving money for the trip to Prague three years ago, when the conference was announced. She had landed a $22,000-a-year grant ($16,000 for stipend, $6,000 toward tuition) from the National Aeronautics and Space Administration, one of only 300 that are awarded nationally, and was able to accumulate travel funds for three years.

"The NASA fellowship meant money for tuition, required fees, whatever," she says. "The university kept sending me bills, saying, 'Here's how much you owe,' and then another note would come, saying, 'Look, someone's already paid for you.' So I felt very secure, knowing the money was there."

But Coleman's NASA fellowship runs out in October and she once again will become a department research assistant, with substantially reduced funding. She will receive tuition support plus about $15,000 per year in salary – compared to her $16,000 NASA stipend. Before her NASA grant ended, she also was receiving a research supplement of about $2,500 per year, paid from her adviser's funds, which brought her total income, to $18,500.

Coleman now will have to pay some $900 annually in required university fees, including mandatory health insurance. The increased fees and decreased take-home pay mean $4,000 less in her pocket.

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Bass to Chair Board of Trustees

GSB ALUMNUS IS SEVEN-YEAR BOARD VETERAN By Marisa Cigarroa

BUSINESSMAN ROBERT M. BASS, of Fort Worth, Texas, has been elected the 22nd chair of the Board of Trustees. He succeeds John Freidenrich, who has headed the board since 1992.

Bass, MBA '74, first was elected a trustee in 1989. He is a director of the Stanford Management Company and has served as a member of the Business School Advisory Council and as a director of the Business School Trust.

Bass, 48, said that this is "an auspicious time in Stanford University's history. The recently announced initiatives in undergraduate and graduate fellowships will enhance Stanford's attraction for the best and the brightest.

"The transformation of the science and engineering facilities into a real Quad has begun, and once constructed, it will provide a physical space [to match] the stature and excellence of Stanford's science and engineering programs. At the same time, we're completing the earthquake recovery and seismic strengthening program that will restore the Main Quad and the rest of the campus."

Bass said that adopting management practices that emphasize "efficiency and effectiveness" in academic planning will be increasingly important if the university is to continue adding innovative programs and initiatives to its curriculum.

He said that his main challenge will be to maintain the positive momentum set by Freidenrich, a Silicon Valley attorney and venture capitalist. Freidenrich will remain a trustee.

As the chair of the trustees' Land and Buildings Committee, Bass has approved and helped plan many of the construction projects that are under way on campus.

Bass and his wife, Anne, made a $25 million gift to the university in 1992. They also have endowed five professorships in the School of Humanities and Sciences, funded four fellowships at the Graduate School of Business and made numerous gifts of equities to the university.

Bass's business interests include investments in financial services industries, manufacturing, information services, real estate, and gas and oil companies. He is president of Keystone Inc., an investment company based in Fort Worth. ST

Linda Cicero

From Russia, With Love Stanford University Libraries and the Hoover Institution recently acquired the family archives of the late Josephine Pasternak, daughter of Russian impressionist painter Leonid Pasternak and sister of poet and writer Boris Pasternak. In this 1980 photograph, Josephine poses with paintings of herself done by her father. The Pasternak collection, which will be housed at the Hoover Institution, includes family correspondence and manuscripts, many of them previously unpublished. The Hoover Institution has one of the country's most significant collections on the history of Russia in the 20th century.

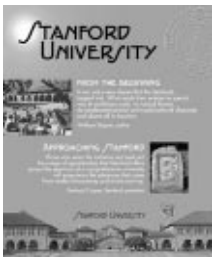
JOSEPHINE PASTERNAK

Yield Rate Up Stanford's closely watched "yield rate" – the number of admitted freshmen who decide to enroll – was 61.4 percent this year, up from 55.1 percent last year. James Montoya, dean of undergraduate admissions and financial aid, said the university's Early Decision program, offered for the first time this year, was a key factor in the increase. Thirty-five percent of the freshmen who will enroll this fall were accepted through the new program. Those students had to commit to enrolling at Stanford in exchange for an earlier-than-normal admission decision. Montoya also cited increased involvement of faculty members and alumni in the admissions process. Alumni and parents hosted 21 receptions for prospective freshmen around the country. Also contributing to the strong yield, Montoya said, was a closer coordination between the Undergraduate Admissions and Financial Aid staffs. "We implemented a new technical system in the Financial Aid office, which assisted in timely awards," Montoya said. The number of applications for the Class of 2000 was 16,359, the highest since the mid-1980s. The entering class is 50.3 percent male, 49.7 percent female.

Campus News

Faculty Diversification Progress toward achieving a more diverse faculty has been uneven during the past 10 years, according to a report presented to the Faculty Senate this spring. From 1985 to 1995, the percentage of women on the faculty rose from 9.88 to 17.75, and the percentage of faculty of Asian ancestry went from 3.40 to 8.22. During the same time, the percentage of Latino faculty grew from 1.47 to 2.47; the percentage of black faculty grew from 1.70 to 2.67; and the percentage of Native American faculty dropped slightly from 0.15 to 0.14. Of the 1,459 faculty currently at Stanford, 1,200 are men and 259 are women; 120 are of Asian ancestry, 39 are black, 36 are Latino and 2 are Native American.

Surfing Stanford A photo tour that includes 2,500 campus scenes is a highlight of the university's redesigned home page on the World Wide Web. The site also offers recent campus news, plus information on admissions, academic and administrative departments, technology and athletics. Stanford's web address is http://www.stanford.edu/. *Stanford Today* also is available through the Stanford page, or directly at http://www-leland.stanford.edu/dept/news/stanfordtoday/.



Cartun Retires Rabbi Ari Mark Cartun retired July 1 from the Hillel Foundation after 21 years as its executive director. Cartun, 46, will continue to teach, write, lecture and lead Jewish educational projects. The organization grew during Cartun's tenure from a small group serving a handful of students to one of the largest Hillel programs in the United States. The range of services offered, the library holdings, staff size and budget all have increased significantly in the last two decades. When the 25-year-old Cartun started, Stanford Hillel had one half-time staff member and a total annual budget of $27,000. Currently, there are five people on the administrative staff and numerous student interns. The annual budget has grown to more than $500,000. ST

RABBI ARI CARTUN

SLEEPLESS NIGHTS, continued from page 29

Still, she knows she was lucky to land in a department that is known for nurturing its graduate students, encouraging women scientists and accepting only as many doctoral candidates each year as its faculty can support financially with research grants. Coleman also counts herself fortunate to be in Lipa's research group, since he has substantial outside funding for space-shuttle experiments.

Many faculty members have expressed satisfaction with the numbers that have been proposed for the Stanford Graduate Fellowships. For one thing, the $12,000 annual tuition voucher and $16,000 stipend add up to $6,000 more than many prized fellowships such as NASA's. Professors who will have Stanford Graduate Fellows in their labs won't have to include the cost of paying research assistants in grant proposals, which should make those proposals less costly and more competitive.

"Under the new program, students will be assigned money, regardless of where they're going," says Susan Abernethy, a development officer who is spearheading the $200 million fund-raising drive that will be needed to sustain the program. "They can go to faculty member X and say, 'I'm funded and won't cost you anything. Will you take me on?'"

Initial reaction to the proposed fellowships has been about as hearty as it gets from a faculty known for its often critical deliberations.

"If we go through the abrupt change in the level of federal funding that many of us are concerned about, then we have an ethical and moral obligation to provide the resources that our students need to complete their degrees," Joseph W. Goodman, chair and professor of electrical engineering, said when the graduate initiative was announced.

"We all worry about what will be the fate of our graduate students if our funding is dropped. It's the subject that keeps us awake at night." ST

Top: Hoover Institution Archives Bottom: Chuck Painter

Science and Medicine

Not Exactly Rocket Science

COLLABORATIONS WITH NASA HELP SHARPEN SURGICAL TOOLS by Mike Goodkind

A PLASTIC SURGEON STEPS INTO an "operating room," dons goggles and gloves, and begins to rearrange the deformed facial features of a child. The first result doesn't please him, so he starts over. He manipulates the features repeatedly until he finds a satisfactory result.

This may not sound much like rocket science. But it is closer than one might imagine.

The surgeon is operating in the realm of "virtual reality" as part of a collaboration between NASA's Ames Research Center and Stanford's Department of Functional Restoration to develop technology that will enable physicians to try out a variety of surgical outcomes before ever stepping into a real operating room.

The space agency is interested in designing tools that would allow surgeons to perform procedures during long-term space missions, while Stanford's goal is to improve the outcome of reconstructive surgery.

"In plastic surgery there are often several ways to achieve the same results, but usually only one surgical route is optimal," says Dr. Michael Stephanides, Stanford resident in plastic and reconstructive surgery.

Predicting which outcome will be best is "something surgeons could not do before with any accuracy," says Dr. Stephen A. Schendel, professor and chair of the Department of Functional Restoration. "They had to rely on many years of experience doing these operations, which was at times less than perfect."

Although the virtual reality technology is complicated, Schendel likens it to Mr. Potato Head, the children's toy.

"It's a model that allows someone to put together various facial elements," Schendel says. "With Mr. Potato Head, the variables are parts such as ears, nose, mouth and mustache, but in the 3-D visual simulator, laser and CT scans allow for changing subtler facial characteristics, specifically skeletal structure and cartilage."

NASA's Muriel Ross views 'virtual surgery.'

The gloves and goggles, which are similar to those used with NASA flight simulators, currently allow surgeons to interact with 3-D images of patients, Stephanides says.

To build the 3-D image, a technician makes laser scans of the patient's face. Data from the scans are used in a software package developed through the Stanford-NASA collaboration to create a three-dimensional image of the patient's facial skin overlying the skull.

A user of this virtual environment can manipulate the bone structure using his hands and virtual surgical tools. Changes in the bony skeleton are reflected in the soft-tissue laser scans.

Stephanides says that the patient, for example, might be a child who is born deformed "and you have to rearrange his skull bones: Unless you have somebody like Dr. Schendel who has done this many times, you will spend a great deal of time in the operating room trying to obtain a decent result."

The software, says Muriel Ross, director of Ames' Biocomputation Center in Mountain View, Calif., where much of the work has been conducted, makes it possible "to do patient-specific reconstructions that will allow surgeons to 'see' the affected bones and to work on them as though the surgical manipulations were real."

She says the group has made good progress after only five months, but they now need to work with computer manufacturers and developers of virtual environments to bring the technology to

NASA Ames Research Center

SURGICAL PROBE

workstation level.

Stephanides says the team hopes to have the final product ready for physician testing within a year. They are especially interested in working with children to correct deformities of the head and face, and with mastectomy patients needing breast reconstruction. But eventually the technology should have other uses.

Another collaboration between a Stanford-affiliated physician and NASA has centered on a robotic probe that could help improve the safety and accuracy of neurosurgery.

Russell J. Andrews, former clinical associate professor of neurosurgery, worked for two years with NASA Ames engineer Robert W. Mah to develop a miniaturized probe that could "learn" the brain's characteristics by using neural net software.

The probe, equipped with a tiny pressure sensor, will enter the brain, gently locating the edges of tumors while preventing damage to arteries. Its small size also should reduce damage, Mah says. Potentially, he says, the robots "will be able to 'feel' brain structures better than any human surgeon, making slow, very precise movements during an operation."

A modified form of the robot possibly could be used for other types of surgery that employ "smart" sensors, Mah says. ST

Donald Knuth Wins Kyoto Prize

AUTHOR OF "BIBLE AND ENCYCLOPEDIA FOR COMPUTER SCIENCE" by David F. Salisbury

DONALD E. KNUTH, ONE OF THE founding fathers of computer science, has been awarded the 1996 Kyoto Prize, Japan's equivalent of the Nobel Prize and the country's highest private award for lifetime achievement. ■ Knuth, professor emeritus of computer science, will receive approximately $460,000, along with a certificate and a gold medal, Kazuo Inamori, founder and president of the Inamori Foundation, announced in June.

"This is just a dream and I'll have to wake up to see who really won the prize," Knuth said. He added that he and his wife have decided to donate the money to charity

The Kyoto Prize is awarded each year in three categories: advanced technology, basic sciences and creative arts. Knuth won in advanced technology.

He is best known as a pioneering mathematician whose research has been of primary importance in the analysis of computer algorithms – procedures by which computations are carried out. He is also a leading investigator of programming languages, and his work has been instrumental in establishing the field as a scholarly discipline.

Among his most widely acclaimed works is the series *The Art of Computer Programming*. When he started writing it in 1962, he expected to finish by the time his first child was born. That son, John, is now a Stanford graduate, and Knuth has completed three volumes. Although his colleagues have characterized his work as "the bible and encyclopedia for computer science," Knuth says it is not finished. In fact, he took early retirement in 1993, when he was only 55, to devote full time to this task. He estimates that he will add about 250 pages per year, starting next year, for 15 to 20 years before he is finished.

Part of the reason the project has turned into a life's work is the rate at which the field of computer science is developing, he said. "In the 1960s I could be exhaustive. Now I have to be content with boiling down the most important developments into the clearest, most concise language possible."

Donald E. Knuth

But another reason is Knuth's passion for perfection. When he saw the galleys for the second volume of *Programming* from the printer, he was horrified at how ugly they looked. "My first edition had been typeset by hand and was very beautiful, but the second edition had been typeset by computers. Knowing a computer was the culprit made me even more upset," he said.

So Knuth applied his knowledge of mathematics and programming to the art of typeface design and typesetting. He developed a document preparation system called TEX and a font design system called METAFONT that first gave computers the ability to control text layouts typographically and print with typeset quality. These programs have been called the single most important achievement in publishing since the invention of the printing press. Rather than copyrighting and licensing the programs, Knuth put them in the public domain.

Since his retirement, Knuth has given seven to eight lectures annually under the title of "Computer Musings." He said he intends to continue this practice as a way to contribute to the department.

Knuth is the third computer scientist to win the Kyoto Prize since its inception in 1985. John McCarthy, professor of computer science at Stanford and the creator of the language used in artificial intelligence research, won in 1988. Maurice Wilkes of Cambridge University won in 1992.

Stanford Dean of Engineering John Hennessy said that the prize is "the closest thing we have to a Nobel Prize in computer science." ST

Top: NASA Ames Research Center Bottom: Linda Cicero

Treatment Tested for Diabetes

TEAM HOPES TO REDUCE DISEASE'S ILL EFFECTS

by Rosanne Spector

A POTENTIAL TREATMENT FOR juvenile-onset diabetes that could eliminate the need for insulin shots is under study at Stanford. ■ "If the treatment works, it will spare patients not only from the inconvenience of insulin injections but also – and maybe more important – the harmful effects of sharp ups and downs in their blood sugar levels," said Dr. Donald Dafoe, senior researcher on the project and director of Stanford's Multi-Organ Transplant Center.

The treatment, which stems from research on rats, including a study led by surgical resident Dr. Gregg A. Adams, is based on implanting fetal pancreas tissue into the patient's forearm. It would provide an internal, self-regulating insulin source, but patients would need lifelong treatment with immunosuppressive drugs to prevent them from rejecting the implanted tissue.

The researchers are testing the strategy first on diabetic kidney transplant patients who already take the immunosuppressants. Ultimately, all juvenile-onset diabetes patients may be eligible for the treatment, as long as fetal pancreas tissue is available.

Juvenile-onset diabetes results when damaged cells in the pancreas no longer can produce enough insulin to control the individual's blood sugar level. The disease, also called type 1 diabetes, affects about a million people in the United States. The standard medical treatment includes insulin injections (usually about three a day), regular exercise and a low-sugar diet. ST

Visual Art Services

Carcinoma Gene Found Researchers from Stanford and the University of California, San Francisco (UCSF) have found a gene that, when defective, causes the most common form of human cancer – a skin cancer called basal cell carcinoma. This type of cancer usually affects pale-skinned people of Northern European ancestry and strikes during middle age or later. But unlike many other cancers, these tumors do not spread throughout the body. The finding provides a promising new direction for researchers pursuing treatments, said Ronald Johnson, a postdoctoral fellow in developmental biology at Stanford. Clinicians currently treat basal cell carcinomas with surgery or radiation. Using the new information, scientists may be able to develop drugs that could be applied directly to the skin for treatment, said Dr. Ervin Epstein Jr., a UCSF professor of dermatology. The team's finding was published in the June 14 issue of *Science.*

CANCER RESEARCHERS

Eco-Friendly Chips It takes roughly 10 gallons of water to make a single computer chip. That may not sound like much, but multiply it by the millions of chips made each year, and the result is a large and growing demand for water. Chip making also requires large amounts of energy and many toxic chemicals. Now, a group of Stanford researchers has harnessed one of the industry's own products – computer-aided design tools – to find ways to reduce the environmental impacts of chip manufacturing while cutting operating costs and improving industry competitiveness. The group – headed by C. Robert Helms, a research professor of electrical engineering – has joined researchers at the University of Arizona and the Massachusetts Institute of Technology to form a "virtual center" – the Center for Environmentally Benign Semiconductor Manufacturing – that will boost the level of basic research in this area. "We hope to train a new breed of engineer, one who knows how to design in environmental factors from the beginning," Helms said. "You start with raw materials – water, energy, chemical sources. We want to ensure that we do as good a job as possible to minimize the use of these materials and, if we do use them, to recycle them."

Science & Medicine News

Controlling Tuberculosis A new mathematical model challenges conventional wisdom about the control of tuberculosis. The model indicates that a poorly managed TB control program may do more harm than no TB control program at all, and that worldwide elimination of TB might actually require more efficient programs in underdeveloped countries than in developed countries. Though traditional epidemiologists might question such conclusions, said Dr. Peter M. Small, acting assistant professor of medicine, the fact is that current programs have not been successful in eradicating TB, even though it has been treatable and preventable for 50 years. "In the next decade, even the most optimistic scenario suggests there will be 80 million cases resulting in 30 million deaths. What this paper allows us to ask is, 'What level of tuberculosis control would be necessary to allow us to significantly reduce that number or to eradicate tuberculosis completely?'" Small and colleagues at the University of California, San Francisco, used the model to compare the effects of various levels of TB control programs. Their findings are reported in the July 26 issue of *Science.*

New Parasite Discovered By analyzing DNA from a strange mass of tissue found in a man's abdomen, researchers have discovered a previously unknown parasite that can infect and kill humans. The organism has been detected in only one person, an AIDS patient who died at age 44 from the parasitic infection. After his death, researchers found that the parasite had formed two large masses composed of many sacs of unusual cells surrounded by fibrous tissue. The researchers have yet to name the parasite or determine its three-dimensional structure, though they can recognize its cells under a microscope. They say it may be in the same class as tapeworms, although it seems far more aggressive. The parasite's mode of transmission and natural host remain unclear, said pathology Professor Luis Fajardo. Discoveries of human parasites are quite rare. ST

LUIS FAJARDO