

CORNELL Chronicle

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PLOTTING THE PATH

With the new *Cornell Plantations Path Guide*, touring the Cornell campus could become an education in itself.

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HIGH-TECH TEACHING

Cornell's faculty is ready to embrace new instructional technology but wants input in the process.

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Superfund program balances training and research

By Roger Segelken

Reversing learning disorders from lead exposure, controlling toxic wastes with soil microorganisms and accurately assessing risks of hazardous wastes all are among the objectives for environmental scientists and students at Cornell, where a Superfund Basic Research and Education Program grant has been renewed for a five-year period.

The research and training grant from the National Institute of Environmental Health Sciences (NIEHS), totaling \$5.2 million for the next five years, comes at a time when the United States is preparing to spend \$400 to

\$700 billion for hazardous waste site remediation over the next 20 years, according to James W. Gillett, Cornell professor of ecotoxicology and director of the Superfund research-education program.

"We're beginning to answer some of the fundamental questions while we're training the professionals for the most costly and most important cleanup project ever attempted," Gillett said.

The NIEHS program is based on the Superfund Amendments and Reauthorization Act, which uses about 4 percent of the tax on petroleum and other chemical feedstocks to fund basic research in hazardous

waste assessment and remediation.

Of the 17 Superfund programs nationwide, Cornell's is unique in its emphasis on professional training while balancing studies of health and environmental effects. Between eight and 12 graduate students and postdoctoral researchers will be in training at any one time at the Cornell program. Past graduating participants in the pilot program at Cornell since 1991 now are employed by federal agencies, national research laboratories, universities and private consulting firms.

At Cornell, the Superfund research-training program is one of the major activities for the Institute for Comparative and Environ-

mental Toxicology, headed by Rodney Dietert, who also serves as director of Superfund training activities. The program draws on the resources of the colleges of Agriculture and Life Sciences, Veterinary Medicine and Engineering, as well as the Biotechnology Program. Scientific collaborators in the Cornell program are based at St. Lawrence University, University of Maryland at Baltimore, University of Wisconsin, the State University of New York at Albany and New York University. Nationally, 146 institutions take part in Superfund programs.

"Our program is focused on bioavail-

Continued on page 4



Ardyth Gillespie, professor of nutritional sciences at Cornell and principal investigator of the Rochester Community Plant Food Project, at Greenstar Cooperative Market in Ithaca.

Study seeks to boost fruit, veggie consumption

By Susan Lang

Although Americans have been encouraged for years to eat five servings a day of fruits and vegetables, most don't.

To find out what can be done on a community level to boost plant food consumption, a group of Cornell nutritionists is teaming up with Cornell Cooperative Extension of Monroe County, and other community organizations in Rochester, in a unique effort to study individual, family and community processes involved in family food decision-making. An advisory committee pulled from the local community will guide project staff on the research component and provide leadership for developing the action component.

"Many communities have tried various approaches to increase fruit and vegetable consumption but haven't been very successful," said Ardyth Gillespie, professor of nutritional sciences at Cornell

and principal investigator of the Rochester Community Plant Food Project. "We think that's because such efforts have not

'Food decisions are also the result of a complex set of interactions and patterns through which values are expressed and negotiated and individual preferences are considered and accommodated.'

— Ardyth Gillespie

been adequately tailored to communities. To do so, you need to first identify individual and family perceptions about

and interest in plant foods as well as community level constraints."

Gillespie and a team of faculty from the Community Nutrition Program at Cornell are examining the food system in the Genesee Valley and how people interact with it. The team includes nutritionists, sociologists and statisticians.

Currently, the researchers are interviewing consumers from a range of socioeconomic and ethnic backgrounds, with special attention given to low- to middle-income consumers. They are seeking to identify the influence women's social roles have on interpreting and transmitting knowledge, attitudes and beliefs about plant foods and health, and how cultural backgrounds influence food choice. To understand the family food decision-making processes surrounding plant food choice, parents with elementary-age schoolchildren will be interviewed.

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Inauguration set for Oct. 12

The inauguration of Hunter Rawlings as Cornell University's 10th president will take place Thursday, Oct. 12.

The inaugural event will coincide with Trustee-Council Weekend and will be preceded by a symposium on the evening of Wednesday, Oct. 11, according to Henrik N. Dullea, Cornell vice president for university relations and chair of the Inaugural Planning Committee.

Rawlings is a classics scholar who has served as president of the University of Iowa since 1988. He was appointed Cornell's president by the board of trustees at a special meeting Dec. 10 and assumes the position July 1.

On his appointment Rawlings said, "Cornell is one of a handful of universities with worldwide impact and influence. It offers a singular combination of the highest academic quality and full commitment to public service. As such, Cornell University

Continued on page 2



Rawlings

A thank you

To the Campus Community:

Two weeks ago, during Reunion Weekend, Cornell was literally on the world stage. The visit of President Lee Teng-hui as the Olin Lecturer not only brought to campus hundreds of his journalist countrymen from Taiwan and across East Asia and the Pacific Rim, but also focused the attention of our own nation on Cornell.

To all of you who helped to make that visit the resounding success that it was, I want to express my deep appreciation. Accommodating on three weeks' notice the arrival of more than 500 additional guests to an already action-packed Reunion was no easy feat, but your spirit of good will, resourcefulness and, not infrequently, humor demonstrated once again what a talented and dedicated team we have at this university.

It has been my great good fortune to serve as one of your colleagues, and I was never more proud of your many talents than during this Reunion.

Sincerely yours,

Frank H.T. Rhodes

ESG tickets are on sale locally

Nearly 20 area non-profit organizations and agencies have begun selling Master Passes for the 1995 Empire State Games, to be held in Ithaca Aug. 2-6. At \$13 for adults and \$6 for children ages 7-12, the Master Pass is the best admission ticket for viewing competition in all 28 sports as well as the opening ceremony at Cornell's Schoellkopf Field.

"This approach to advance ticket sales is really a win-win situation for everyone," says ticket sales co-chair Jill Ciccone. "The sports fan gets a bargain by buying a Master Pass good for every event on every day of the Empire State Games, while the participating non-profits raise money by keeping a portion of the revenue from each ticket they sell."

Master Passes are being sold by these organizations: Alcoholism Council of Tompkins County; Ithaca-Cayuga Rotary Club; Cayuga Chamber Orchestra; Ithaca Sunrise Rotary; Community School of Music and Art; Ithaca Youth Bureau; Covenant Love Community School; Kiwanis Club of Ithaca; Hobasco Lodge #716; Youth Mission; Homes Inc.; Firehouse Theatre; Ithaca Elks Lodge #636; Trumansburg All-Sport Booster Club; Ithaca High School-Rotary Interact Club; Trumansburg Boy Scout Troop #13; Ithaca Rotary Club; YMCA of Ithaca and Tompkins County.

After July 23 Master Passes will be available through local ticket outlets. Once the Empire State Games begin, both Master Passes and Daily Passes will be available. The Daily Passes will cost \$6 for adults and \$3 for children ages 7-12. Children 6 years of age and younger will be admitted free to all events.

Contact Jill Ciccone at 257-8500 or Melissa Seigel at 272-6286.

Volunteer for Games

Get an "up close and personal" look at the Games by volunteering to help out Aug. 2-6.

"The Empire State Games has been blessed from the beginning with the assistance of dedicated volunteers who contribute their time and talents," said Bob Witty, who is coordinating volunteer services on behalf of the Ithaca Organizing Committee. "There are many ways to serve, and volunteer involvement has been key to the competition's success ever since the Games began 18 years ago."

Volunteer needs include staffing for parking, concessions, information distribution, data entry and for venues for 28 sports ranging from archery to wrestling.

Anyone over 13 may volunteer. Volunteers will receive an Empire State Games hat and T-shirt. Call Jeff Gargiulo or Kim Kohut at Cornell Federal Credit Union, 257-8500.

Cornell in times past



Argus was a popular camera when Earl Talmadge managed the Campus Store's Photographic Department in the 1950s. Now film strip projectors and reel-to-reel tape recorders like those displayed in the foreground are as hard to find as the 16-mm movie projector at left.

Division of Rare and Manuscript Collections/Carl A. Kroch Library

Special VIP seats are available at July 3 fireworks

Expanded VIP seating is available at this year's Community Fireworks Show. The 48th annual fireworks display will be shot from Ithaca College's South Hill campus at about 9:30 p.m. Monday, July 3.

Donors of \$125 or more get VIP treatment that includes tickets to the Ithaca Lakers-Schenectady Mohawks baseball game, reserved parking, pre-fireworks entertainment, a barbecue buffet and special seating for the aerial fireworks display — all for a party of four. In addition, VIPs are eligible for door prizes, according to Fran Benedict, chairman of the volunteer fireworks committee.

"Get a group together, enjoy the party atmosphere and help keep this Ithaca fireworks tradition alive," Benedict added.

Benedict said donations in any amount are welcome and that \$25,000 must be raised for the 1995 show. "Donations make the show possible. They're our only source of funding for this annual event," he said.

"To help keep this event alive and growing, we added the VIP section three years ago," he explained.

In addition to VIP seating, Ithaca College opens up its parking lots for spectators. However, the vast majority of spectators on South Hill and elsewhere in the community are not making donations to sustain this community Independence Day celebration, according to Benedict.

"We know that several thousand people watch the fireworks show from the hill-

sides, their backyards and local parks. Just \$1 from each person would guarantee a fireworks show this year and next. Without donations, the fireworks show could fizzle," Benedict said.

Pre-fireworks entertainment in the VIP area will include singer Alice Detrick and DJ Bobby Comstock. Special ground displays by American Fireworks Co. of Utica/Ithaca will be visible from the VIP area only.

Individual, group and business donations can be sent to Benedict at the Ithaca Commons office of the Tompkins County Trust Co. VIP donations should be submitted by June 26 to allow time for sending parking passes and other materials to the donors.

The rain date is July 5.

Cornell Chronicle

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Cornell University is committed to assisting those persons with disabilities who have special needs. A brochure describing services for persons with disabilities may be obtained by writing to the Office of Equal Opportunity, Cornell University, 234 Day Hall, Ithaca, N.Y. 14853-2801. Other questions or requests for special assistance may also be directed to that office.

BRIEFS

■ **English classes:** Registration for free English classes sponsored by the Cornell Campus Club is Thursday, June 22, from 7:30 to 9 p.m. in the One World Room, Anabel Taylor Hall. There is a \$5 registration fee. Classes begin June 26. For more information, call Ann Marie Dullea at 277-2488 or Joan McMinn at 277-0013.

■ **English teachers:** Interested in helping people from foreign countries associated with the Cornell community? A Cornell Campus Club program teaches English as a second language to persons temporarily in Ithaca. The commitment is for one two-hour class per week. Summer Session runs from June 26-Aug. 4. Contact Ann Marie Dullea at 277-2488 or Joan McMinn at 277-0013.

■ **ESG sponsors:** The Ithaca Organizing Committee is seeking sponsors to provide cash or in-kind contributions for the Empire State Games Aug. 2-6. Sponsorship levels are: platinum, \$5,000; gold, \$3,000; silver, \$2,000; bronze, \$1,000; patron, \$750. Depending on their level of support, contributors can receive a variety of benefits. Call Ezra Cornell at 273-1190.

NOTABLES

■ **Alfred E. Kahn**, the Robert Julius Thorne Professor of Political Economy Emeritus and special consultant, National Economic Research Associates Inc., was awarded the Wilbur Lucius Cross Medal at the Yale University commencement ceremonies May 22. The medal was established in 1966 and is the highest honor awarded to alumni of the Yale Graduate School for outstanding achievements in their careers.

■ **Karl Pillemer, Christiann Dean and Bonnie Albright** of the Cornell Applied Gerontology Research Institute in the College of Human Ecology have won the Brookdale National Best Practice Award from the National Institute on Human Resources and Aging for their project "Partners in Caregiving." The project trains nursing home staff and family members of residents in communication skills to increase cooperation and reduce conflict between family members and staff, helping them to work together more effectively to help the nursing home resident. Partners in Caregiving was cited as a "benchmark for others seeking to promote excellence in long-term care service delivery."

Inauguration *continued from page 1*

represents an extraordinary opportunity for leadership, and I am honored to be asked to assume its presidency."

Rawlings, who was born in Norfolk, Va., received his Ph.D. from Princeton University in 1970 and is a 1966 graduate of Haverford College, with honors in classics.

Before going to the University of Iowa in 1988 as president and professor of classics, Rawlings served for four years as vice president for academic affairs and research and dean of the system graduate school of the University of Colorado, Boulder.

He joined UC-Boulder in 1975 as assistant professor of classics. He became department chair in 1978 and was named full professor in 1980. He served as associate vice chancellor for instruction from 1980 to 1984.

Rawlings' scholarly publications include a book, *The Structure of Thucydides' History* (Princeton University Press, 1981). He also is the author of scholarly monographs and articles and has served as editor of *The Classical Journal*.

At Princeton, Rawlings was a Woodrow Wilson Fellow and National Defense Education Act Fellow.

Further details on the inauguration will be announced in the weeks ahead.

Close-up exam of myopia makes case for early intervention

By Roger Segelken

The "visual experience" of close work – the reading, writing and arithmetic that young eyes never evolved to do – finally is being seen as one cause for the worldwide increase in myopia.

Now that vision researchers know more about eye-to-brain feedback in the formative years and can add "environment" to "genetics" as causes of nearsightedness, there is hope for early intervention to prevent myopia in adulthood, said Cornell vision researcher Howard C. Howland. The professor of neurobiology believes that although pharmacological

Our current understanding of myopia, Howland said, owes a lot to animal models, especially the common barnyard chicken. Development of a chick's eyes in the first days after hatching parallels a human infant's in the first months and years, he noted, so chicks have been wearing lenses for science.

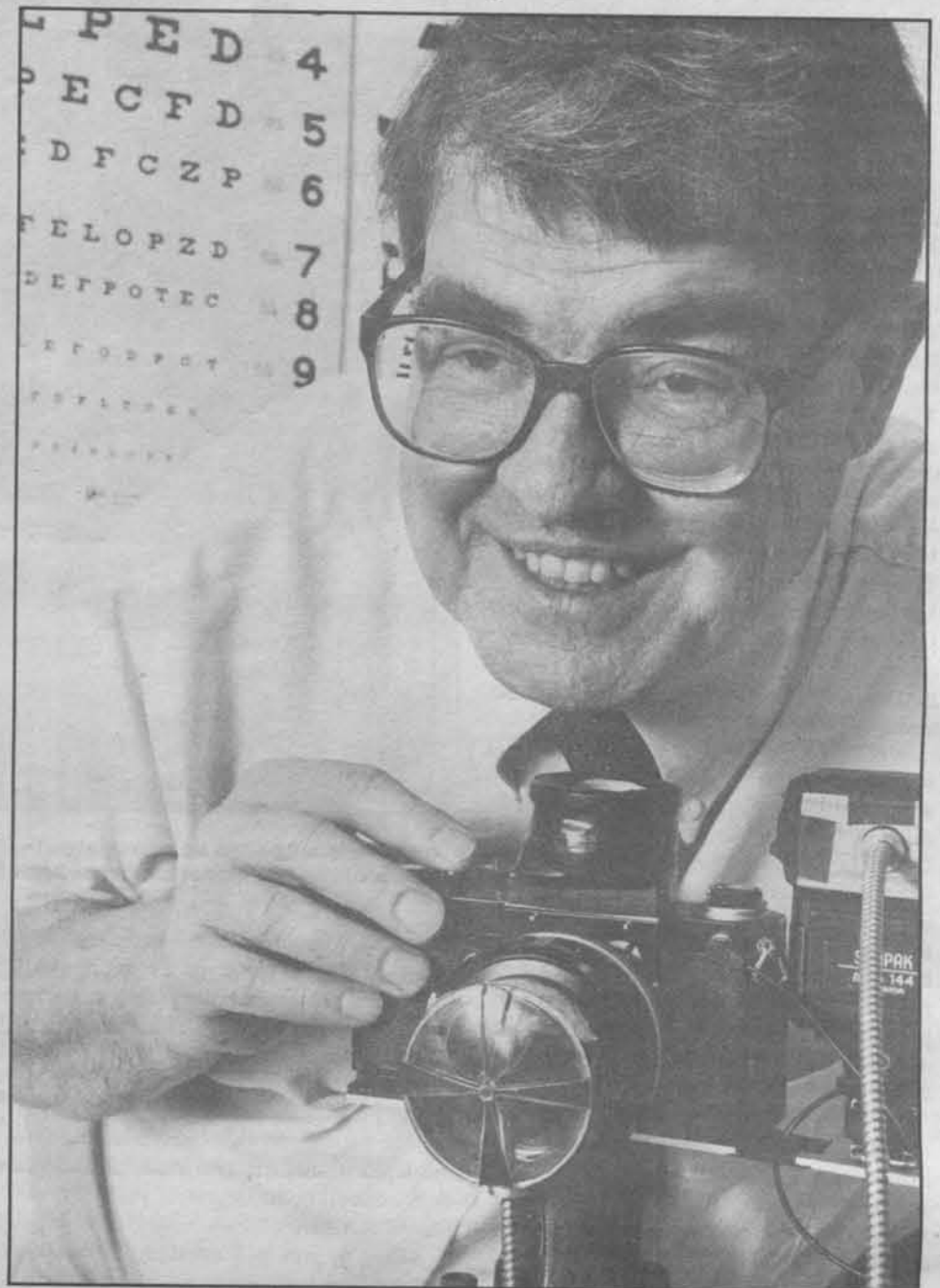
Researchers were looking for the so-called feedback loops between eyes and the brain as young, developing eyes try to focus on the tasks at hand – and often grow to become too long for distant vision. Information on when feedback loops reach through the brain, as well as when eyes grow on their own, may lead to early intervention for children who are genetically predetermined to be myopic, Howland said.

Pharmacological intervention, with neurotransmitter blockers to suppress the onset of myopia, is one intriguing possibility for humans, he noted. Somewhat less controversial would be prescribing lenses to simulate distance-viewing when school-age eyes are actually looking at close objects.

Howland explained that infant eyes at first are supposed to be good at close work (finding a mother mammal's breast, for example, or spotting bird feed an inch away). But most animals' vision evolved for distance tasks in adulthood. Chickens need to see the hawk circling overhead, but many people can't because close work changed the shape of their eyes, making them myopic during the critical growing years.

Ten years ago, most researchers believed that myopia was only genetically controlled, Howland said. Now, the effect of environmental and feedback loops on growth of the eye is known: When eyes are not focused in the distance, they grow the wrong way.

The spectacle-wearing researcher notes "a compliance problem" because glasses on youngsters are about as popular as braces on their teeth. "It's going to be glasses sooner or later," he said, "because we're always fighting that feedback loop."



Adriana Rovers/University Photography
Cornell vision researcher Howard Howland, professor of neurobiology, aims the orthogonal photorefractor, a camera-based device he invented to measure the magnitude of defocus in children's eyes in tests for astigmatism, myopia or hyperopia.

'If our children want the visual acuity of fighter pilots in their 20s, they may have to wear glasses during their school years.'

— Howard Howland

treatment of myopia may one day be a viable alternative, lenses still are the more likely choice.

"If our children want the visual acuity of fighter pilots in their 20s, they may have to wear glasses during their school years," Howland said. He is co-editor, with Frank Schaeffel of University Eye Hospital in Tübingen, Germany, of a special myopia issue of *Vision Research* (April 1995, Vol. 35, No.9).

Schaeffel was a postdoctoral researcher in Howland's Infant Vision Laboratory in the late 1980s, when many of the key experiments were done, trying to learn the causes of a myopia epidemic that coincides with increases in literacy.

Nearsightedness now affects from 20 percent of some populations to 80 percent of others in the United States and Europe, and up to 90 percent in Far East countries.

Scholarship support soars for Cornell's Summer College

By Darryl Geddes

Scholarship support for Cornell's Summer College, a residential precollege program for high school juniors and seniors, has swelled to an all-time high.

Program administrators say that more than \$250,000 has been contributed this year to the program by corporations, social agencies and philanthropic foundations. That figure is up dramatically from 1990, when scholarship support totaled only \$16,250.

The scholarships will enable about 50 students – many from traditionally underrepresented populations – to attend this year's Summer College, which opens June 24.

Support from private and public sources helps defer the \$4,650 tuition for disadvantaged students, many from such ethnic groups as Latino, African American, American Indian, Mexican and Puerto Rican. Students from these groups made up 18 percent of the Summer College enrollment last year. The six-week program, which will be attended by nearly 600 students, provides students with a preview of college life and the opportunity to earn college credit, which can be applied toward an undergraduate degree at Cornell or another school.

Summer College Director Abby Eller said the increased support from foundations and corporations, like General Mills and the Municipal Bond Investors Assurance Corp., signifies the growing interest corporations and others have in making college an experience for all.

"Corporations and other donors recognize the critical need to partner with higher education to prepare underrepresented and economically disadvantaged students for our competitive era," she said. "They understand that the 'bridge' experience Summer College provides is useful to all students but often so

critical for disadvantaged young people."

Program administrators suggest that there are other motives for such abundant corporate giving. "I think corporations view these contributions as an investment in the future of America's workforce," Eller noted. "With their support, corporations can ensure that tomorrow's graduates – their future employees – will be well-trained and well-educated."

Summer College scholarships have created a unique relationship between businesses, high schools and Cornell. For example, the scholarship funded by General Mills is awarded to a student from a high

among Summer College, various philanthropic organizations and social agencies. One of the most successful is with Boys Harbor Inc. in New York City. The agency sends 28 students from New York City high schools on full scholarships to attend Summer College each year. Sixty Boys Harbor students have attended the program since 1992. Last year students from A. Philip Randolph, Martin Luther King and Park East high schools in Harlem were sent by Boys Harbor to the Cornell program.

Other partnerships exist with:

- Boystown in Boystown, Neb. Nineteen

Bay area high school students.

• Three New York high schools – Canajoharie, Fort Plain and Lafayette High School in Buffalo. The schools provide full or partial support for their students to attend Summer College. Since 1990 Lafayette High School has awarded a dozen students full scholarships to attend Summer College.

Individuals, too, are well-represented among Summer College benefactors. "People are extremely generous when it comes to giving for educational purposes," said Jon Kopita, an educational consultant in New York City and 1987 Cornell graduate.

This year Kopita has secured scholarship support from individuals to enable two students from the Bronx and one from Manhattan to attend Summer College. Anonymous foundations in New York and Washington, D.C., also offer scholarships.

"What we are seeing is a groundswell of support in communities across the country to ensure that the college experience is one that does not elude some of our brightest students," Eller said.

The recipient of this year's General Mills scholarship, Hieu Ngo, a native of Vietnam who attends Warroad High School, said the scholarship is making his Summer College stay a reality. "I'm very fortunate to have the support of General Mills," he said. "I'm not sure I'd be attending Cornell without the scholarship."

For James Robinson, a junior at Rice High School in Harlem, who received a scholarship from an anonymous donor in New York City, the support is his ticket out of the Big Apple. "I wouldn't be able to come to Cornell without the financial support," he said. "I'm really looking forward to getting away from the city this summer and studying at Cornell."

'I think corporations view these contributions as an investment in the future of America's workforce. With their support, corporations can ensure that tomorrow's graduates – their future employees – will be well-trained and well-educated.'

— Abby Eller

school in Minneapolis or surrounding suburbs – the home of General Mills – who plans to study food science and nutrition.

"This relationship is a way for corporations and others to make an investment in their own community," Eller said. "It's an attractive arrangement that provides benefits for all parties: It enables Cornell to strengthen ties with high schools and industry and offers corporations a way to give back to the community by supporting its youth."

Municipal Bond Investors Assurance Corp. in Armonk, N.Y., provides two scholarships for Westchester County high school students, and Nestle Research & Development in New Milford, Conn., sponsors a student from New Milford schools.

Similar scholarship partnerships exist

Boystown students have attended Summer College since 1985.

• Providence St. Mel's Summer Opportunities of a Lifetime in Chicago. The program provides support for one St. Mel High School student to attend Summer College.

• Teach for America in Houston. A Teach for America member coordinates Summer College's partnership with Jefferson Davis High School. Seventeen students from Jefferson Davis High School have attended Summer College since 1993 on scholarships funded by Tenneco, Aetna, the *Houston Chronicle* and Continental Airlines, among others.

• Summer Search Foundation in Mill Valley, Calif. The foundation funds joint scholarships with Cornell for San Francisco

Superfund *continued from page 1*

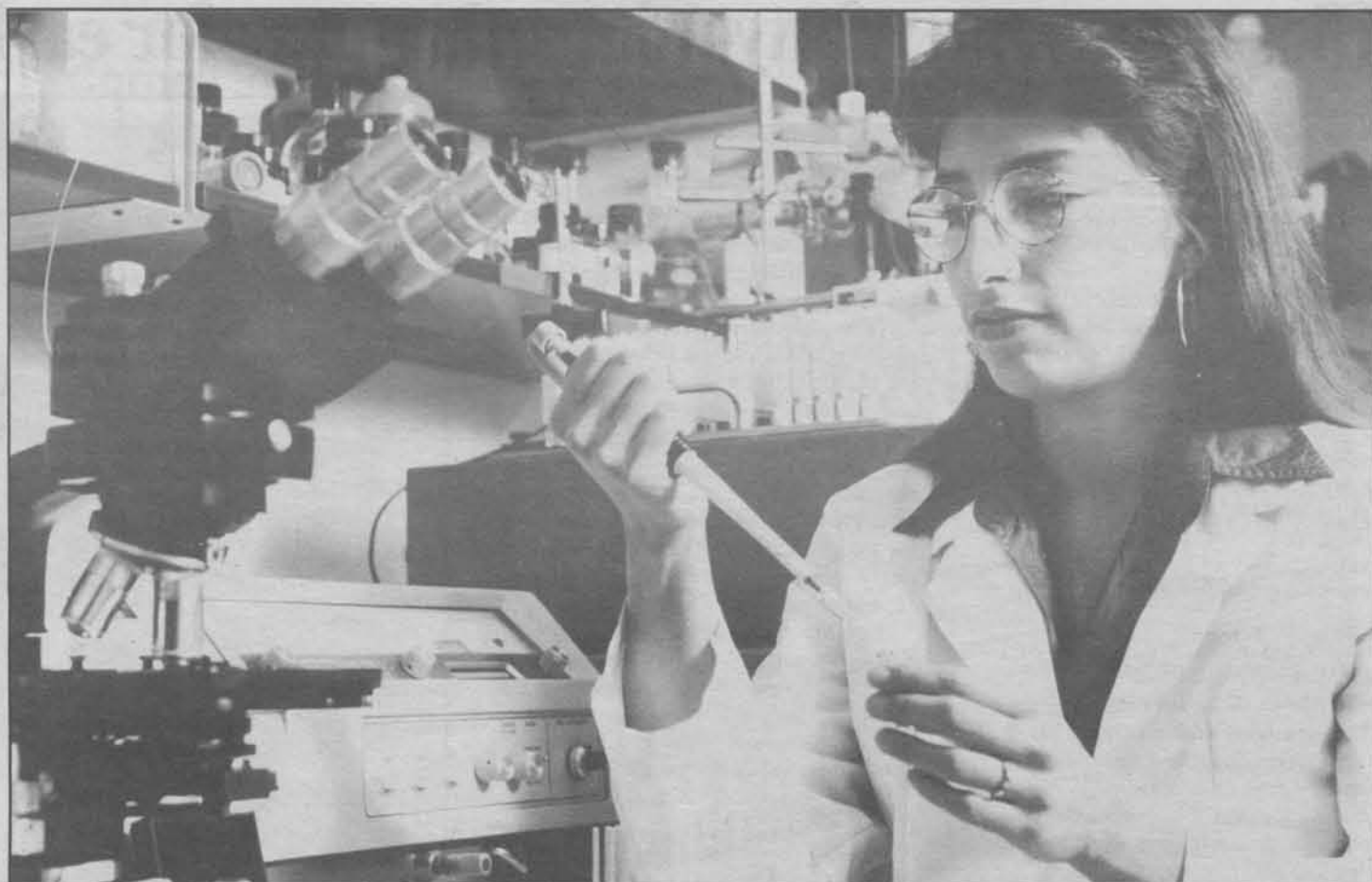
ability and impact of hazardous substances in human health and ecological risk," Gillett explained, pointing to three projects in the basic biomedical category and three in the environment:

- Coordinated efforts in biomedical sciences (the areas of immunology, neurology and developmental toxicology) will continue the study of dogs as surrogates for people living near Superfund sites, especially the Mohawk Indians at Akwasasne. Exposure of laboratory dogs to PCBs already has demonstrated similar adverse health effects to those seen in dogs — and in some people — at Akwasasne, the upstate New York reservation also known as St. Regis, which is adjacent to a major PCB dump site. These studies are conducted by Fred Quimby and James Marsh of Cornell's Veterinary Microbiology, Immunology and Parasitology Department; Thomas J. Reimers, Veterinary Diagnostic Laboratory; and Mary H. Fadden, a veterinarian in the Department of Environmental Biology at St. Lawrence University who began the dog study as a Ph.D. student in ecotoxicology at Cornell.

- A pioneering project with rats as animal models is developing methods to measure the effects of lead on attention deficit disorders in children. Barbara Strupp and David Levitsky of the Division of Nutritional Sciences have used sophisticated testing to demonstrate how exposure to lead in the diet decreases learning and adaptation by interrupting critical processes, and will next examine the effects of a possible therapeutic agent for lead poisoning, dimercaptosuccinic acid (DMSA) as part of a national effort adjunct to the Superfund program.

- Effects of lead and of DMSA on the developing immune system will be examined in rats and chickens by Rodney Dietert and Karen Golemboski, Department of Avian and Aquatic Animal Medicine, in collaboration with Strupp and Levitsky and with Judy Zelikoff of New York University.

Environmental projects in the Superfund program at Cornell focus on the soil-chemical-microbe interaction, Gillett said, noting that the bioavailability of chemicals for uptake by plants and animals — and for degra-



University Photography

Studying family dogs as surrogates for humans who live near toxic sites, Cornell graduate Mary H. Fadden, D.V.M., Ph.D., will continue her Superfund research from St. Lawrence University.

dation by microorganisms — in the environment is a key issue in assessment of Superfund sites, especially as the chemicals "age" in soil or sediments. The environmental projects are:

- Martin Alexander, the Liberty Hyde Bailey Professor of Soil Science, will examine the hypothesis that bioavailability and biodegradability are two sides of a single coin, reflecting the degree of problems expected at a site.

- One project will continue to develop better visualization of soil-chemical-microbe interactions for input to mathematical models. It uses fluorescent antibody microscopy of organisms, microradiography of radiolabeled pollutants and scanning tunneling electron microscopy of soils

to literally illuminate the activity as microorganisms come in contact with soil particles and pollutants. The visualization study is a collaboration by William Ghiorse, professor and chair of the Section of Microbiology; Eugene Madsen, Microbiology; Leonard Lion, School of Civil and Environmental Engineering; and Michael Shuler, School of Chemical Engineering.

- A third environmental project, directed by Lion in collaboration with Ghiorse and Shuler, will continue to examine the role that compounds released by microorganisms play in mobilizing heavy metals and organics for biodegradation and leaching into ground water. Laboratory tests and model simulations have established that these detergent-like materials affect how

soil pollutants move and are degraded. The materials could either improve remediation or increase risk of ground water pollution, and researchers in the Superfund program hope to determine which effect will occur.

Administration of the Superfund grant by Gillett in the Department of Natural Resources includes oversight and outreach for the program. Laboratory support services are coordinated by Richard Holsten, director of research in the Biotechnology Program's Center for Advanced Technology. Dietert uses site visits, guest lecturers and expositions by students of their research, as well as the Superfund training course, "Hazardous Waste Toxicology," to involve students from toxicology, engineering, statistics and other fields.

CU videoconferencing software is licensed

By William Steele

SAN FRANCISCO — CU-SeeMe™, a low-cost videoconferencing program for desktop computers developed at Cornell, soon may be available in a commercial version. Cornell officials in May announced an agreement to license the software to White Pine Software of Nashua, N.H.

White Pine plans to offer an enhanced version of the program as a commercial product and also will act as licensing agent for other commercial developers.

"White Pine is extremely pleased and challenged by the opportunity to have been selected by the Cornell Research Foundation as its exclusive master licensee of their CU-SeeMe technology," said Howard Berke, president and CEO of White Pine Software. "We are proud to be a commercial partner and look forward to populating meeting halls, conference rooms, office desktops and at-home countertops around the globe with this exciting 21st-century communications tool."

CU-SeeMe allows users of desktop computers to send and receive video and sound over local area networks and the Internet, the worldwide computer network. Groups of people in widely separated locations can use it to "meet" by sitting in front of their computers, seeing pictures of other members of the group side-by-side on their screens and talking to one another using microphones and speakers attached to their computers. Before CU-SeeMe was released in 1993 such videoconferencing required either a satellite link or very expensive computer hardware at every location.

CU-SeeMe already is in wide use, mainly among university faculty and students and computer professionals. Cornell will continue to develop and provide the "freeware" version, according to Dick Cogger, assistant director for advanced technology and planning in the networking division of Cornell Information Technologies. A consortium of universities, commercial and non-profit companies and government agencies has been formed to support this development, Cogger said.

Founding members of the CU-SeeMe Consortium, in addition to Cornell, are Cornell Medical College, NYSERNet, Cisco Systems Inc., BellSouth Wireless, the University of North Carolina, NASA, the National Science Foundation (NSF) and White Pine Software. The consor-

tium is open to other academic, government and commercial members who wish to participate in further improvement of CU-SeeMe.

"The source code for CU-SeeMe will be available free but only for non-commercial use," Cogger said, "but White Pine will be sublicensing the technology to commercial developers who want to include it in other products or build enhanced versions."

To reduce demand on the network, CU-SeeMe's pictures — in the current version — are in black and white and are updated about a dozen times a second, rather than at 30 frames per second as in conventional video. They appear in up to eight small windows on the computer screen.

"The video quality might be poor by some standards, but poor-quality video from someone 3,000 miles away that you can get with a couple of mouse clicks can be very useful," Cogger said. Cogger had the initial idea for CU-SeeMe and has directed the project since its inception; the first version of the program was written by Cornell programmer Tim Dorsey with important contributions from Scott Brim, John Lynn and Cornell Medical College. Significant funding has been and continues to be provided by the NSF.

"The CU-SeeMe software is to videoconferencing what Mosaic was to information retrieval on the Internet," said Martine M. Hallgren, executive director of the CU-SeeMe Consortium. Hallgren was referring to software used to access the World Wide Web, a system of distributing text and pictures over the Internet. Mosaic also began as free software and subsequently was licensed for commercial development.

In addition to videoconferencing for business and academic groups, CU-SeeMe has been used to allow consultation between medical specialists, to transmit course material for "distance learning" and to connect grade school and high school students all over the world in a NSF project known as Global Schoolhouse.

CU-SeeMe is available in versions for Macintosh computers and IBM compatibles running Microsoft Windows. Anyone can receive CU-SeeMe pictures and sound; a video camera and in some cases additional hardware are needed to send.

CU-SeeMe may be obtained by anonymous FTP from <cu-seeme.cornell.edu> in the directory pub/cu-seeme, or via the World Wide Web at <<http://cu-seeme.cornell.edu>>.

Veggies *continued from page 1*

On the community level, the researchers are analyzing the movement of plant foods into and through the city of Rochester and how food producers, distributors and retailers perceive their roles in increasing the availability and use of plant foods. "Individuals make food decisions within a cascade of the larger contexts of family and community food systems," Gillespie said. "Food decisions are also the result of a complex set of interactions and patterns through which values are expressed and negotiated and individual preferences are considered and accommodated. Other factors that influence food decisions include time, money, skills, social and domestic responsibilities and relationships; personal preferences, needs, beliefs and knowledge about food and nutrition as well as ethnic/cultural influences."

Beginning in October, the researchers will conduct a survey of a representative sample of 1,000 individuals to determine how individuals, families and the community interact in the food system.

"This comprehensive look at plant foods from individual, family and community perspectives and how these factors interact gives us a unique opportunity to assess barriers and identify what might boost the consumption of fruits and vegetables in the Rochester area. At the same time, it will provide a method to assess communitywide factors for developing community action. Our goal is to develop a process that will be useful to other communities in developing a response to fit their unique situation," Gillespie concluded.

"From a practical perspective, this applied research project can improve the effectiveness of community nutrition education efforts such as the Expanded Food and Nutrition Program," said Bo Yerxa, director of Cornell Cooperative Extension in Monroe County. "The knowledge gained should also assist local farmers in identifying new and expanding market opportunities that will improve their profitability."

The study is funded by the U.S. Department of Agriculture.

Study finds help for overstressed urban bus drivers

By Susan Lang

Urban bus drivers endure so much job stress that they suffer from more health risks and medical disabilities than peers in other comparable jobs, many studies find. A new Cornell study, however, shows that their on-the-job stress can be significantly reduced—and their health and welfare improved—with traffic interventions and better passenger information.

"City bus drivers die at a younger age from coronary heart disease, typically retire earlier with physical disability and stress-related illnesses and are absent from work at much higher rates because of stomach, musculoskeletal and nervous disorders than other workers in similar occupational groups," says Gary W. Evans, an environmental psychologist and professor of design and environmental analysis at Cornell.

He points to the toxic combination of high pressure workload demands that include physical and psychosocial stressors, a low sense of control over factors affecting the job and a high degree of social isolation on the job for producing a powerful multiplicative and negative effect on health.

In the journal, *Accident Analysis and Prevention* (Vol. 26, 1994), Evans published the first critical overview of findings on urban bus drivers' health status. He found that physical stressors included traffic congestion, long periods of sitting and twisting around, heat, crowding and noise. The psychosocial stressors included relentless time pressures to be punctual, which were frustrated by the need to drive safely and provide accurate and courteous information to passengers. In addition, bus drivers felt stressed by the risk of physical assault and problems of unruly passengers.

Having identified the major stressors that take a serious toll on drivers' health, Evans, in collaboration with researchers Gunn Johansson and Leif Rydstedt at Stockholm University, designed one of the only intervention studies with bus drivers to determine whether driver stress could be reduced and their health improved.

The researchers used a multifaceted approach, including questionnaires, objective observations, interviews and psychosocial protocols of 47 drivers to assess health be-



Professor Gary W. Evans recently published findings indicating that urban bus drivers' on-the-job stress can be significantly reduced and their health and welfare improved. Charles Harrington/University Photography

fore and after the intervention. The intervention reduced traffic congestion, driving impediments and time pressures by regulating that private vehicles give way to buses, broadening roads in problem areas, changing routes to prevent sharp turns and "bottle-necks," extending separate bus lanes, reducing the number of bus stops, automating some traffic lights and improving routes. The researchers reduced passenger questions by implementing an automated passenger information system.

Drivers who participated in the project reported reduced stress on the job and lighter workloads. The researchers found these drivers used significantly fewer drugs to cope

with job stress, showed significantly fewer psychosomatic symptoms and had lower blood pressure and heart rates than before the intervention. Over the same time period, matched controls were stable on the same set of indices.

"These results show that you can improve time pressure, physical stressors and passenger problems by reducing the hour-to-hour multiple, minor hassles that have a multiplicative effect on bus drivers and thereby, improve their health and well-being," said Evans, who teaches courses on human-environment relations and research methods.

These findings not only are relevant for bus drivers and other mass transit workers,

but may be applicable to other job situations in which multiple psychosocial and physical stressors act in concert to damage health and well-being. In the United States, about one-quarter of all public transit operation costs stem directly from driver absenteeism, which is due largely to stress-related disorders, Evans said.

Evans credits his systematic human ecological research approach to the influence of Cornell's College of Human Ecology, which he joined three years ago. "Most other stress research focuses on specific or physical environmental or characteristics of the individuals studied. We, however, took a broader ecological view."

New book guides walkers through Cornell's natural curiosities

By Roger Segelken

Equipped with comfortable walking shoes, the new *Cornell Plantations Path Guide* and a sense of curiosity, touring the Cornell campus could become an education in itself.

Publication of a guidebook for browsers learning to love the campus, which is widely regarded as "America's most beautiful," represents the collaboration of dozens of experts and the culmination of a love story.

The seven miles of Plantations Path—named for Cornell Plantations, the university's outdoor museum of living plants—link awe-inspiring gorges where icy waters tumble through the Ivy League campus, manicured quadrangles framed by venerable structures and Latin-labeled botanical gardens and arboretum with the high-tech apparatus of one of the world's leading research universities.

But Plantations Path and the campus itself had no comprehensive guidebook until a university alumnus with a yen for surprise presents, Class of '56 College of Engineering graduate Robert Cowie (M.B.A. '57), and his children determined to underwrite the book's publication as a birthday tribute to his wife.

Vanne Cowie, Cornell Class of '57, for years has devoted most of her volunteer efforts to beautifying the 2,900 acres of Cornell Plantations. Robert Cowie explained in the dedication of the guide-

book, which was unveiled June 10 for an unsuspecting spouse at an outdoor luncheon. "Here was a chance to give something worthwhile to Cornell and to this wonderful woman at the same time," he said. Besides, Cowie noted, he owed his wife a payoff for her surprise 60th birthday present to him two years before.

Because of the underwriting gift, the 240-page, fully illustrated book can be sold for under \$10 a copy, explained Peggy

• Cascadilla Gorge Path connects historic downtown Ithaca to the campus edge and the city's storied Collegetown along stone walkways and bridges, crafted 60 years ago by the Civilian Conservation Corps, and rising 400 feet in one-third of a mile. Human commuters aren't the only ones to use the urban greenway; it is a migratory route for birds, the guidebook notes, listing species that travel through in spring and fall.

'Rocky gorges, a majestic lake, rolling hills, and over all, the Cornell campus—memories of these linger in the hearts of those who tarry here, bringing them always back to tread the hill again.'

— Robert Cowie

Haine of Cornell's Office of Communication Strategies, who prepared the book's narrative descriptions. The guide includes a pull-out map of Plantations Path and the campus, maps of intersecting trails in the Ithaca area and lists of plants and animals likely to be encountered along the way.

To avoid information overload, Cornell Plantations Associate Director Donald Rakow suggested the fact- and anecdote-filled guide might best be read the same way visitors are advised to hike the Plantations Path—one "loop" at a time. Here are those loops:

• Founders Loop winds through the historic heart of the university, and the guidebook tells the stories behind the buildings of the College of Arts and Sciences, the gardens and the legends.

• Liberty Hyde Bailey Loop honors the pioneering American horticulturist and college dean where he worked well into his 90s, at the College of Agriculture and Life Sciences, and also covers the grounds of the College of Human Ecology, Cornell Plantations' Botanical Garden, the Biotech Quad, College of Industrial and Labor Relations and

School of Hotel Administration.

• Beebe Lake Loop circumnavigates the former swamp that a young Ezra Cornell dammed to power Col. Jeremiah Beebe's plaster mill. Now a landscape feature as well as a flora- and fauna-rich habitat, the lake and its trails frequently are used to teach geology and natural history, the guidebook notes.

• Mundy Wildflower Garden Loop leads to more than native plants (more than 70 of which are listed, season by season, in the guidebook). Among the wildflowers (like cow parsnips, great lobelias and sharp-lobed hepatics) are resident birds (great blue herons, pileated woodpeckers, eastern screech owls and 23 other species), fascinating insects, harmless reptiles and a variety of mammals. Near the wildflower garden is the W.C. Munscher Poisonous Plants Garden, where veterinary students learn what animals (and humans) should not eat.

• Arboretum Loop traverses the more than 100 acres of woodlands, meadows, ponds and special collections of the F.R. Newman Arboretum, the largest stretch of building-free land on the Cornell campus. Lofty points around the arboretum's great bowl, which was carved by glaciers, are good places to contemplate the geology of the area, the book suggests.

• Fall Creek Path traces part of the course of the stream that passes through Beebe Lake and over Ithaca's signature waterfalls on the way to Cayuga Lake.

Book edited by CU scholar explores home-based work

By Susan Lang

More Americans than ever — about 20 million — work from home. Home businesses alone (as opposed to home-based wage work) pump \$247 billion of gross income each year directly into the economy, according to a new book edited by a Cornell professor.

Almost 10 percent of all households in a nine-state study have a member earning money from work they do at home, reports Ramona Heck, associate professor of consumer economics and housing in Cornell's College of Human Ecology.

Her new book, *Home-Based Employment and Family Life* (Auburn House, 1995), co-edited with Alma J. Owen and Barbara R. Rowe, both of Purdue University, details the findings of a three-year study of 899 homeworking households in Hawaii, Iowa, Michigan, Missouri, New York, Ohio, Pennsylvania, Utah and Vermont.

"Many people think of the typical home-based worker as an apple-cheeked homemaker doing crafts at home while her children quietly play nearby and a pot of stew simmers on the stove," Heck said. "In reality, however, the typical home-based worker is male, middle-aged and has an above-average education. He is married with children, owns his own home and has lived in the same community for about 20 years."

Home-based wage earners, the researchers found, do better than their counterparts in the centralized workplace while home-based business owners do worse. Home-based business owners make about \$8,700 less (working three fewer hours a week) than home-based wage earners and earn about the same net income as the average self-employed worker who is not home-based.

"We also were surprised that only about 25 percent of home-based workers had young children under age 6. This means that the decision to work at home is only partly inspired by the need to be with the children. Clearly, other motives are involved, and only some are related to family," said Heck, who teaches a course on families in business.

The book, comprised of eight chapters written by family economists from eight other universities, explores various aspects of home-based work, including how workers balance family and work, where and how they work at home, the types of businesses and services they engage in, how they interact with their communities, and what researchers still do not know about the nature of working at home.

Home-based workers were defined as those who worked at home or from the home (excluding production farming) for at least six hours a week throughout the year.

Among the study's other findings:

- About three out of four home-based workers have their own businesses.

- The typical at-home worker earned \$17,835 a year in 1988, working about 36 hours a week. About one-quarter had other employment. Typically, home-based work provided 40 percent of the household's income.

- Male wage-earners earned the most income, followed by male business owners; female wage-earners made more than female business owners.

- Sixty percent of home-based workers resided in married-couple households with children; one-quarter were in adult-only families.

- The typical home-based worker is a married 44-year-old male with two years of college.



Charles Harrington/University Photography

Ramona Heck with her new book, in her office in Martha Van Rensselaer Hall.

FABIT: Faculty ready for instructional technology but need help

By William Steele

Cornell's faculty is ready to embrace new instructional technology but would like more say in how and where it's set up, along with some technical help. And they'd especially like help in paying for it.

That's the gist of a recent report from the Faculty Advisory Board on Information Technologies (FABIT), a committee created some 18 months ago to advise the provost and the vice president for information technologies. The committee submitted its report, titled "Planning for Learning Technologies Services," in January.

Cornell Information Technologies (CIT) already has put some of the report's recommendations into practice, according to David Lambert, acting vice president for information technologies. On the faculty side, associate deans of the colleges met in April and expressed cautious approval of the report's call for upgrading teaching spaces.

"It's not a one-shot process, where we just go out and upgrade everything," said Stanley Bowman, associate dean of the College of Architecture, Art and Planning. "It's going to be a slow evolution. We focused on getting standards that would apply to new construction or renovation."

Bowman chaired the FABIT subcommittee on "teaching spaces" — a broader term than "classrooms." He said he hopes the group will become a permanent faculty committee to advise on how and where upgrades should be made. Other subcommittees studied student access and faculty needs. "Instructional technology" can mean the gamut from a piece of chalk to a supercomputer. What's under consideration here are recent advances such as projectors that can put computer displays on a big screen, classrooms with individual student terminals, the use of e-mail or World Wide Web systems to distribute class materials to students and custom-made teaching software.

Students are starting to expect such high-tech approaches, and not all faculty are ready to provide them. "Most of the current faculty

did not grow up with the computer. Most of the current students did," Bowman pointed out. FABIT's recommendations included:

- Implementation of the recommendations in the 2001 Report, prepared in 1992, which calls for the creation of a central technical support organization for the entire campus as well as support teams in each academic unit. Each local team would consist of two people, one to work with faculty in designing new approaches, and one to keep the hardware and software working on a day-to-day basis. The central organization, called the Design and Evaluation Support Group, would provide support to local teams.

- Establishment of incentives, in the form of special funding, for faculty to create innovative ways to use new technology.

- Improvement of student access to computing facilities and networks.

- Upgrade of all teaching spaces to at least a minimum standard, known as "Tier 1." This would include an overhead projector with a liquid crystal display device to project com-

puter displays and a network connection. A few spaces would be "Tier 2" with phone jacks for teleconferencing and satellite downlink connections. Perhaps three would be "Tier 3" with state-of-the-art technology, perhaps including individual student terminals.

These recommendations come at a time when the university is facing cutbacks in funding. "The FABIT group recognizes that there isn't new money available," Bowman said. "Improvement of teaching spaces is going to have to be a joint effort of the colleges, the university and CIT. It's been left to CIT and the colleges and really hasn't been done on a university level. What FABIT is really about is to get it discussed at that level."

CIT already is adjusting its budget in some areas. "For the first time, next year's budget has a line item for upgrading student computer labs," Lambert reported. CIT operates public computer labs at several locations, with a total of about 300 machines. In the future, Lambert said, CIT will plan on upgrading one-third of those machines each

year, at a cost of about \$300,000 per year.

Several colleges also have their own computer labs. The College of Engineering, for example, has several terminal-equipped classrooms that are open as labs when classes are not being taught, and the Department of Design and Environmental Analysis in the College of Human Ecology operates a special Computer-Aided Design (CAD) facility.

CIT expects to have all dormitory rooms wired for high-speed connections to the campus network by fall and has promised to add additional modems to improve telephone access for off-campus students. Students have complained loudly this year about endless busy signals during evening hours.

This year for the first time, all incoming students were required to attend a short introductory class on Internet usage called "Travelers of the Electronic Highway" before being allowed to use their Net IDs. The classes were scheduled throughout September, but faculty members said this was too late.

"Many faculty members wanted to hit the ground running using e-mail with their students from the first day of school," Lambert said, "so next year the classes will be held during orientation." CIT is hiring 60 students to do the teaching and will keep about 20 of them on to provide consulting services in residence halls, Lambert added.

The FABIT committee and its subcommittees continue to meet, according to its chair, W. Ronnie Coffman, professor of plant breeding and biometry and director of the Ithaca Agricultural Experiment Station. "For at least several years to come, we're going to need an advisory group in this area," Coffman said. "We just can't plan fast enough to cope with the changes we're facing." New subcommittees have been formed to study costs, research computing and possible standards for World Wide Web services, he added.

"This is one of the major challenges facing higher education," Coffman concluded, "and even though we don't have the money to pay for it, we can't afford not to pay for it."

Examples of instructional technology

Several colleges and departments are deploying new teaching technology. Here are some examples:

In the College of Engineering, two classrooms are equipped with individual student terminals as well as projection facilities. B-14 and 366 Hollister, along with 155 Olin, have multimedia projection facilities and Ethernet hookups. Several buildings also have cart-mounted equipment.

Many professors use computer simulations, such as a program that allows students to design electronic circuits on a computer screen, then "run" them and watch the results. The college has its own Multimedia Courseware Studio, where technicians assist faculty members in creating

presentations that combine slides, videotape, computer simulations and other sources into interactive programs that can be displayed in class or run by individual students.

In the College of Veterinary Medicine, a program called SimPharm simulates the autonomic nervous system (which controls involuntary body processes such as breathing and heartbeat). "A student can perform experiments such as stimulating or cutting a nerve or injecting a neurotransmitter or other drug into an organ or organ system," reported courseware developer Steve Rutherford. "It's all graphical. You're looking at a heart beating and there's a blood-pressure graph and an electrocardiogram graph."

CORNELL RESEARCH

Ultra-compact system produces more affordable fish

By Roger Segelken

Rearing small and large fish together indoors, feeding them all they can eat and processing wastes in compact bioreactors will make fish nearly competitive in price to other meats, Cornell agricultural engineers predict.

An intensive water-recirculation system, with waste-treatment bacteria living on tiny polystyrene beads that float in a compact bioreactor, has passed all its tests at Cornell and, when scaled up to commercial production, could produce tilapia fish for as little as 57 cents a pound.

'Yield from marine fisheries is declining because the oceans are practically fished out, and availability of fresh, farm-raised fish is limited by location: You can't deliver fresh, affordable fish year-round everywhere in the United States because outdoor aquaculture depends on climate.'

— Michael Timmons

Michael B. Timmons, professor of agricultural and biological engineering and co-director of the Cornell Aquaculture Program in the College of Agriculture and Life Sciences, reported on the microbead bioreactor's success Feb. 2 in San Diego, at the annual meeting of the Aquacultural Engineering Society.

"Americans would eat more fish than they do now — about 15 pounds per capita per year — if the price weren't so high," said Timmons, who focused his research on poultry production for 15 years before turning to fish farming. "Yield from marine fisheries is declining because the

oceans are practically fished out, and availability of fresh, farm-raised fish is limited by location: You can't deliver fresh, affordable fish year-round everywhere in the United States because outdoor aquaculture depends on climate."

Indoor water-recirculation systems for aquaculture are hampered by cost and complexity, Timmons observed. So the Cornell aquaculturists aimed for a fool-proof system so compact that one module fits in a one-car garage. Continuous biomass loading (or mixing all fish sizes together while harvesting the largest) is a proven key to efficient production, the Cornell studies show. Another is the high feeding rate (about 2 percent of body weight a day) so the fish grow from fingerling size to market in a matter of months.

But all that fish food produces plenty of waste, particularly toxic ammonia, which must be cleaned from the recirculated water. A 20-foot-wide tank can yield 30,000 pounds of fish a year, but they make as much sewage as a town of 4,000 people. Cornell's proposed solution is a novel microbial filter with a large surface area to hold waste-eating bacteria as they convert ammonia into nitrites and nitrates. Waste-laden water is circulated from fish tanks into cylinders in which millions of 1-millimeter polystyrene beads — covered with thin biofilms of nitrosomas and nitrobacter bacteria — bob about in floating beds.

"You need surface area to maintain a large working population of 'bugs' per unit volume," explained William J. Jewell, Cornell professor of agricultural and biological engineering, an expert in immobilized bed microbial systems as well as floating bed systems. "There are several acres of surface area (on the 1-millimeter beads) in the 5-foot-diameter filters used in Professor Timmons' systems," he noted.

At Cornell, Timmons teaches engineering classes in "Principles of Aquaculture," and Jewell teaches "Treatment and Disposal of Agricultural Wastes." The Cornell Aquaculture Program also offers three-month internships in fish farming.



University Photography

Fresh from biologically filtered waters at the Cornell Aquaculture Program's compact, indoor fish-farming system, rainbow trout are readied for market by Robert LaDue, left, project manager, and Scott Tsukuda, a Cornell graduate student of agricultural and biological engineering. Fish automatically are fed by the machine in the upper right, while their wastes are processed nearby with a bacteria-based filter about the same size as the feed hopper.

Mammal brains are unexpectedly similar, CU researchers find

By Blaine P. Friedlander Jr.

The brains of different mammals, including humans and animals as different as bats and monkeys, are much more similar to each other than previously assumed, Cornell researchers have found.

When two mammalian species have brains about the same size, then nearly all the major parts of the brain also are about the same size, according to research published by two Cornell psychologists.

This finding has surprised neuroscientists, because different species use their brains in different ways, the researchers said. For example, while bats and mice have about the same size brains, bats can perform specialized functions such as echolocation and aerial maneuvers.

"When you look at the bodies of mammals," said Barbara L. Finlay, Cornell professor of neurobiology and psychology, "there are structures like the elephant's trunk or giraffe's neck that are many times as large as you would expect from the animal's overall size. Within the brain, the same is true for the olfactory bulb, whose size varies enormously across species. However, in our research we found that this simply isn't true for other parts of the brain. If you tell me the size of a particular animal's brain, then I can tell you with great accuracy the size of every

major structure in it except for the olfactory bulb."

Finlay, along with co-author Richard B. Darlington, Cornell professor of psychology, published the findings, "Linked Regularities in the Development and Evolution of Mammalian Brains," as the cover article in the journal *Science* (June 16, 1995).

The researchers emphasize that one would not get a large brain simply by

"In each part of a developing mammalian brain, cells that will later turn into neurons divide again and again," Finlay said. "The longer this division continues for a given brain structure, the larger that structure is in the adult brain. The cross-species similarities in structure size are apparently caused by similarities in developmental schedules."

In fact, similarities in development led

by better use of its voice for communicating with its troop. Suppose that better use could be produced by doubling the size of the part of the brain that controls the vocal tract. Evolutionary forces possibly could double just those brain parts, but they could produce the same result by the apparently inefficient means of doubling the size of the entire brain.

"To our surprise, the latter route has been taken. Evolutionary selection for just one ability produces coordinated enlargement of the entire brain, even in areas which seem to have nothing to do with the selected ability," Finlay said.

Darlington expands the analogy. "This suggests to us that the brain is a general-purpose computing device. A computer in your office or home can be used to write a letter in the morning and compute your taxes in the evening. You just change the program — the software. Brain evolution works primarily by changing the brain's software rather than its hardware. Of course the environment helps write the software and evolution changes the software only over millions of years."

Finlay said: "The brain actually can change its hardware in the sense of expanding or contracting the entire brain. But not all changes are possible in brain evolution. Evolution is constrained more than we had realized."

'Evolutionary selection for just one ability produces coordinated enlargement of the entire brain, even in areas which seem to have nothing to do with the selected ability.'

— Barbara Finlay

expanding a small brain. As brain size increases, the neocortex increases more rapidly than other structures.

"Nevertheless, when all sizes are expressed on logarithmic scales, the size of every major brain part except the olfactory bulb has a simple linear relation to the size of the total brain," Darlington said. "That fact has impressed people."

Similarities in structure are produced by similarities in timetables of development, the researchers believe.

the researchers to search for, and find, similarities in the structures of adult brains.

The findings suggest that brains evolve according to different rules than do bodies. "Legs, tails, noses and so forth have all enlarged and shrunk independently from other body parts in different species in response to evolutionary pressures, but the brain doesn't show independent change in the size of its parts," Finlay said.

For example, consider a primate in the forest whose survival would be improved

CALENDAR

June 22
through
June 29

All items for the Chronicle Calendar should be submitted (typewritten, double spaced) by campus mail, U.S. mail or in person to Chronicle Calendar, Cornell News Service, Village Green, 840 Hanshaw Road.

Notices should be sent to arrive 10 days prior to publication and should include the name and telephone number of a person who can be called if there are questions.

Notices should also include the subheading of the calendar in which the item should appear.

dance

Cornell International Folkdancers

Open to the Cornell community and the general public. All events are free unless otherwise noted. Beginners are welcome; no partners are needed. For information, call Edilia at 387-6547 or Marguerite at 539-7335.

June 25, 7:30 p.m., Romanian dances for couples taught by Ed Abelson; 8:30 p.m., open dancing and requests, Maplewood Community Center.

Israeli Folk Dancing

Thursdays through Aug. 17, 8 to 10 p.m., Maplewood Park Community Center; instruction and request dancing, free and open. For information, call 272-4623.

exhibits

Johnson Art Museum

The Herbert F. Johnson Museum of Art, on the corner of University and Central avenues, is open Tuesday through Sunday from 10 a.m. to 5 p.m. Admission is free. Telephone: 255-6464.

• "Ziet, de dag komt aan: Dutch Landscape Prints and Drawings," through Aug. 6. These scenes from the permanent collection are by artists such as Jacob van Ruisdael, Jan van de Velde, Adam Pynacker and Isaac de Moucheron.

• "Paintings From the Boissier-Leviant-Smithies Collection," through Aug. 27. This collection presents important works by renowned Latin American painters of the late-1940s and 1950s.

• "Ithaca Collects," June 24 through Aug. 6. This group of works borrowed from residents of the Ithaca area range from Asian ceramics to contemporary American painting.

• "The Fires of War: Paintings by Susan Crile," June 24 through Aug. 13. Crile spent several months in Kuwait after the Persian Gulf War and observed the ecological devastation of that country's burning oil fields. Her large-scale paintings and works on paper capture all the terror and awe of modern warfare and its consequences.

• "12 O'Clock Sharp: Thursday Noontime Gallery Talks": On June 22, Amy Oliver, curatorial assistant, and Frank Robinson, museum director, will lead a tour of "The Dutch Baroque."

Cornell Plantations

Council for the Arts grant recipient Erin Caruth's sculpture, "Hope's Threshold," is on display in the Zucker Shrub Garden, F.R. Newman Arboretum, through June 30.

Kroch Library

"Cornell History Exhibition," through September.

Tjaden Gallery

"New Lives on Old Land: Picturing Life in the Afar Rift Valley of Ethiopia," a work in progress by Nanci Kahn, visiting assistant professor of photography, is on view through July 1. A reception will be held June 27 from 5 to 7 p.m.

films

Films listed are sponsored by Cornell Cinema unless otherwise noted and are open to the public. All films are \$4.50 (\$4 for students), except for Tuesday night Cinema Off-Center (\$2) and Sunday matinees (\$3.50). Films are held in Willard Straight Theatre except where noted.

Thursday, 6/22

"Imaginary Crimes" (1994), directed by Anthony Drazan, with Harvey Keitel, Fairuza Balk and Kelly Lynch, 7:30 p.m.

"The Advocate" (1994), directed by Leslie Mehahey, with Colin Firth, Ian Holm and Nicol Williamson, 9:45 p.m.

Friday, 6/23

"A Great Day in Harlem" (1995), directed by Jean Bach, with Dizzy Gillespie, Art Farmer and Sonny Rollins, 7:30 p.m.

"Bullets Over Broadway" (1994), directed by Woody Allen, with Dianne Wiest and John Cusack, 9:15 p.m.

Saturday, 6/24

"Imaginary Crimes," 7:30 p.m.

"Diabolique: Restored Version" (1954), directed by Henri-Georges Clouzot, with Simone Signoret and Vera Clouzot, 9:45 p.m.

Sunday, 6/25

"Bullets Over Broadway," 7:30 p.m.

Monday, 6/26

"The Informer" (1935), directed by John Ford, with Victor McLaglen, Heather Angel and Preston Foster, 7 p.m.

"L.627" (1994), directed by Bertrand Tavernier, with Didier Bezace and Lara Guirao, 9 p.m.

Tuesday, 6/27

"Diabolique: Restored Version," 7:30 p.m.

"The Advocate," 9:45 p.m.

Wednesday, 6/28

"Gimme Shelter" (1970), directed by David Maysles, with Mick Jagger and Ike & Tina Turner, 7:30 p.m.

"True Lies" (1994), directed by James Cameron, with Arnold Schwarzenegger and Jamie Lee Curtis, 9:30 p.m.

Thursday, 6/29

"L.627," 7 p.m.

"True Lies," 10 p.m.

graduate bulletin

• **August degree deadline:** Friday, Aug. 25, is the deadline for completing all requirements for an August degree, including submitting the thesis/dissertation to the Graduate School.

• **Dissertation and thesis seminars** will be held in the Morison Seminar Room, Corson/Mudd Hall. The master's thesis seminar will be on Tuesday, June 27, from 3 to 4 p.m. The doctoral dissertation seminar will be Wednesday, June 28, 3 to 4 p.m. The thesis adviser will discuss preparing and filing theses and dissertations; students, faculty and typists are encouraged to attend.

• **Fellowships for 1996-97:** The Fellowship Notebook, listing more than 600 external awards, is available in each graduate field office, on CUINFO/Gopher under the heading "Academic Life" and the subheading "Grad School," and at the Graduate Fellowship Office, Sage Hall. Post cards are available requesting application forms; some application forms are on file in the Graduate Fellowship Office.

music

Summer Sessions

Cornerstone will perform its contemporary bluegrass music at the welcome reception on the Arts Quad June 26 from 4 to 6 p.m.

On June 27, bass baritone Keith Earle and



The restored version of the 1954 film *Diabolique* makes its Ithaca premiere June 22 at 7:30 p.m. at Willard Straight Theatre.

pianist Catherine York-Norris will perform the music of Charles Ives in Barnes Hall at 7:30 p.m. The concert is free and open to the community; seating is limited.

Bound for Glory

June 25, the first of six live shows this summer. Live sets are at 8:30, 9:30 and 10:30 p.m. in the Commons Coffeehouse, Anabel Taylor Hall. Admission is free, kids are welcome and refreshments are available. Bound for Glory is broadcast from 8 to 11 p.m. on WVBR 93.5 FM.

religion

African-American

Sundays, 5:30 p.m., Robert Purcell Union.

Baha'i Faith

Fridays, 7 p.m., firesides with speakers, open discussion and refreshments. Meet at the Balch Archway; held in Unit 4 lounge at Balch Hall. Sunday morning prayers and breakfast, 7 a.m.

Catholic

The summer Mass schedule, June 3 through Aug. 20, is: Saturday, 5 p.m., and Sunday, 10 a.m., Anabel Taylor Auditorium. Daily Masses will be announced weekly.

Christian Science

Testimony and discussion every Thursday at 7 p.m., Founders Room, Anabel Taylor Hall.

Episcopal (Anglican)

Sundays, worship and Eucharist, 9:30 a.m., Anabel Taylor Chapel.

Friends (Quakers)

Sundays, 11 a.m., meeting for worship in the Edwards Room of Anabel Taylor Hall. Discussions most weeks at 9:50 a.m., 314 Anabel Taylor Hall.

Jewish

Morning Minyan at Young Israel, 106 West Ave., call 272-5810.

Saturday Services: Orthodox, 9:15 a.m., Edwards Room, ATH; Conservative/Egalitarian, 9:15 a.m., Founders Room, ATH.

Korean Church

Sundays, 1 p.m., chapel, Anabel Taylor Hall.

Latter-day Saints (Mormon)

Discussions on the Book of Mormon: Wednesdays, 7:30 p.m., 314 Anabel Taylor Hall. All are invited to come and discover the religious writings of ancient American cultures.

Sunday services: Cornell Student Branch, 9 a.m., Ithaca ward, 1 p.m. For information, call 272-4520, 257-6835 or 257-1334.

Muslim

Friday Juma' prayer, 1:15 p.m., One World Room, Anabel Taylor Hall. Daily Zuhra, Asr, Maghreb and Isha' prayers at 218 Anabel Taylor Hall.

Protestant Cooperative Ministry

Sundays, 11 a.m., chapel, Anabel Taylor Hall.

Sri Satya Sai Baba

Sundays, 10:30 a.m., 319 N. Tioga St. For details call 273-4261 or 533-7172.

Zen Buddhist

Tuesdays, 5 p.m.; Thursdays, 6:45 p.m., chapel, Anabel Taylor Hall.

seminars

Genetics & Development

"In Vitro Analysis of Maize Mitochondrial COX2 Promoters," Danielle Lupold, June 28, 12:20 p.m., small seminar room, Biotechnology Building.

Neurobiology & Behavior

"Reproductive Behavior and Paternity in a Mound-building Megapode Bird, the Australian Brush-turkey," Sharon Birks, neurobiology & behavior, June 23, 12:30 p.m., A106 Corson Hall.

symposiums

Cognitive Studies Program

From June 23 to 26, the Cognitive Studies Program will sponsor a symposium on "Big Brains." Many forces encourage and constrain the development of large brains, and large brains assemble themselves into new architectures that reflect these forces. Using "big brains" as a focal point, the conference will draw together researchers who work at all levels of analysis to understand how our large brain has come to be. For further information, contact Sue Wurster at 255-6431 or cogst@cornell.edu.

miscellany

Alcoholics Anonymous

Meetings are open to the public and will be held Monday through Friday at 12:15 p.m. and Saturday evenings at 7 p.m. in Anabel Taylor Hall. For more information call 273-1541.

Folk Guitar Lessons

Once again, the Willard Straight Hall Program Board presents Phil Shapiro's group folk guitar lessons. There are six one-hour lessons on Wednesday evenings, starting June 28 in the International Lounge of WSH. Registration is at the first lesson. Bring a guitar. The 7 p.m. class is for beginners; and the 8 p.m. class is for intermediates. Those who are unsure which class is for them should come to both. The course costs \$35, payable at the first lesson. It is open to the public. For further information, call Phil Shapiro at 844-4535.

Summer Sessions

The bluegrass music of Cornerstone, free ice cream and more await you as the School of Continuing Education & Summer Sessions kicks off its summer concert and lecture series June 26 from 4 to 6 p.m. on the Arts Quad. The event is free and open to the entire community.