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Illinois Research

Fall 1991
Volume 33, Numbers 3

Agricultural Experimentation Station: Student Research

University of Illinois at Urbana-Champaign
College of Agricultural, Consumer and Environmental Sciences

What makes this dynamic trio tick?

- Improved Embryo Preservation Process for Livestock Industry
  Tina M. Prow
  A new fast-freezing technique prevents cell-damaging ice crystals.

- Keeping Up with a Changing Work Force
  Kandeh Yumkella

- Gene Research to Help Animal Breeders
  Claudine Cole
  Focusing on genes that influence muscle development and weight gain.

- In Progress

Illinois Research

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Volume 33, Number 3

Published quarterly by the University of Illinois Agricultural Experimentation Station

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Editor: Nancy Nichols

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Illustrations: Paula Wheeler, Timothy Stiles

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This issue of *Illinois Research* is printed with soybean ink on recyclable paper.

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Education for the Twenty-First Century

William L. George

These are exciting times. The world is in the midst of a technological revolution - one that is unmatched in human history and that will challenge our nation's economic growth and security for many years to come. For a century, the United States has led the world in developing science and technology on behalf of the global food and agricultural system. If our leadership is to continue, however, we must gain a broader understanding of the demographic, social, cultural, economic, and policy factors that influence agriculture.

We need a new generation of scientists who will lead the way in achieving breakthroughs in the rapidly growing fields of biotechnology. We need an outstanding cadre of scientists prepared to focus on genetics, molecular biology, physiology, biochemistry, and related areas. Similarly, future food and agricultural scientists and professionals must capitalize on opportunities to improve environmental quality, water conservation, food safety, and nutrition and health. We need to learn more about global climate change. And agribusiness managers and marketing specialists must help our nation regain a sure footing in the global economy. But these changes will not come easily.

Our scientific and professional expertise in the food and agricultural sciences is threatened on many fronts. Curricula of colleges of agriculture are not popular choices among many of today's youth, even at a time when the job market for our graduates is excellent. There is serious concern about the lack of qualified professionals to fill positions. Moreover, the current food and agricultural sciences work force and student body suffer from a lack of cultural diversity. In many instances, gender diversity is also sorely deficient; graduate enrollments in some of our academic specializations remain predominantly male.

As we approach the twenty-first century, bold, innovative initiatives are needed to reverse the many factors moving us toward an eroding base of expertise in agriculture. We need new visions.

Our own College of Agriculture needs curricular revitalization. We need more balance between general education and specialized education to produce more rounded, *better-educated graduates* .

The College needs to sustain and expand its Jonathan Baldwin Turner (JBT) programs. Our JBT Merit Scholarship Program has attracted 719 outstanding student scholars to our College in twelve years. However, the program needs a stronger endowed funding base. Our JBT Undergraduate Research/Scholarship Program needs to expand so more students work with faculty in research and become inspired to seek advanced degrees. Our JBT Graduate Fellowship program, now a doctoral program, needs to expand to include master's degree students.

We need not only to improve access of our minority groups to quality education but also to ensure their success. We must increase our Minority Apprenticeship Program (MAP) for high school students, our Summer Research Opportunities Program (SROP) for minority undergraduates, and minority scholarships and internships. We need to develop minority graduate fellowships and assistantships and to enhance cooperation through student and faculty exchanges with historically black universities to enrich our minority pool.

By providing outstanding students with the means to investigate and understand societal problems, we will increase their professional competence. And we will prepare our students for the ever greater challenges of

the year 2000 and beyond.

William L. George, Associate Dean and Director of Resident Instruction

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The Complementary Relationship Between Graduate Student and Professor

Donald A. Holt and David H. Baker

Unlike undergraduates, who learn primarily by attending classes and studying textbooks, graduate students learn by doing. These more advanced students benefit most from conducting research over long periods in collaboration with an individual professor.

The close working relationship between the graduate student and his or her "major" professor adds a new dimension to learning. By the end of the experience, he or she has moved beyond the traditional student-teacher relationship to become the professor's colleague.

This form of individualized instruction is normally reserved for graduate students, partly because it is expensive. Selected undergraduates, however, also benefit from such hands-on research through innovative programs geared toward this group.

Graduate students are recruited, much like athletes. For practical reasons, each professor wants to work with the best and brightest students, who can contribute significantly to the professor's research program. More importantly, however, the students improve themselves as scientists so that they will be in demand in the job market when their degree is finished.

Graduate students bring a fresh, youthful vigor and creativity to their work. They are less biased by experience; they do not know what "cannot be done." Their generally high-quality work rarely has to be repeated. Catching the enthusiasm of science and discovery has a profound effect on their young lives.

Most professors feel that working one on one with bright, talented, highly motivated graduate students is the most rewarding part of their careers. It is also the most important way they influence their field of specialization, shape the future, and contribute to the welfare of humankind. Training the next generation of scientists is an important function of the university professor.

Relationships between professors and their graduate students range from formal and impersonal to deeply personal and even affectionate. In the College of Agriculture, it is rare when a graduate student does not develop a deep and lasting friendship with his or her major professor.

At first, the student is highly dependent on the professor. The professor must help the student select courses and a thesis topic. The student must be integrated into the structure and function of the professor's laboratory and research program.

Later, the student will begin to function more independently, taking more and more responsibility for selecting learning experiences and managing portions of the professor's program. As the student develops as a scientist, he or she may manage almost all day-to-day activities of the professor's program, thereby gaining valuable managerial as well as technical experience.

The professor ushers the student into the realm of scientific thought, in which all theories, hypotheses, and facts are subject to doubt, no matter what their source. The student must question his or her own ideas and judgments and must learn how to design experiments that attempt to disprove them. The student learns that intellectual honesty is the moral foundation of science.

Each student is set on a trail that can, and often does, lead to becoming the world's expert in a specialized field. To follow that unmarked trail, the student must learn in extreme detail the facts and procedures of his or her field and related fields. In addition, the student must use his or her own creativity to discover what lies beyond the known facts.

Effective graduate training takes the student from being an apprentice to becoming a master. Nothing is more rewarding to a professor than to nurture and watch that remarkable transformation.

Professors differ in their philosophy of graduate training and in their ability to train students. Some try to make the student over in their own image. Others help the student explore the full measure of his or her own creativity. Effective professors vigorously challenge students, instilling in them the philosophy that "if you want to float big ships, you have to go where the water is deep."

Successful research professors are under great stress to acquire outside funding to sustain their program and pay the salaries of graduate students and other staff. Well over 80 percent of the cost of a professor's research program is offset by his or her own funding obtained from federal agencies and private sector grants. Ideally, graduate student trainees also obtain experience in writing research proposals. This ability will be essential to their success as researchers.

Graduate students also have to deal with stress. They are expected to perform academically and scientifically at the highest levels. The competition for positions is stiff. Only about one in eight applicants for graduate training are accepted. Students who were not in the upper 15 percent of their undergraduate class have little chance for success in the more rigorous graduate programs. Only about one in 400 people obtain a doctoral degree.

The rigor and competition of graduate training is necessary to prepare students for their careers. From the time they graduate with an advanced degree, their salary, rank, support, and job satisfaction will be almost directly proportional to their creativity, productivity, and capacity for hard work. Few will ever enjoy the protection of seniority. From the time they assume their duties as a professor or researcher, they will face the consequences of the rigorous promotion and tenure process or its private sector equivalent. Their salary will be based on merit.

In return for enduring the stress and competition, graduate students will enjoy the privilege of being modern-day explorers, stepping across frontiers into vast uncharted regions. To guide them, they will have only their own talent and ingenuity, tempered in the fire of graduate training and honed by experience.

Molecular geneticist Lila Vodkin, center, discusses data on soybean molecular biology with graduate students Joselyn Todd and Jon Lindstom. This kind of individualized instruction is typical of graduate training yet is enjoyed as well by a few elite undergraduates.

Disease Prevention Focus of Foods and Nutrition Research

Tina M. Prow

An interest in health and medicine, particularly disease prevention, drew Angela Odoms to the University of Illinois for a degree in foods and nutrition. The Chicago native said she expected to find her studies interesting and challenging, but she had no idea she would have an opportunity to help design and conduct an important research project before she graduated in 1990.

During her junior year, Odoms, 22, now a graduate student at Cornell University, was accepted into the UI Summer Research Opportunities Program (SROP). The program is designed to expose minority undergraduates to experiences they might have in graduate school. Hoping to make a contribution to the field of disease prevention through her project, Odoms chose to study the effects of alcohol on breast tissue.

"Breast cancer is a leading cause of cancer-related deaths among American women," she said. "Researchers have observed that women who drink moderately or heavily have a higher incidence of breast cancer compared with women who don't drink or who drink very little. I wanted to find out how alcohol may affect breast cancer."

Before she went into the laboratory, however, Odoms spent time in the library reading research articles related to alcohol, breast tumors in humans, and research procedures. She discussed the articles with her adviser, Keith Singletary, a UI nutritionist.

"I didn't know anything when I started," she admitted. But she was a quick study, according to Singletary.

"Angela was a genuine, diligent student--an eager learner able to comprehend new information in areas she hadn't had exposure to," he said. "And even though she lacked exposure, and hadn't taken certain science classes, she did an excellent job. Her observations appear to be valid and could be very important in giving us more clear insight into how alcohol may influence the development of breast tumors."

With an extensive literature review behind her, Odoms began the laboratory portion of the study. Using laboratory rats as an experimental model, she found that alcohol intake significantly increased cell replication in breast tissue. In a later study, she observed that alcohol slowed maturation of mammary glands, which could make cells in the breast more susceptible to the development of tumors.

"To date, several studies have been done observing the relationship between alcohol intake and the risk of breast cancer in humans, but there hasn't been much research using an experimental model," Singletary said, "and that kind of research is important in clarifying and enhancing our understanding of this problem."

For Odoms, the research not only helped build the knowledge base for an area she was interested in, but also proved to be a fun learning experience.

"Everything went well. Dr. Singletary was a real inspiration; he took time with me when I didn't understand what I was reading, but also left me on my own to think through what I was doing. He provided the mechanisms for me to be independent, so I felt like I was in control and doing something important," she said.

Odoms' project did not end with laboratory observations. She also prepared a paper and made an oral presentation to the SROP advisory committee. Later, an opportunity to talk about her projects with fellow researchers at an annual meeting of the American Institute of Nutrition, a member of the Federation of American Societies for Experimental Biology, was a highlight of her research experience, she said.

"I prepared a poster and stood by it at the meeting to answer questions from people in biology, chemistry, and nutrition," she said. "There were a lot of scientists there; I had read some of their papers during my literature search, and it was exciting to talk with them."

The meeting was also an opportunity to talk with graduate students and faculty members from Cornell University. Odoms, currently a master's and doctoral candidate in nutrition and biochemistry at Cornell, plans to pursue a career in college-level teaching and research. Her undergraduate research experience, she said, helped her choose her goals.

"If someone gets the opportunity to do research, they should take it. It's an opportunity to grow for the experience of learning," she said. "I feel that it helped me get more involved in the department and with an adviser, and that made me feel closer to people in the program.

"Also, I think going to national meetings and writing papers helps with the application if you're going on to graduate school. And once you're in grad school, which can be a terrifying experience --new classes, new people, a new place, and more work required-- you aren't so unaware. You've already had some research experience, you've been in a lab, you know how to get papers, and you know some of the terms. A research project is an experience that's going to help in the long run with your graduate career."

Angela Odoms analyzes tissue samples with her adviser, Keith Singletary. Her research focuses on the link between alcohol consumption and breast cancer.

Tina M. Prow, science writer, Agricultural Experiment Station

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Students, Faculty Encouraged by Summer Research Program

Craig Chaimberlain

Since 1986 the UI Summer Research Opportunities Program (SROP) has sought to encourage minority students to pursue academic careers. The evidence so far suggests that a little encouragement can go a long way.

Two-thirds of participants who have completed their undergraduate degrees have gone on to graduate or professional school, about three times the national average.

Many instructors who have served as mentors also have found encouragement--about the quality of research they can expect from undergraduates, and the role they as faculty members can play in lending support to a future scholar.

The program was launched six summers ago by the Committee on Institutional Cooperation--a consortium of Big Ten universities and the University of Chicago - as a means of reversing a decline in the number of qualified minority applicants to graduate schools. It encompasses all disciplines, including agriculture.

Its chief component is an in-depth research experience in which each student is matched with a faculty mentor who supervises the student's work.

To qualify for selection, the student must be either a sophomore or junior with a minimum 3.75 grade-point average. Each student receives a $2,500 stipend; each faculty mentor receives a $1,000 research allowance.

The program began in 1986 with 99 students, 10 at UI, and has grown dramatically since. This summer, about 600 students participated, with UI hosting the largest group--90 students working with 83 faculty members.

As part of that growth, students have been invited in from outside the host institutions. Twenty-six of the 90 at UI fit that category, with most of them coming from six historically black campuses. The overall program is the largest of its kind in the nation, says Elaine J. Copeland, associate dean of the UI Graduate College.

William George, associate dean of the UI College of Agriculture and coordinator of College participation, says that 15 SROP students studied agriculture-related subjects this summer. Ten of those were supported through a $45,675 competitive grant from the U.S. Department of Agriculture.

Janice Bahr, a professor of physiology in the Department of Animal Sciences, has been an SROP faculty mentor for the past two summers.

"I think it's a very fine program," she said. "It's a wonderful opportunity for undergraduates to do research."

In 1990 Bahr, who runs a reproductive physiology lab, supervised biology major Donna Hemphill, whose project focused on ovarian function. Bahr said that the program has "opened up all kinds of doors" for Hemphill, who graduated in May and entered the UI Medical School in Chicago this fall.

A plus for the program, Bahr said, is that it gives support to the laboratory, which helps pay for expensive supplies. "The minute a student steps foot into your laboratory, [he or she] begins to cost you money," she said.

Bahr's support for the program is shared by her colleagues across campus. As one SROP mentor put it, "I just think the university has a jewel of a program here."

Craig Chamberlain, general-assignment writer, UI News Bureau

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Teenagers Demystify Sustainable Agriculture

Gary Bickmeier

The author, left, accompanies students from Scott County on a tour of a research plot near the UI campus. Extension entomologist Kevin Steffey explains an experiment involving artificial infestations of black cutworms.

Sustainable agriculture is making headlines in both the popular and agricultural press. The media has learned that the topic is controversial and pricks a nerve for many readers.

Emotion rather than knowledge seems to dictate opinion on this issue. The sustainable ag controversy is fueled by farmers' concerns for their children, health, and livelihood. It is also buttressed by the lack of research-based information and reliable, unbiased authorities.

To provide the agricultural community with better information and help quell fear and skepticism about sustainable agriculture, the Scott County Cooperative Extension Service in 1990 initiated a program of hands-on research for high-school students. Six 4-H and Future Farmers of America members planned and implemented on-farm research with the support of a grant from the Illinois Division of Natural Resources.

The teenage scientists delved into such topics as reduction and optimization of fertilizer, insecticide, and herbicide use, and enhancement of crop yield through integrated pest management. With the help of their parents or other adults, the fledgling researchers put out plots, took necessary tests (such as soil tests and nematode assessments), harvested the crops, and monitored results. Each student also made a presentation at a field day and prepared a research results paper.

Statistical analysis was emphasized throughout the project. The teenagers picked up the basic principles of analysis at two training sessions. Participants were exposed at every opportunity to the requirements of a properly prepared, statistically analyzed research trial.

The teenagers learned firsthand of the troubles and tribulations encountered in agricultural research. Angela Worrell, a 13-year-old member of Liberty Hustlers 4-H Club in Winchester, got an unexpected surprise when ponded water wiped out a large section of one trial. Another youngster, Aaron Gregory, a 15-year-old Bluffs FFA member, gained a new appreciation for weeds after his postemergence herbicide study was thwarted by a lack of such intruders. Jill Stice, 16 years old and a member of the Scott County Eagles 4-H Club, lost some replication when her father picked corn and combined several replications on one weigh ticket.

Learning the value of statistical analysis the hard way, the participants and their families were thoroughly disappointed to find that of the six trials, only one had significant results. Most trials, however, were viable and well done but lacked adequate replications--something difficult to accomplish over the length of

only one summer.

Eddie Mack Young, who assisted his son, Brad, a member of the Winchester FFA, commented, "I didn't realize how much precision is involved in ag research. After seeing the effort that was put forth on these plots, I can see why the amount of research from our colleges is limited." Jill Stice's father, Paul Stice, added, "After seeing what's involved in performing research, I find myself questioning manufacturers' claims even more closely."

As a result of the program, a large cross section of Scott County and other nearby residents got a closer look at sustainable agriculture through high school classroom sessions, plot tours, publication of plot results, and presentations at the field day.

The program has changed some attitudes, too. Help was given (perhaps grudgingly at first, but given nevertheless) by the Farm Bureau Board, Soil and Water Conservation District Board, and various businesses. Enthusiasm by members of these groups grew with every meeting. And in recent months, several members have come forward with their own ideas for sustainable agriculture programs.

The key to changing attitudes is knowledge--the more that is known, the less that is feared. Through the Scott County sustainable ag program, teenage researchers, their families, and friends are beginning to judge sustainable agriculture from a knowledge base rather than by emotion alone.

Gary Bickmeier, Scott County Extension adviser, agriculture

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The Case of the Restless Researcher

Anita Povich

Shannon Douglass meticulously counts eggs of the corn earworm moth in her investigation of insect egg-laying behavior.

One sunny afternoon in Orlando, Florida, in 1987, Shannon Douglass accepted a luncheon invitation from the director of research at Ferry-Morse Seed Company in California. Douglass had just delivered a paper on her sweet corn research at the American Society for Horticultural Science meetings, and the director was anxious to meet her and discuss her research findings.

You could imagine Douglass's surprise when the director asked if she was happy with her assistant professor's position at the University of Illinois College of Agriculture. "Would you consider leaving to join Ferry-Morse as a seed physiologist?" he said.

"I'm just a student," the bewildered Douglass answered.

"Well," countered the flabbergasted director, "would you consider joining Ferry-Morse after you finish your Ph.D.?"

"But I'm only an undergraduate," Douglass laughingly responded.

This is a story that College of Agriculture Associate Dean William L. George likes to tell about Douglass, because it illustrates the success of the college's undergraduate research program.

For although Douglass was only a junior when this story took place, she'd been an active researcher in the horticulture department for two years, thanks to the Jonathan Baldwin Turner Undergraduate Research/ Scholarship Program (JBT). Through the program, she was working on a major problem in sweet corn--germination and emergence in cold spring soils--with John A. Juvik, UI associate professor of plant genetics in the horticulture department.

Douglass is one of several dozen agriculture undergraduates given the opportunity to develop research projects with faculty and graduate students in the College. Her entry into undergraduate research was paved by George, who met her when she interviewed for a JBT scholarship in 1985. At that time, she was a dynamic and personable high school student recognized by George as someone "really interested in science and not intimidated by anything. She had a concept of science and the potential for solving problems that lent itself to undergraduate research," George says.

"She was looking at Cornell and the University of Wisconsin," George recalls, "but we wanted her at Illinois. She was among the best and brightest, an outstanding young woman who would welcome the opportunity to interact with faculty at a research level."

Although Douglass started her UI career as a horticulture major, she soon switched to agricultural science in order to take more chemistry classes, one of her favorite subjects in high school. "I loved chemistry," she says, "and studied it for three years. My teacher, Lee Borowski, was also my cross-country ski coach. In fact," she says with pride, "he recently won a national award for coaching the U.S. Olympic cross-country ski team."

Douglass graduated from Brookfield East High School, Brookfield, Wisconsin (a Milwaukee suburb), with only one B among her straight-A grades. Tall (5'9") and muscular, she played soccer, volleyball, and basketball, and also edited the school yearbook.

Douglass was an impatient university student, eager to learn more. After completing her first year, she phoned George from her Wisconsin home to ask if she could work in a laboratory. He introduced her to Juvik, who eventually became her undergraduate and graduate adviser.

"Douglass was interested in plant breeding when I met her," recalls Juvik. "George sent her to talk with me, and we immediately put her to work."

Douglass has an interesting anecdote about her introduction to research in Juvik's laboratory. She fondly recalls Juvik telling one of the graduate students to give her a hard time because "she's one of the dean's special students."

Douglass doesn't feel "special," and is proud of her inquisitive nature. "I like to know why things happen," she says. "Research is like detective work."

She and Juvik proved a good match. "I ask my students to work on projects that have relevance to real problems in agriculture," Juvik says. "The reduced performance of sweet corn in cold soils is a big problem for the sweet corn industry. This was an excellent project for Douglass because it helped her develop an interdisciplinary approach--she worked both in the field and in the laboratory."

Douglass recalls working with sixty sweet corn genotypes for two years at two different locations in the state, measuring percent emergence, plant vigor, and uniformity. In the laboratory, she learned valuable analysis techniques, such as gas chromatography and spectrophotometry.

Her research experience ranged from "the mundane to the sublime" as she became familiar with methodology, Juvik says. "She was able to bridge disciplines at the biochemical and genetic level and apply her findings to agricultural problems.

"Her undergraduate research with the shrunken-2 and sugary enhancer genes as she measured chemical characteristics in the lab revealed her love for pure research. Besides being an enthusiastic and effective worker, she's quite efficient at getting things done," Juvik says.

Douglass says that research taught her how to write a proposal, do a literature review, search for ideas, and consult with other researchers. "I learned to look at the data and ask why I'm getting these results."

After spending three years as a research assistant in horticulture and earning two JBT scholarships, a

National Garden Club Scholarship, and an Orville G. Bentley Undergraduate Research Award, she received her bachelor's degree in 1989. Not long after graduation, Douglass designed her own master's project. She happened upon a research topic in plant biochemistry while surveying the host range of the corn earworm, Heliothis zea, one of the world's most costly plant pests. Her curiosity led to a topic that combined her love for both chemistry and plants.

In surveying the host range of ninety-nine different plants, she found that tomato and corn plants were especially attractive to female moths. She was curious about what made the insects prefer these plants for oviposition, or egg laying. Juvik's lab had already identified certain compounds in the tomato that attract the moth and stimulate oviposition.

"Insects detect or choose plants by visual and chemical cues," Douglass says. "If we identify these chemical cues, we can encourage Heliothis zea to go to a weed, rather than a tomato plant, to lay its eggs."

This research reinforces the importance of identifying alternatives to pesticide use in order to reduce dependence on chemical pest controls. She studied the chemical structures needed to stimulate egg laying so that she could identify other compounds that elicit the behavior. She then designed a set of eight compounds and tested them for relative oviposition effectiveness by counting the number of eggs laid by the moths.

"Once you know the compound, you can develop a genotype with these features and have a control method," she says. During her research, she studied chemistry and ecology to learn more about plant chemicals and natural product biology.

Although Douglass spent hours and hours in the laboratory, usually 8 a.m. to 10 p.m. during the work week, she found time to play with the UI Soccer Club and watch her favorite soap operas on an old black-and-white television that she kept at her desk. Understandably, one of her goals after graduation was to earn some money after living on a graduate student stipend that ranged from $6,000 to $8,000 per year. She names Robert Frost as her favorite poet, and sees his lines, "and miles to go before I sleep, and miles to go before I sleep," as symbolic of her life in research.

This past year, 23-year-old Douglass made several changes in her life. On January 17 she successfully completed her master's thesis. On February 16 she returned to Brookfield, her home town, where she married Scott Campbell, a UI computer engineering graduate. And on March 18 she began her research-and-development position in Colgate-Palmolive Company's oral-care division, working with toothpaste. In hiring her, the vice-president of global product development said that "she'd be a good fit, she has a real science mind," and "her presentation to staff during the interview was the best we'd ever had."

Douglass says that she welcomes the competitive nature of private industry. "I grew up in an extremely competitive family where my brothers and I always competed for grades. Steve, 25, is a nuclear engineer with the Navy, and Ryan, 20, is a physical education major at the University of Wisconsin–La Crosse.

"Competition is a good motivating factor," she reveals, "but it wasn't always good for my self-image."

In person, Douglass is shy, reluctant to discuss her achievements. And they are numerous. She completed her UI studies with only a couple of B's and the rest A's after five and a half years of research in horticulture. She was on the Dean's List every semester, and numbers fifteen honors and awards on her resume, including the prestigious Bronze Tablet, the highest undergraduate honor. She's currently the author of seven research papers, two of which are published in trade journals. Yet this serious researcher describes herself as sometimes loud, sometimes obnoxious, and very stubborn.

Her UI professors disagree with her self-assessment.

"Douglass is unusual in that she's among the upper 3 to 4 percent academically," George says. "She's dedicated, has perseverance, and followed a rigorous curriculum throughout her bachelor's and master's

degrees. She's at the forefront of scientific investigation, thanks to her abilities and her introduction to challenging agricultural research."

Her adviser, Juvik, whose laboratory received a $200,000 grant to continue Douglass's undergraduate research project on cold tolerance in sweet corn, describes her in a simpler fashion: "She has a big research appetite; she'll do fine."

During the research project, Shannon Douglass spent most of her waking hours in the lab. With her is plant geneticist John Juvik.

Anita Povich, agricultural publications editor

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From Dishwashing to Lipids

Doug Peterson

Through hard work and determination, Dena Miller rose to the rank of researcher.

It started with dishwashing and ended with some award-winning research on an innovative new piece of food chemistry equipment.

As a University of Illinois undergraduate in food science in 1988, Dena Miller was looking for some extra spending money and a chance to observe what goes on in Burnsides Research Laboratory. So she took a job washing fats and oils out of test tubes and other lab glassware.

Within a semester, Miller's resourcefulness took her into the Jonathan Baldwin Turner Undergraduate Research/Scholarship Program. Through the program, she remained in Burnsides Laboratory, but this time she was the one putting oils into the tubes, rather than cleaning them out. She began doing work on lipids, which include both fats and oils and are found in a variety of foods.

From a health perspective, polyunsaturated fats are a healthier choice than saturated fats, which are linked to increased heart disease. The drawback, Miller says, is that polyunsaturated fats are much less stable than saturated fats. They go rancid faster, leading to off-flavors.

"When fats are exposed to light and oxygen, they begin to decompose," says Ed Perkins, a UI professor of food chemistry and nutritional sciences, as well as Miller's research adviser. "The question is, how long can you store fat or oil before it goes rancid?"

To measure how quickly various fats and oils go rancid, the food industry has traditionally relied on the active oxygen method (AOM), which Miller says is "a very tedious, labor-intensive method."

That's why the Archer Daniels Midland Company in Decatur has developed a new technique-- the oil stability index (OSI). This automated approach removes much of the tedium and saves labor.

Miller's job was to work with one of the two OSI prototypes in existence. She put the equipment through a battery of tests to see how it stacks up against the traditional active oxygen method.

After testing three different soybean oils with the OSI prototype, Miller says they found that the new approach was a clear success, for it "correlates quite well with the older method."

The project went smoothly, she says, except for the usual equipment headaches and a surprise flood in the lab room. Water used as a coolant overflowed during one night and coated the floor by morning.

But glitches or not, this kind of research gave Miller a foretaste of graduate school, preparing her for the master's degree work she is now pursuing in food science at Cornell University.

"As an undergrad working on this project, I put in ten to fifteen hours of work per week," Miller says. "I felt like a graduate student, working at the lab until midnight and on Saturdays. This research taught me to think on my own and work independently."

"It took a lot of dedication for her to come in here every day," says Steve Hill, a UI graduate student in food science who helped supervise Miller. "Most undergrads don't even step foot into this kind of lab - a cross between organic chemistry and food chemistry."

"It's unique to have an undergraduate do scientific research...period," adds Perkins.

The inquisitiveness that drew Miller into Burnsides Lab goes back to her life on a farm near Niantic, Illinois.

"I was always reading food labels," Miller says. "In high school, I was always wondering how my father's corn made it into a box of cornflakes. I wondered how cheese puffs puff. I wondered what potassium sorbate was. And I liked to cook and experiment."

During her undergraduate career, Miller didn't exactly get an inside look at how her father's corn makes its way into a box of cornflakes. But she did get a good look at how low-calorie ingredients are made, how corn sweeteners influence product shelf life, and how cocoa processing affects pudding texture and flavor.

Those unique perspectives came from summer internships at three different food companies-- the R.J.R. Nabisco Company in New Jersey, A.E. Staley Manufacturing in Decatur, and M & M Mars Inc., in New Jersey. As an intern, she sampled everything from the formal, suit-and-tie environment of Nabisco to the looser, more informal life at a candy company.

"They gave us interns a surprising amount of responsibility," Miller says.

On-the-job intern experience nicely complemented her research experience in Burnsides Lab. And topping it all off was a healthy amount of recognition.

In 1990, Miller's work with the OSI prototype earned her second place in the College of Agriculture's Orville G. Bentley Undergraduate Research Award program. In addition, the Institute of Food Technologists (IFT) chose her research paper as the best among Midwest undergraduates. And at the national IFT conference in Anaheim during June of 1990, she took second place with her presentation.

At Cornell, Miller is continuing her emphasis on "lipid oxidation" - the process that causes some food to go rancid. In particular, she is looking at the effect of dietary iron on pork.

"Because pigs are susceptible to anemia at a young age, hog producers often overshoot the level of iron that they put into a pig's diet," she says. "As a result, more iron is found in the meat. We're looking at how this affects lipid oxidation - how it affects the speed at which the meat goes rancid."

Miller has had a knack for charting a straight course in her career. She chose food science as her major during her first year at the UI and has not diverted from this track. She now hopes to complete a doctoral

degree, then land a job in industry in research and development.

This time around, however, she'll skip the dishwashing job.

Doug Peterson, Extension communications specialist

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Selling Young People on Science

Orville G. Bentley

Many agriculture colleges have, to their credit, provided undergraduate students opportunities for exposure to research. Such experiences frequently lead the students into careers as science teachers or scientific researchers. But the anticipated demand for more highly trained people in the future, especially in science and technology, is greater than can be supplied by students now in the science-education pipeline.

Erich Bloch, former director of the National Science Foundation, recently stated his concern about the decline of science education in an article published in the journal Science: "We are not mobilizing the human resources we need to compete effectively in a modern world." Further, "our high schools offer too few science and mathematics courses,...student interest in science and engineering is declining,...and only about 15 percent of college freshmen plan a major in science or engineering."

A former president of the American Association for the Advancement of Science, Richard Atkinson, adds that future shortfalls in the number of trained scientists and engineers "will have a major impact on economic growth, international competitiveness, and national security." (See graph.)

Obviously, educational institutions need to be actively searching for new ways to persuade students to pursue science as a career. The UI College of Agriculture is doing just that.

The College is stirring up interest in science by giving undergraduates a taste of research normally reserved for graduate students and professional scientists. The Jonathan Baldwin Turner Undergraduate Research/Scholarship program (JBT), for example, involves the selection of undergraduates on a competitive basis to develop research projects and carry them out in consultation with their faculty and scientific advisers.

After the research is finished, reports on their projects are judged by a college-level committee as a basis for recognizing the quality of their work. The winners are recognized by receiving the Orville G. Bentley Undergraduate Research Award, which carries a cash prize that has varied from $50 to $250. Over the past eight years, eighteen students have received such a prize.

An impressive outcome of the JBT and Bentley awards programs has been the selection of thirty-eight research reports for presentation at national or state scientific meetings. Few undergraduates ever receive such recognition. To top it off, twenty-three reports have been or will be published in scientific journals as papers or abstracts.

The breadth of the students' research is equally impressive. Topics have included nutrition, soil fertility, farm management, animal science, agronomy, food science, and home economics.

Research provides undergraduates a hands-on opportunity to "put education to work." Further, it introduces the student not only to research methodology but also to the discipline needed for evaluating and reporting data.

The College's effort to steer more students toward science careers seems to be working. Nearly all of the students who have received the Bentley undergraduate research prize and have earned their degrees are now employed in science-related positions or have entered programs for graduate education in science.

Agriculture educators across the country have a challenging opportunity to encourage students to seek productive and rewarding careers in agricultural science and education. One way to do so is through programs such as the JBT research awards and the Bentley prize. The potential benefits will be to enhance the competitiveness of U.S. agriculture domestically and in world commodity markets and to develop the scientific and technological leadership needed for the future.

Orville G. Bentley, dean emeritus of the College of Agriculture

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A Glimpse into the Lives of Three Young Researchers

Nancy Nichols

No two scientists think exactly alike. Even when doing research in the same field, using similar laboratory techniques, and conforming to the same rigorous standards, scientists differ in how they organize and carry out their experiments. Each takes his or her own path toward discovery.

The following profiles show similarities and differences among three young researchers at the University of Illinois. Each earned a College of Agriculture degree and, in the process, conducted scientific research through the Jonathan Baldwin Turner Undergraduate Research/ Scholarship Program. But the diverse topics they chose to study--wool, corn, and restaurants - reflect their distinct personalities, backgrounds, and professional interests.

Renita Jones Jinkins

Age: 21.

Hometown: Greenup, Illinois.

High school: Cumberland.

Achievements in high school: Class valedictorian; Illinois Future Farmers of America degree; FHA chapter president; National Honor Society secretary; Cumberland County 4-H secretary.

Agricultural background: Parents own 120 acres of tillable farmland; raised sheep as a hobby.

Current status: Bachelor's degree from UI in textile and apparel marketing (December 1990); working on doctoral degree in textile science at the University of Georgia.

Undergraduate research topic: Selected properties of crossbred lamb's wool.

Why I do what I do: "I was in the UI honors program, and they have a big push toward research. Once I got into wool research, I decided it was something I really wanted to do."

Career plans: "In the short term--in my Ph.D. program--I'd like to look at fabric 'hand' and drape, for which there seems to be a very direct application. In the long term, I want to teach and do research at a university, and eventually become dean of a home-economics department."

Distinctions at UI: Orville G. Bentley Undergraduate Research Award; Chancellor's Scholar award; Phi Upsilon Omicron National Scholarship.

Latest accomplishment: American Home Economics Association national fellowship.

Favorite place to study: In the agriculture library carrels, "where no one can see you."

Favorite animal: Corriedale sheep.

Last book read: *It's Always Something,* by Gilda Radner.

Favorite publication: *Ms*. magazine.

Interests: Sewing, walking, volleyball, backpacking.

Favorite musician: Clint Black.

Favorite movie: *The Sound of Music.*

Favorite food: Italian.

Favorite place in Illinois: Parents' home.

Favorite place outside Illinois: Northeast Georgia mountains.

Greatest lesson ever learned: "That you don't have to give 100 percent all the time, that you're not able to give 100 percent all the time. There are only so many places you can spread yourself. Not everything can get equal attention."

Thoughts about creativity: "For inspiration, usually I go off by myself. Sometimes I sit up in the textiles lab, like at 11 or 12 at night. I figure that if I'm in the textiles lab, maybe I'll get vibes coming in that will inspire me."

John Rossi

Age: 22.

Hometown: Chicago.

High school: Marist.

Achievements in high school: "To be terribly honest, I was a very average student in high school. I was on the wrestling team for a couple of years, but most of the time I worked. All the children in my family pay for their own schooling."

Agricultural background: Urban gardening.

Current status: Bachelor's degree from UI in restaurant management (May 1991).

Undergraduate research topic: Consumer preferences for beef and pork products served in restaurant

Latest accomplishment: Bronze Tablet award (highest UI undergraduate honor).

Favorite place to study: "The stacks in the graduate library, where there are just floors and floors of old books that hardly anyone reads. You can hide in there very easily."

Favorite restaurateur: Jean Banchet, former owner and master chef of Le Francais restaurant in Wheeling, a Chicago suburb. "Excellence was all he would settle for. If it could be done, he did it. If it wasn't going to be perfect, he wasn't going to do it."

Most memorable moment in college: Getting locked in the graduate library stacks at night during finals week.

Second most memorable moment in college: Getting locked in the undergraduate library stacks the next evening.

Favorite animal: Dog.

Favorite plant: Crocus sativus (saffron).

Last book read: *The Firm,* by John Grisham.

Favorite publication: *Gourme* t magazine.

Hobbies: Fishing, hunting.

Favorite music group: Genesis.

Favorite movie: *The Godfather.*

Favorite food: Italian pastas.

Favorite restaurant: Spiagia in Chicago.

How I spend my spare time: Reading cookbooks; cooking at home for the family.

Favorite place outside Illinois: Milwaukee, for its zoo and its marvelous German restaurants.

Thoughts about creativity: "To me, creativity calls to mind the kitchen. It's probably the only place where I am particularly creative. I consider what I do in the kitchen to be art."

Juliann Czyzewicz

Age: 25.

Hometown: Niles (northwest Chicago suburb).

High school: Niles North in Skokie.

Achievements in high school: Captain of the swim team and member of diving, gymnastics, and soccer teams; clarinet player in band; member of the Environmental Club.

Agricultural background: "Being a city kid, I didn't even know what agronomy was."

Current status: Master's degree from UI in plant physiology (May 1990); working in UI agronomy lab studying nitrogen fertilizer's effect on corn kernel and cob development.

Undergraduate research topic: In vitro identification of factors governing seed size in corn.

Why I do what I do: "I did well in high school in science. It's monotonous work and it's boring, but I've been brainwashed--I love it."

Favorite TV show: "Cheers."

Last books read: *Socrates Meets Jesus,* by Peter Kreeft; *Chronicles of Narnia* , by C.S. Lewis.

Favorite publication: *Science News.*

Hobbies and interests: Bowling; singing; playing flute and clarinet; photography; psychology; throwing "Christmas-in-July" parties.

Favorite music groups: Chicago; Michael Card.

Favorite movie: *Dead Poets Society.*

Favorite food: Nale´sniki (Polish crepes).

Favorite restaurant: Walker Brothers on Chicago's North Shore.

How I spend my spare time: Directing a church choir and putting together jigsaw puzzles.

Favorite place outside Illinois: Dubuque, Iowa; "big caves" anywhere.

Greatest lesson ever learned: "No matter how many factors in the environment you control --the light, the water, the temperature--the plant will do whatever it pleases."

Thoughts about creativity: "Problems I see inspire creative thinking on how to solve them, from small problems in the lab, like how to go about setting up an experiment, to large problems like feeding the world. I usually do my creative thinking either on my bedroom floor or at my office desk, with classical music in the background."

Nancy Nichols, agricultural publications editor

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Improved Embyo Preservation Process for Livestock Industry

Tina Prow

Growing up on a beef cattle farm in Williamston, Michigan, Christine Simmons was used to working with animals. In fact, she grew up thinking she might be a veterinarian. So she was a little surprised by her reaction during her first encounter with laboratory mice at the University of Illinois.

"I really had to work at getting to where I could handle them," said Simmons, 22, a 1990 UI graduate.

Becoming comfortable with mice was only one hurdle that Simmons, now a graduate student at Michigan State University, overcame while she pursued a degree in animal sciences at UI. Without any experience in laboratory research, she undertook a project and developed the skills to accomplish results that will help scientists in their efforts to refine techniques for long-term freezing and storing of embryos.

"After I took the regular animal science classes, I wanted to do something else. But there were no other classes for undergraduates," she said. She took her problem to Charles Graves, one of her instructors, and he suggested research under the Jonathan Baldwin Turner Undergraduate Research/Scholarship Program.

Her successful proposal outlined a study of problems associated with vitrification, an experimental method for fast-freezing of embryos by placing straws containing embryos directly into liquid nitrogen rather than slowly decreasing temperature during the cooling process. A new technique, vitrification was first used in a laboratory in 1985. During the vitrification process, embryos are placed in a fluid and cooled very rapidly to a solid without the formation of ice crystals.

"Christine committed many evenings and weekends to her work and displayed dedication, self-discipline, and interest," said Graves, a UI animal physiologist and Simmons' research project adviser. "Her work has enabled us to greatly improve the technique for freezing and storing embryos, which has important implications for the livestock industry."

Already familiar with artificial insemination procedures on the farm, Simmons envisioned a similar low-cost process for storing and then transferring embryos to recipients. Her research project focused on preventing cell-damaging ice crystals, common in the slow-cooling process, from forming in embryos. But her first problem was to find a way to do the research.

"There were a lot of little things I had to do before I got started--find the equipment, make the medium for freezing the embryos, and even develop my own skills in handling petri dishes and cultures and microscopes. It took a lot of time, and not everything worked right the first time or worked as I thought it would," she said. "But along the way, I picked up the skills I needed and found the factors I wanted to look at; the preparation proved to be one of my most valuable learning experiences."

After she developed a system for conducting the studies--and established a rapport with the mice--Simmons devised control studies based on findings reported in literature and parallel studies that varied temperature and time factors.

She found that storing embryos more than 24 hours before vitrification decreased survival compared to embryos stored less than 24 hours or not at all. Embryos cooled to 4 degrees C before being placed in a protective fluid had better survival rates than the controls, which were added to a protective fluid at 25 degrees C. Similarly, embryos equilibrated in fluid for 5 minutes had better survival than control embryos kept in fluid for 10 minutes. A sucrose solution added during thawing to slow removal of the cryoprotective medium from the embryos decreased embryo survival.

"This is an important technology for improving production efficiency and cost on the farm," Simmons said. "With the success of the smaller animal embryo systems, it's just a matter of time before a producer or

veterinarian is able to retrieve embryos, freeze them, and then implant them into the recipients at any time, just as they do with artificial insemination now.

"But the research also has larger implications. Someday, it might be possible to preserve large organs, such as the heart, in a similar manner."

Simmons had an opportunity to discuss her findings with other scientists during the 1990 National Animal Science Meeting, where she presented the first of two papers to come from her research. That same year, she also presented a poster at the Midwest Animal Science Meeting and made an oral report to the College of Agriculture's JBT Undergraduate Research Committee.

"The research project helped me decide what I wanted to do after graduation. I had applied to vet school, but because of that whole experience with research I decided to go to graduate school instead," Simmons said. She is earning a master's degree in reproductive physiology at MSU, trading laboratory mice for the more familiar cattle to study the effects of bovine somatotropin during dry and lactation periods.

Simmons said her plans include working on a doctoral degree and pursuing a career in research, possibly with industry or combined with teaching at a university.

Her success and interest in research have come as no surprise to her UI academic adviser, Douglas Parrett. Parrett, a beef cattle researcher, met Simmons when she showed cattle in high school. Even then, she struck him as "extremely bright, personable, and full of potential," and he took every opportunity to talk with her about academic and research opportunities at UI.

"From the beginning, Christine exhibited excellent academic skills. She was interested in science and really fit the mold for research," he said. "But at the same time, she wasn't a bookworm--she's outgoing and was able to find time to be active in her sorority, student clubs, and other extracurricular activities.

"Christine is a rare find."

Tina M. Prow, science writer, Agricultural Experiment Station

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Keeping Up with a Changing Work Force

Kandeh Yumkella

Our food and agriculture system has advanced dramatically in recent years. Breakthroughs in biotechnology are meeting the demand for better agricultural products. Redesigned crop production methods are becoming more friendly to the environment.

Although the new technologies are getting the fanfare, the workers who will be using the technologies are equally important. In the future an increasing number of those workers will be minorities.

By the end of the decade, 85 percent of all new entrants into the U.S. work force will be women, minorities, and recent immigrants. These demographic shifts also affect the public school system. In the year 2000, minorities will constitute more than 40 percent of the enrollment in many public schools in major U.S. cities.

As our economy becomes more sophisticated and technology-oriented, and as competition in international markets increases, the need for highly trained minority professionals will be great. Our competitiveness in the global marketplace will hinge to a great extent on the contributions that these future technicians and managers make to the national product.

Recognizing this urgent need, the UI College of Agriculture is intensifying its efforts to recruit minority students to both undergraduate and graduate programs. In the 1980s, several initiatives were undertaken through the Minorities in Agriculture Program to vigorously recruit minority students and retain them. The goal has been to increase the number of minorities in food, agricultural, and human-sciences curricula. It is hoped that these students will form a pool of qualified minorities for faculty or professional positions in academia, government, and industry.

One of the initiatives to recruit and retain such students is the Minority Apprenticeship Program (MAP). This six-week program is jointly administered by the College of Agriculture and the College of Veterinary Medicine. It targets students who have completed their junior year in high school and is designed to expose the student to scientific research, careers in the food and agriculture industry, and college life. Since its inception in 1987, MAP has had seventy-seven participants (twenty-three in 1988 and 1989, and thirty-one in 1990).

The students receive hands-on experience working with faculty and graduate students in such areas as tissue culture, DNA coding and fingerprinting, food processing and engineering, nutritional analysis of food products, and microcomputerized video-imaging. In addition to their daily research responsibilities, MAP participants are also involved in computer instruction, career awareness sessions, and field trips.

The students submit weekly reports about their work, and at the end of the program they prepare a write-up of their research. A panel of judges selects the three best research reports, and the authors are asked to present their work at a farewell luncheon attended by College administrators, faculty mentors, and donors. All participants receive a stipend and a certificate of recognition.

MAP has been an effective recruiting tool. In 1989, 36 percent of the minority members of the College's freshman class were former MAP participants. Thirteen of the twenty-seven students admitted for fall 1991 have participated in the summer 1990 program. And sixteen students in the first two graduating classes from the Chicago High School for Agricultural Sciences have enrolled in the College of Agriculture. Each year several other MAP participants have enrolled in agriculture programs at other universities.

The vast majority of financial support for the program has come from nonrecurring funds from individual departments in the College, the U.S. Department of Agriculture, and the National Institutes of Health.

Several agriculture-related companies have sponsored students interested in certain disciplines. These

sponsors have included John Deere, Nutrasweet Company, Archer Daniels Midland Foundation, and Nabisco Brands. Other companies, such as Monsanto Agricultural Company, Caterpillar, and Frito-Lay, have given facility tours to program participants.

MAP participants have given the program rave reviews. Lebecca Gills, a 1990 participant from Rich East High School in Park Forest said that the strength of MAP was that it gave the students an insight into what they took for granted. "As I learned more about agriculture," said Gills, "I realized it was not just for farmers."

Another student, Natasha Buckner of the Chicago High School for Agricultural Sciences, said that visiting agriculture-related companies and learning more about computers were the most exciting parts of the program.

The College continues to vigorously seek funds to expand and improve MAP. A math enrichment class has been introduced for second-time participants who have also been admitted into the College. And plans are under way to expand participation in coming years.

The biggest strength of MAP is that it gives minority high school students a chance to experience college life. Getting a college education and studying agriculture become viable options for their "life after high school."

Kandeh Yumkella, assistant to the dean for minority affairs

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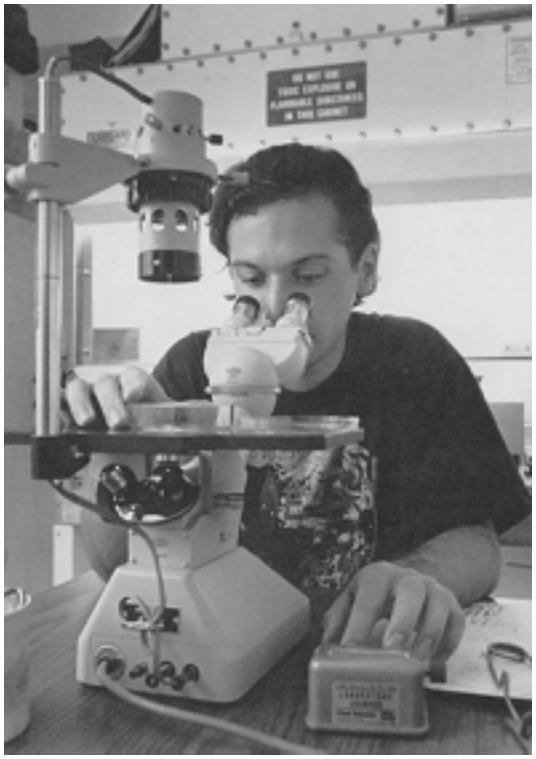
Gene Research to Help Animal Breeders

Claudine Cole



Allan Kaspar examines cells through a microscope in the molecular immunology lab.

This spring, a University of Illinois junior began an experiment that could lead to exciting applications in the livestock industry.

Allan Kaspar, a recipient of the Jonathan Baldwin Turner Undergraduate Research Scholarship (JBT), is conducting a gene research experiment that could provide more dependable information for animal breeders to use in selection. The experiment involves studying genes that influence growth.

The agricultural science major's excitement about his research is obvious as he describes the project. "I've never experienced discovery," Kaspar said. "I'm most excited about the fact that it gives me a head start" on getting into graduate school.

"I could go all four years, get straight A's, and never 'do science'," he said.

Since his freshman year, Kaspar, 20, has helped out with other researchers' experiments in the laboratory of his adviser, Larry Schook. But just "hanging around," as Kaspar calls it, had in some ways been frustrating. "Procedures are time-consuming. One little experiment can take a week," he said. "So I missed out on parts of the process," including seeing the result of some experiments.

Now that he is in charge, the situation is different.

Kaspar's experiment can be worked on for two to three hours a day and then left, said Schook, a UI professor of animal science. It should allow Kaspar to see the "big picture" over a long period of time.

The junior's motivation for applying for the JBT scholarship, which provides $1,000 for lab costs along with

a $500 tuition reduction, partly stemmed from his wanting more explanation than classes give. "That's not real experimentation, when you know what the results are going to be already," Kaspar said with a laugh.

He first became interested in studying biotechnology while still a student at Pleasant Plains High School in his hometown of Springfield, Illinois. Besides studying basic genetics in a biology class, Kaspar said he also spent time reading intriguing news reports about early field tests of engineered bacteria and other feats of biotechnology.

During his three years at UI, he has received the Raymond J. Fitzpatrick Family Scholarship for demonstrating interest in agricultural environmental problems and their solutions. He also has won a Colgate-Palmolive Undergraduate Laboratory Research Award from the Biotechnology Center.

Kaspar's project involves studying genes related to growth and the point at which they are expressed in the development of mice embryos. Specifically, genes that influence muscular development and weight gain are being analyzed, along with about eight others that influence growth in some way.

Schook said the results should help livestock breeders by showing at what point muscular development and weight gain can be manipulated in animals. Embryos are already screened in the dairy industry for the presence of a certain form of casein, a protein in cows' milk that is necessary for cheese production.

Schook said the screening could save money by eliminating less-efficient animals, something every producer hopes for.

But Schook hastens to add that the main purpose of the experiment is to provide Kaspar the opportunity to do research himself. He said the project has made Kaspar - who plans to study cell and structural biology in graduate school - more committed, less nervous, and more independent.

How does Schook, a senior faculty member, feel about working with undergraduates? "Oh, it's great!" he said. He enjoys introducing them to research, making them competitive graduate school candidates. Graduate programs want to see the distinction of years in a lab--experience. "Having good grades and being a good researcher aren't necessarily the same thing," he said.

"It's one of the reasons I came to the University. There are a lot of good students," he said. It irritates him when talk of teaching leaves out instructing students like Kaspar to become scientists.

"Allan has the tools to get into really top programs," Schook said. "He's quiet around us, but he's very conscientious, very dependable."

And it shows. Kaspar is exasperated with not knowing the details of his project well. He would like to have all the answers today.

But, he said, if he knew it all, then there would be no reason for research.

Hands-on lab experience helps undergraduates like Kaspar get accepted into top graduate programs.

Claudine Cole, agricultural communications graduate, and staff writer at Drovers Journal in Shawnee Mission, Kansas

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In Progress

Project to Improve Water Quality in East-Central Illinois

Over the next four years, researchers from several state and federal agencies hope to improve water quality throughout the Little Vermilion River in east-central Illinois by helping farmers to adopt improved agronomic and pest-management practices that reduce soil erosion and agrichemical transport.

The Little Vermilion River watershed is the focus of a recently awarded federal project called the Little Vermilion River Agricultural Nonpoint Source Hydrologic Unit Area. The watershed includes 122,240 acres in parts of Vermilion, Champaign, and Edgar counties. Georgetown Lake, an impoundment on the river, serves as a water resource for the 4,200 inhabitants of Georgetown, south of Danville.

The Illinois EPA has classified the lake as impaired because of inadequate water-storage capacity and poor water quality. These problems have been attributed to siltation and high nitrate concentrations as a direct result of farming practices in the watershed.

Administered by the U.S. Department of Agriculture, the water-quality project involves cooperation among several agencies, including the Agricultural Stabilization and Conservation Service, the Soil Conservation Service, the Illinois EPA, the Illinois Natural History Survey, and the Illinois Cooperative Extension Service and Agricultural Experiment Station.

UI researchers J. Kent Mitchell of the Department of Agricultural Engineering and Allan S. Felsot of the Office of Agricultural Entomology will support the project by monitoring the transport of nitrates and pesticides into the river. They will focus mainly on the contributions of tile drainage to the nitrate loads in the river and lake. As greater areas of the watershed come under improved management practices, the researchers hope to document declines in the loads of agrichemicals leaving the fields.

Allan S. Felsot

UI Student Wins Prestigious Award

Maxine Cameron, a UI doctoral student in animal sciences, has won a 1991–92 Purina Mills Research Fellowship carrying a $12,500 stipend. The fellowship will support Cameron's research in ruminant nutrition.

Cameron's research, which began this fall, focuses on the nitrogen requirement of microbes in the rumen (a cow's first stomach). With better information about the requirements of these microbes, dairy operators will be able to blend different protein sources to improve a cow's ability to digest feed.

The 27-year-old researcher is one of four agricultural students nationwide to win the fellowship. The competition is fierce, Cameron said. "I've been trying for three years to win one."

A native of Canada, Cameron grew up on a dairy farm north of Calgary, where her family milked 100 Guernseys. She was a member of 4-H for 13 years.

She came to the UI after receiving a bachelor's degree in animal breeding and genetics from the University of Alberta in Edmonton. At UI, she developed a keen interest in ruminant nutrition, the subject of her master's degree and doctoral research at the UI Department of Animal Sciences.

"It's been nice coming into a huge department. This is a very creative atmosphere because you have so many people to bounce ideas off of," she said.

After completing her doctoral degree, Cameron plans to get a research job in industry and eventually run a dairy consulting company.

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