

# *Illinois Research*

Agricultural Experiment Station  
Winter 1993/94

*Returns on  
Investments  
in Research*

*"Daddy and Me"  
program promotes  
happy families*

## THE COVER

*Brent McBride, in background, is director of the Child Development Laboratory and assistant professor of human development and family studies. Pictured with him are Alexandra Kelly and her father, Kevin, who participate in a model parenting program known as "Daddy and Me." See story on page 4.*

### **Illinois Research**

Winter 1993/94

Volume 35, Number 4

Published quarterly by the University of Illinois Agricultural Experiment Station

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# Returns on Investments in Research

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## Research Pays in Many Ways

**T**he Illinois Agricultural Experiment Station is the research arm of the University of Illinois College of Agriculture. We deal with the basic things of life — the provision of food, clothing, and shelter, and the well-being of people, families, and communities. We look for ways to

- Advance technologies to expand markets for agricultural products and employment in the agricultural and food sector in Illinois
- Promote the economic development and management of agricultural and food systems and rural communities in Illinois
- Increase the capacity of crop and animal systems to respond to changing world food demands
- Improve nutrition, food quality, and human health
- Provide for sustainable use of natural resources

About seven hundred people work for the Illinois Agricultural Experiment Station. These include scientists and other professionals, graduate students, technicians, and clerical workers. In the fiscal year ending September 30, 1994, the Station will expend about \$40 million conducting agricultural research. Roughly half of this amount will come from regularly appropriated funds from the state and federal governments. The citizens of Illinois and other states will pay these amounts as part of their taxes. The other half of this support will come in the form of grants, contracts, gifts, and sales of products and services from research operations.

To obtain support, we must demonstrate to state and federal legislators, agency administrators, and private sector managers that an investment in our operations will have a high return. When we request support, we are, in effect, asking for venture capital. Often our ventures are joint ventures, launched in cooperation with other institutions, agencies, and private firms.

The Agricultural Experiment Station has many clients and customers, each with somewhat different needs. Our customers include

- Consumers of agricultural products and services
- Producers, processors, distributors, and retailers of agricultural products and services

- The vast supporting infrastructure of agriculture (including rural communities, financial institutions, suppliers, builders, transporters, agricultural and trade organizations, consultants, branches of government, media, and other institutions of higher education)
- People with environmental concerns

The question is, Are we living up to the expectations of these many customers and clients? Does our work justify the investment of public and private funds?

One way to find the answers to these questions is to look at our track record. That is what we attempt to do in this issue of *Illinois Research*. Much of the issue is devoted to “anecdotal” evidence, that is, stories of specific research efforts and the benefits they generated. While these are interesting and reveal a rich history of dedicated effort and valuable contribution, they do not tell the whole story.

Most of the economic benefits of publicly supported agricultural research come in the form of small, incremental improvements in agricultural productivity and in the quality, safety, affordability, and convenience of food products and services. These benefits are modest for any one individual in any one year, but aggregated over all consumers and all the people who work in the industry of agriculture and over a period of years, they are enormous.

Some researchers, both inside and outside the public agricultural research establishment, focus on measuring these aggregate benefits. When this research began back in the 1950s, researchers tried to estimate the benefits of specific new technologies, such as hybrid corn, and attributed those benefits to the research leading to the new technology. Now, economists attempt to measure societal benefits from public research, private research and development, public extension, and farmers’ schooling.

Through these studies, economists are able to measure both producer and consumer “returns to research” and can determine who is helped and who is hurt by new agricultural technology. They are able to measure costs and benefits for individual crops and classes of livestock and for individual states. They can also identify situations in which research



*The Experiment Station's clients and customers are a diverse group, ranging from people concerned about the environment to traditional agricultural producers.*

benefits are likely to “spill over” to other states, regions, and nations as well as other situations with few spillover benefits. Although there is still some disagreement on the interpretation of some of the findings of these researchers, there is considerable agreement on the overall effects of agricultural research.

So what is the bottom line? U.S. agriculture has experienced a century of uninterrupted growth in productivity — a really remarkable record. The output of U.S. agriculture is about five and a half times what it was a century ago, while the real value of inputs only increased 15 percent over that period. According to agricultural economists W.E. Huffman and R.E. Evenson, the average annual, pre-tax return on the public's investment in the whole package of agricultural research between 1951 and 1982 was 41 percent, an extremely high return by any measure.

As the techniques for measuring returns on investments in research improve, agricultural economists are incorporating information on the off-site and other indirect economic and social effects of agricultural technology. This provides a more accurate estimate of the distribution of the costs and benefits of various technologies.

Studies of the returns from agricultural research are valuable to all decision makers who influence agricultural research. The studies help identify research areas with the greatest likelihood of payoff. They also reveal the important roles not only of research but also of extension and human capital development in agriculture. They identify situations for which the linkages between research and practical outcomes need improvement. They reveal areas of research best conducted by private firms and those best conducted by public institutions and agencies.



Often the research and development leading to improvements in agriculture involve several institutions and private firms, so we cannot claim all the credit. We are part of a unique system of public and private agricultural research. We like to think that we are a very important part of the system, but it is the system that should get the credit.

Likewise, the past record is not reason for complacency. Agriculture is changing rapidly, in part due to agricultural research. It continues to face great challenges. The Illinois Agricultural Experiment Station must change also. It must improve, both in the way it organizes research and in the way it conducts research. We continue to work on that improvement. — Don Holt, director, Agricultural Experiment Station, and Sarahelen Thompson, interim assistant director of AES and associate professor of agricultural economics



# Farewell Ivory Tower: Innovative Research Has Practical Results

*Tina M. Prow and Sarahelen Thompson*

**I**f you think professors and scientists rattle around the ivory tower talking only to each other and thinking big thoughts that have little relevance to the real world, consider the researcher whose parenting studies prompted him to develop a program that helps fathers become more involved with their children. Or the entomologists whose on-farm research helps farmers understand when not to use insecticides.

Consider that the findings of agricultural economists in the areas of lending practices, risk, and financial management are applied almost as quickly as data are analyzed. Or that an animal scientist who developed a better swine and broiler nutrition plan receives invitations from all over the world to explain how the diet reduces production costs and pollution.

Consider that fruits and vegetables, already known to be good for you, can be even better when researchers improve the nutritive content. Scientists also are studying disease-prevention qualities in foods that may help reduce risk from cancer, cholesterol, and other diseases.

These projects are a small sampling of research conducted at the University of Illinois College of Agriculture. The College's historic land-grant mission of research, teaching, and extension attracts faculty with a broad range of interests and a strong sense of purpose. For these scientists, the College's laboratories serve as staging areas for research that leads to innovative products, practices, and thinking that challenge convention, revolutionize industries, drive change, and ultimately benefit society. Many scien-

tists also teach, bringing to the classroom the latest developments in a field — often developments from their own laboratories.

## Daddy Can Do It

Seeing research put to use as quickly as the data are analyzed is something Brent McBride has experienced since he started studying family relationships in the late 1980s. In fact, he considers parallel development of basic and applied research to be a goal.

"Everything I do has a purpose of: what does it mean to the real world; what does it mean to families struggling for redefinition of roles; what does it mean for people in the child development field," he says.

In the 1990s, he notes, parents increasingly are faced with changing expectations for what men and women do in the family. For instance, the message that fathers should be more involved with their children is everywhere in advertisements, television, movies, and magazines. Yet McBride's research with parents who record activities in time-use diaries shows the parenting workload is almost unchanged.

"If fathers are doing anything different, they're playing more with their kids, but all the functional work that relates to the kids still is done primarily by mothers," he says.

That is not to say that fathers are unwilling to do more, he adds, saying fathers often volunteer that they do not know how to do more. That admission

prompted McBride to develop an applied research project aimed at fathers. "There are a lot of messages saying do something different, but not a lot of information on how to do it. As a society, what I suggest we do is create mechanisms that help men make changes and increase parenting options for families."

The "mechanism" McBride created is a model parenting program, called "Daddy and Me," for fathers of preschoolers. His partner in the project is his wife, Rebecca McBride. An assistant dean for academic programs in the College of Agriculture, she participates not as part of her position but because "the work is rewarding." The McBrides' goal is to sensitize fathers to ways they can be more active participants in parenting. Each Saturday for 10 weeks, the fathers spend time in supervised, interactive play with their children. Then they meet with other fathers and a facilitator to discuss issues they identify as important to their roles as fathers.

The participating fathers often come from different age, economic, cultural, and social backgrounds. Even so, as a group and individually they generally report less stress related to their parenting role after going through the program, McBride says.

"We actually see changes in parenting," he says. "These fathers play with their children, but they also start taking on more of the responsibilities that are time-consuming and emotionally draining and don't necessarily involve direct contact with the kids."

The parenting research is a natural



*Four-year-old Jamie Rhoads of Champaign shows her father, Bruce, the fine art of painting. The father and daughter are part of a model parenting program offered by the Child Development Laboratory.*

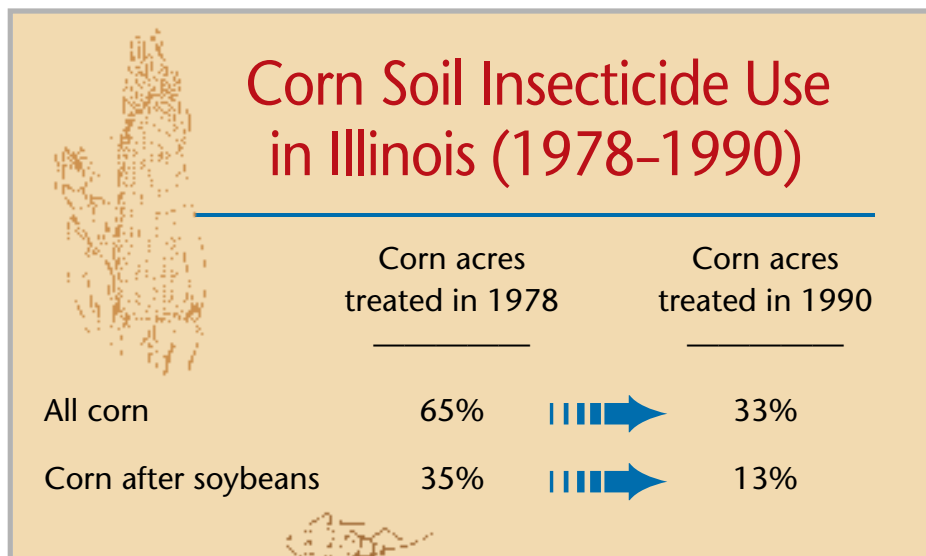
spinoff from the UIUC Child Development Laboratory that McBride oversees. A model program for early child care, the laboratory is “not only a good place for children,” he says, “but also reflects the College’s mission of teaching, research, and service.” Students from many colleges on campus come to the laboratory to observe. Some put classroom theory into practice through work-study projects. Faculty and graduate students worked on twenty-five research projects at the laboratory last year.

Genuinely dedicated to child and family welfare, laboratory teachers contribute to the College’s three-part mission by assuming a leadership role in the community. They participate in parenting and teacher workshops, serve on child-care advisory boards, and write for newsletters and magazines aimed at teachers.

### When Farmers Are Bugged

The intricate weave of teaching, research, and extension forms a strong backdrop for the College’s integrated pest management program (IPM). Developed in the 1970s to promote favorable economic and ecological outcomes from pest management, IPM is grounded in crop rotation, planting and harvesting schedules, pest-resistant varieties, natural enemies, pest monitoring, projected damage thresholds, and other strategies that minimize pesticide use. The strategies are developed and tested by scientists around the country, including entomologists at the UIUC. Research data from their studies provide Illinois Cooperative Extension Service specialists with a scientific base of information to help producers and crop consultants keep up with rapid changes in pest management recommendations.

One measure of the effectiveness of that research is the reduction in corn acres treated with soil insecticides. Fifteen years ago, Illinois farmers applied soil insecticides to 65 percent of the corn acres to protect against such pests as corn rootworm and black cutworm. Recent surveys show the number of treated acres has dropped to about 33 percent.



Instead of soil insecticides, many farmers rely on a soybean crop to interrupt the life cycles of pests that feed primarily on corn. “The research showed clearly that soil insecticides are not necessary on corn following soybeans,” says Kevin Steffey, a UIUC Extension entomologist.

Without UIUC research in the late 1980s, the numbers might have gone the other way, adds colleague Michael Gray. Interest in soil insecticides was heightened when researchers found a small percent of northern corn rootworm hibernated through two winters rather than one. The finding meant farmers relying on crop rotation for rootworm control might have more damage than usual, but did the damage warrant applying soil insecticides? UIUC researchers found out by going into 1,100 first-year cornfields and measuring rootworm damage. Their reports of low rootworm populations and little damage averted a potential shift to higher soil insecticide use, Gray says.

The number of acres treated each year with soil insecticides might drop even further as word spreads of a recent on-farm study of soil insecticide rates. Twenty-nine farmers reduced soil insecticide rates applied to continuous-corn fields without experiencing greater corn rootworm injury. In fact, Gray says, data show rootworm levels in most fields were not high enough to cause economic damage.

“We went into this reduced-rate study specifically to look at how effectively farmers could use lower rates to achieve root protection,” he says. “What we ended up finding out was that most producers aren’t needing soil insecticides to begin with. Most don’t have economic infestations.”

In addition to on-farm research, farmers and others interested in pest management work with UIUC entomologists to monitor several pests. For instance, hundreds of people around the state monitor black cutworm moth flights into Illinois each spring. This allows entomologists Steffey and Gray to project a date that populations likely to cut corn plants will strike. The “early warning system” has contributed to a drop in at-planting applications of soil insecticides for black cutworms.

The benefits from reducing soil insecticide applications in corn are significant, particularly in northern Illinois where about 90 percent of the continuous corn is treated each year, Gray says. “It saves money from a production standpoint, and it reduces the total pesticide load in the environment.”

Success of the Illinois IPM program is due in part to the close and constant contact Steffey, Gray, and their colleagues maintain with producers and crop consultants. The entomologists oversee one of the country’s premier on-farm research programs involving farmers. Unique to the UIUC IPM pro-

gram is a team of IPM Extension educators located off campus to help producers around the state identify and solve pest problems. In addition, the UIUC entomologists coordinate a newsletter, annual conference, workshops, and short courses for producers and crop consultants.

"We use our research to support our Extension programs and use our Extension programs to get feedback for research," Steffey says. "We want to make sure that all our programs are aimed to benefit the farms economically but also to benefit society at large so that society doesn't have to pay for mistakes."

## Of Barns and Banks

Growing a crop or raising livestock can mean long hours in the barn — and the bank. Long before the planter comes out or the feed order is placed, most farmers visit lenders for land, production, and other loans.

A decade ago, many of these farmers used a balance sheet only if their lender required it, and few understood how they were evaluated. Furthermore, the evaluation factors lenders used were unreliable for some cases. Today, however, farmers and lenders are more financially astute, in part due to UIUC research in farm financial management. Findings from a number of studies have allowed farmers to seek and obtain better financing and lenders to assess risk more accurately.

Peter Barry and David Lins are among a nationally recognized UIUC faculty working to improve the quality of information between borrowers and lenders by analyzing borrowing, lending, and investment practices of farmers and farm lenders. Their work is supported in part by the Center for Farm and Rural Business Finance, a cooperative effort of the UIUC and University of Arkansas. The center sponsors research in all areas of finance and credit affecting farmers and rural businesses. Although primarily focused on the agricultural finance system, their research findings also have application for consumer banking.

"If we can improve the system efficiency, everybody's better off," Barry

says. "As you get better information developed, better networking of how procedures to evaluate creditworthiness work and their uniformities, then that lowers the cost of farmers' borrowing. The effect is a combination of either lower interest rates or greater credit availability, or more suitable returns on borrowed money that make it easier to repay — easier in the sense of lower risk for lenders and a better overall system."

One focus of Barry's research is on how capital is made available to Illinois farmers. That includes studying the way lenders go about evaluating creditworthiness of farmers. Recent studies show a new trend toward letting interest rates adjust to the level of risk. According to Barry, this trend is a recognition of differences in creditworthiness among farmers: higher-risk farmers should pay higher interest rates to help compensate the lender for higher repayment risk.

With this shift in lending practices, how lenders evaluate creditworthiness becomes more important and makes Barry's research on credit-scoring systems particularly relevant. His findings show a high degree of similarity among lenders but differences in their use of terminology.

"The research shows more uniformity in the way creditworthiness is being evaluated than you might expect by just looking at the instruments and talking to the lenders," Barry says. "The implication is that farmers should shop around some. The terms will not be that different, but there's enough difference between the interest rates and the non-interest rate terms that farmers need to listen to what several lenders say to put it all together to make the right choice."

Helping farmers and lenders understand financial choices is an interest of Lins. During the farm financial crisis of the 1980s, he counseled farmers and lenders with research-based information to help them improve their financial management skills. His research at that time provided the Illinois Farm Development Authority with the data it needed to call for changes in a proposed loan guarantee program, a move that helped

save the state an estimated \$15 million in potential loan losses.

In the area of farm financial management, Lins is causing some lenders to rethink financial performance measures. Using UIUC Farm Business–Farm Management records, he has shown that an accrual measure of income is a better measure of profitability than a cash measure of income. Research data show a 60 percent to 80 percent discrepancy between the two measures, meaning farmers and lenders who make decisions based on cash basis information could have an 80 percent error in their measure of income, Lins says.

Lins also is challenging conventional thinking with his investment analysis research. Like many of his projects, this research resulted from questions posed by farmers and businesses. The research shows that farmland currently is a good investment for those with cash but a poor investment for anyone borrowing money to pay for it. Whether or not farmland is a good investment at any point in time depends largely on the returns to land ownership, the returns on other investment opportunities, and the cost of borrowed money. In today's economic environment, he suggests, farmers might be better off investing in machinery and livestock and renting rather than buying land.

"The perception is that you're always better off if you own land than rent land," he says. "But if you look at returns to ownership of land today, you can expect about 6 percent of market value from cash rent, and inflation will be another 2 to 4 percent, so you're at a return of around 8 to 10 percent. Take off 1 percent for taxes and you're back down to 7 to 9 percent return to the ownership of land. Now, if you borrow money to buy that land, you'll pay 7 to 9 percent to borrow that money.

"So if you've got cash to invest in farmland, it's a good deal compared to nonfarm investments like certificates of deposit. But to borrow money to buy land doesn't make a lot of economic sense."

Lins's research into rent versus pur-

chase of land has become a cornerstone of classroom discussion on investments. This link between research and teaching in all areas of agricultural finance contributes to a strong academic program at the UIUC. *Farm Futures* magazine ranked it "the best place to study ag finance" in its survey of agricultural colleges in the nation ("The Best Education," mid-March 1993).

Making sense of complex financial information is the impetus behind another one of Lins's projects — a spreadsheet-based model for evaluating refinancing of home and farm mortgages. A generic model with fewer limitations than any program currently available, it could work with almost any property being refinanced, he says. The new spreadsheet will be available through Extension when work is completed.

## Ideal Diet Improves Performance, Reduces Pollution

Another new, practical tool that far surpasses anything already in use is the Illinois Ideal Protein Diet for swine and broilers developed by David Baker. This diet, the UIUC animal scientist suggests, is "revolutionizing how animal feeds are put together" because it can lead to more efficient gains, cheaper meat, and reduced pollution from animal production. Although aimed at swine and poultry, the ideal protein ratio is causing pet-food manufacturers to rethink formulations and prompting calls from scientists working in human nutrition.

Baker's research and development of the ideal protein diet is built on studies conducted in the 1950s at the UIUC by H.H. Mitchell, H.M. Scott, and other pioneers in nutrition research. They identified many of the amino acids — the building blocks of protein — necessary to form muscle. That early research had little relevance to Illinois producers, who used corn and soybeans for a near-perfect amino acid pattern, but it was used in Great Britain to develop what became a world-accepted standard for figuring amino acid requirements from alternative feeds. In 1986, however, Baker began

to suspect that the standard was flawed. In particular, some of the amino acid recommendations looked too high, he says.

With genetically leaner pigs coming to Illinois, the availability of cheap synthetic lysine and other amino acids, and increasing concern about animal pollution, Baker decided it was time to revisit the early UIUC research, evaluate the accepted standard, and, if necessary, develop a better diet. He spent two years working with a chemically defined diet that served as a tool for developing an "ideal" pattern of amino acids for pigs and broilers — a pattern that met the animals' amino acid requirements without the excesses responsible for pollution.

The pattern he developed had lower levels of nutritional components compared to the standard, but pigs and broilers performed better on it. Now known as the Illinois Ideal Protein Diet, the pattern defines the requirement for lysine, an essential amino acid often short in swine diets, and then lists all other amino acid requirements as a percentage of lysine. Consequently, producers need to know only the lysine requirement to figure the amino acid ratios for any diet.

Because new genetic lines of pigs are leaner and more complicated to feed using traditional approaches, the ideal protein diet is a timely development, Baker notes. Body compositional factors and dietary factors that affect individual amino acid requirements have no effect on the diet ratios.

Another benefit to improved performance is the reduced nitrogen and phosphorus pollution in excreta of animals fed using the ideal protein diet ratios, Baker adds. Recognizing pollution from animal production as a threat to fish and groundwater quality, several European countries already have laws regulating nitrogen and phosphorus in animal waste.

"You could say that we've been working for 25 years to come up with these desired ratios; it's very basic, fundamental research," Baker says. "In the last four years, we decided to make it practical, and now our pig ratios are being used to formulate feeds through commer-

cial channels throughout the world. It's an example of how you can take fundamental knowledge and use it in the practical setting."

If calls, letters, and invitations to speak on the Illinois Ideal Protein Diet for swine and poultry and its potential for cat and dog diets are any indication, animal diets will change dramatically over the coming decade, Baker says.

## Food as a Prescription

Could foods be an integral part of the prescription for good health? Some UIUC researchers think foods known to be good for you could be made better, like the sweet corn that UIUC horticulturist Jack Juvik is studying with a goal to reduce calories and improve nutritive value. Juvik is one of more than fifty faculty members working with Functional Foods for Health, a joint program of the UIUC and UI at Chicago. These researchers are looking at foods that may have benefits for preventing disease and promoting health.

The belief that foods have health benefits is not new. For instance, the Europeans and Japanese have long maintained that certain berries have cardioprotection and anti-tumor properties. UIUC horticulturist Mary Ann Smith is studying the wild blueberry and bilberry, lingonberry, and cranberry to find a basis for that belief. She is identifying phytochemicals, naturally occurring secondary products in plants.

Her goal is to reproduce the phytochemicals in tissue cultures and then find ways to change the phytochemical content in cells. If the phytochemicals prove to have health benefits and Smith's tissue culture strategies are successful, one possible result from this research might be pharmaceutical production of extracts with the health-promoting phytochemicals. That could make berry production an alternative crop in Illinois. Or breeders might develop varieties with more of certain phytochemicals.

How the amount of phytochemicals in plants might affect health is an interest of UIUC horticulturist Robert



*It's a bird, it's a plane, it's Supermuffin! Well, not exactly. But nutritionist Sue Potter (pictured) is convinced that incorporating soy protein into our everyday diets could improve our health. The trick, according to colleague Barbara Klein, is to develop soy foods that are tasty enough to get people to change their diets.*

Skirvin. He is looking at the different amounts of phytochemicals in onions, blackberries, and strawberries. Eventually he will collaborate with UI-Chicago human-health researchers to assess different levels of phytochemicals for chemo-cancer prevention.

How much of a good thing is enough is also a concern of UIUC nutritionist Susan Potter. She is studying the effects of soy protein isolate on cholesterol levels. The first series of studies, conducted at the Veterans Affairs Medical Center in Danville, Illinois, showed blood cholesterol levels for twenty-five male patients eating soy-fortified foods dropped an average 11 percent.

That drop in cholesterol levels, accomplished with 50 grams of soy protein, moved some patients from high-risk to moderate-risk categories, consequently reducing their risk for cardiovascular disease. In a follow-up study conducted outside the hospital environment and using

lower soy protein levels (25 grams), cholesterol levels again dropped in subjects with high cholesterol levels. A new study will focus on effects of soy protein in women, including effects of estrogen-like compounds found in soy.

That soy protein reduces cholesterol is not a new finding, but the way Potter is studying the effect makes the finding more relevant than ever. Most early soy studies put subjects on diets that replaced all the animal protein with soy or used liquid formulations unlikely to be maintained by most individuals over a long period. But Potter's approach is to look at a typical U.S. diet and determine where soy might easily and acceptably be added every day — and that is in baked goods. To formulate recipes for baked goods that taste good even though they have soy protein, she is relying on Barbara Klein, a UIUC food scientist. Klein is using soybean protein isolate in breads, muffins, and other baked goods and also devel-

oping a quick-mix for breads. The soy protein is virtually undetectable in these baked goods.

The soy protein isolate used in Potter's studies is not commercially available, so it may be some time before Americans find soy-fortified breads and muffins on store shelves. But the company that eventually picks up the challenge to commercialize soy-fortified foods will likely find a market, Potter predicts.

"In a cafeteria study a couple of years ago, we offered soy bread and soy muffins, but people didn't really buy them. Yet when we put out educational cards, sales went up dramatically," she says. "People are interested when they are informed."

*Tina M. Prow, science writer, Agricultural Experiment Station, and Sarahelen Thompson, interim assistant director of AES and associate professor of agricultural economics*





# Ag College Recruits All-Stars for Winning Team

Anita Povich and Tina M. Prow

Although you won't find them performing to a crowd of cheering fans, the four scientists profiled here are in a league of their own. They are key players on the College of Agriculture's winning research team, which includes hundreds of scientists supported by a \$40-million annual research budget.

Each featured researcher is a prospect whose career bears watching. Their impressive stats include numerous publications, awards, fellowships, multimillion-dollar research grants, and recognitions for innovation and creativity. **Sharon Donovan**, a former National Institutes of Health fellow, was recently honored as a Future Leader in Nutrition from the International Life Sciences Institute, which gives only three awards a year. A top acquisition last year from his post as director of the Center for Wildlife Ecology at the Illinois Natural History Survey, **Richard Warner** is a seasoned veteran who blazed a trail in interdisciplinary environmental studies. A former high-school basketball coach, **Neal Shay** now uses his winning ways to coach graduate students in human metabolism. He joined the Illinois team after a two-year postdoc at Florida's Institute for Food and Agricultural Sciences. **William Sullivan** is an innovator in landscape design, environmental planning, and plant-people interactions. His high-energy approach and cooperation with other universities have caught the eye of major funding groups such as the U.S. Environmental Protection Agency.

No stranger to playing fields across the country, these researchers have gone to bat with the best at Stanford, the University of Florida, UC-Davis, the University of Massachusetts, the University of Michigan,

Kansas State, Iowa State, and in Urbana-Champaign with the UIUC home team.

These all-stars go well beyond the traditional view of a scientist in a white lab coat with test tubes and a microscope for company. They're in tune with real-world issues and are collaborating with grad students, post-docs, and colleagues to help solve complex societal problems.

What makes them outstanding? Their love of scientific discovery, dedication to the task at hand, and ability to work through frustration and disappointment — all part of the research game.

**S**haron Donovan was finishing up undergraduate preveterinary studies when a physiological chemistry course excited her about nutrition. A lecture on maternal and infant nutrition cinched a change in career paths. She followed up with postdoctoral research on a National Institutes of Health (NIH) fellowship at Stanford University School of Medicine, where she studied growth hormones with the pediatric endocrinology faculty.

Her graduate research focused on human milk and its advantages over formulas for premature babies. Formulas approach human milk in nutritional as-

**DONOVAN**  
Assistant professor, Division of Foods and Nutrition, and registered dietician

**Education:**  
• B.S., Ph.D. in nutrition, University of California-Davis

**Working philosophy:**  
Infant feeding is more than choosing breast milk or formulas. Each offers protein, fat, and other nutrients. However, formulas lack the hormones and enzymes found in human milk that may enhance infant development. There's nothing wrong with using formulas, but there's something really right about human milk. Recent studies have shown that breast-feeding has long-term health benefits.



pects, and most infants thrive on formulas, but formulas do not provide the same bioactive components as human milk, she says. These components play a protective role for at least the first 10 years of life.

The San Jose, California, native continued that research when she came to the University of Illinois at Urbana-Champaign in 1991. Donovan teaches two to three classes each year, and her research is gaining national recognition. She received a Future Leader in Nutrition award from the International Life Sciences Institute and recently collaborated on an invited ar-

ticle on growth factors in milk for *Annual Reviews in Nutrition*.

Her research interest remains focused on human milk, formula nutrition, and premature infants. One method she is using to conduct research is a piglet model developed in collaboration with UIUC animal scientists. The piglet digestive tract is similar to that of humans, so researchers can simulate the effects of such problems as premature birth, compromised nutritional support, and intestinal injury.

Among the projects Donovan finds most exciting are:

- **Insulin-like growth factors (IGF).** Found in human milk, IGFs stimulate growth. To find out how much, researchers measure and trace effects of IGF on growth, intestinal development, and enzyme digestive levels using the piglet model. Now in the second year of a four-year NIH grant, Donovan's team hopes eventually to develop formula products with IGF for premature infants.

"It may take a decade, but our goal is to develop a product to help infants," Donovan says. "If we can show the function in piglets, we can do future studies in infants, especially premature infants. They are compromised to begin with — very often they need surgery or have other problems — and human milk is a definite advantage."

- **Hormone therapy during recovery from malnutrition.** Malnutrition is the primary cause of child mortality worldwide and can cause permanent growth stunting. Research has shown that growth hormone and insulin-like growth factor therapy combined with nutrition can normalize growth. These studies may have future applications in developing countries, according to Donovan.
- **Curriculum for teenage mothers.** Still in developmental stages, this program will promote breast-feeding to teen mothers.

"I have a basic science background and interest, but applied science interests as well. I've always worked with women and children," Donovan says.

**R**ichard Warner developed an appreciation and respect for nature while growing up in the Fox River Valley in northern Illinois. His father was an outdoorsman, and many of his hometown friends around Elgin, were farmers. Although he flirted with the idea of marine biology, his desire to stay in the Midwest drew him back to agriculture and the environment. He interned at the Illinois Natural History Survey in 1970, enrolled in a master's program in 1973, and went on to pursue a doctoral degree while working with the Survey.

Warner's interest in agricultural environment, policies, and programs led to a focus on how farmers perceive such issues as water quality or use of energy and other finite resources. He also explored how farmers get information and how they are influenced toward change. Ignoring warnings that he might hurt his marketability, Warner chose an innovative doctoral program that spanned departments of Ecology, Ethology, and Evolution; Rural Sociology; Agricultural Education; and Education.

"I noticed that ecological research and conservation programs ignored the ag setting and related to pristine, pure, highly theoretical programs or the undisturbed environment — did such environments really exist? Now it's trendy to be involved in disturbed environments and study the effects of humanity," he says.

Last October, Warner joined the Illinois Agricultural Experiment Station on a part-time basis to foster growth in involvement and integration in natural-resources research, teaching, and outreach programs of the College of Agriculture.

"I'm doing what I want to do," Warner says of his unusual career path. "I'm one of those lucky people."

High on Warner's list of goals is to develop an accurate, broad-based sys-

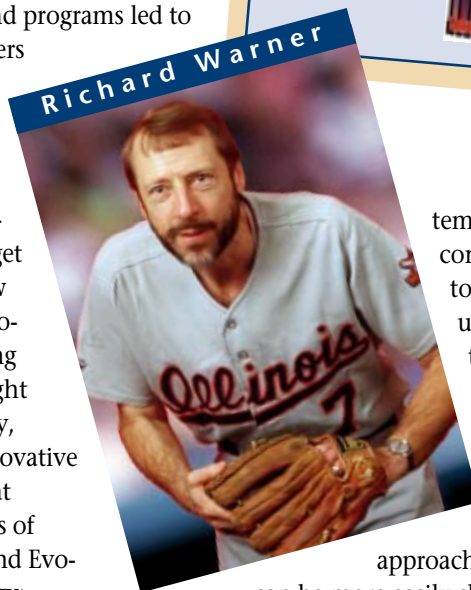
**WARNER**  
Associate professor, Department of Forestry; interim assistant director, Agricultural Experiment Station; and College's Agro-Ecology Program coordinator

**Education:**

- B.S. in fish and wildlife biology, Iowa State University
- M.S. in ecology and Ph.D. in interdisciplinary environmental studies, University of Illinois at Urbana-Champaign

**Working philosophy:**

The environment is a stress point for agriculture. We want the Agro-Ecology Program to help agriculture address environmental issues and make good decisions that will benefit farmers and society for the long run.



tematic approach for conveying knowledge to farmers through education, communication, and influence. That entails linking agencies, private groups, faculty, and researchers in a team or systems

approach so that knowledge can be more easily shared.

For instance, understanding the way that farmers relate to agriculture, agencies, and farm programs opens avenues for solving some environmental problems. The set-aside program is an example of missed opportunity for societal gains, Warner suggests. It diverts land only for a short-term reduction in crop production, when it potentially could include incentives to protect soil and water and enhance wildlife habitat.

Wetlands policy is an example of how farm programs can adversely affect conservation. Farmers once received incentives to drain wetlands; now that wetlands are recognized as nature's filters and home to many wildlife species, however, landowners must be educated to protect wetlands.

"Farm programs can have multiple benefits to society: they can benefit nat-

ural resources, so society benefits; they can improve recreational opportunities; and they can reduce nonpoint-source pollution that society pays for," he says. "We need to be asking up front what the outcomes of farm programs should be and at the start involve agencies that will deliver those outcomes. We have to spell out which farm program practices are benefiting society and why.

"It's not a matter of dollars; society invests millions of dollars in set-aside and gets little in benefits. It's more a matter of the conservation community developing effective ways to communicate what their needs are; it's a matter of developing ways for conservationists and the ag community to work together."

Warner plans for the UIUC Agro-Ecology Program to take leadership roles in several projects intended ultimately to help the conservation and agricultural communities work together. Among them:

- **Information systems.** This proposed project will describe how agriculture has changed and look at information in a new way using new computer tools and science. It will involve communications experts, home economists, agricultural economists, farm families, and others. The ultimate goal is to provide opportunities for farmers to learn about and envision the effects of adopting various farming practices relative to a range of factors pertaining to the sustainability of agriculture. These socioeconomic factors include net profits, time management, farm landscapes, and natural resources.
- **Water quality.** A new farm on the south edge of campus may be used to study the headwaters of the upper Embarras River. Teams will take a systems approach to look at farming systems at the river head.
- **Farming systems.** On lands given to the University of Illinois for research and interests in agro-ecology, teams will take a farming-systems approach that emphasizes environment, sound practices, and sustainability over the long term.

Neil Shay was fascinated with math and science as a youth in Fairfield, Connecticut. After receiving his master's degree, that fascination kept him in the classroom for six years, teaching high-school biology and physics and coaching basketball and other sports. But curiosity enticed him back to graduate school, where his interest in math, science, and the human body drew him to genetics and molecular biology. Today Shay teaches and conducts research in nutritional molecular biochemistry — how body cells are affected by nutrition.

He came to the University of Illinois at Urbana-Champaign in 1993, having finished postdoctoral studies in the Department of Food Science and Human Nutrition, Institute for Food and Agricultural Sciences, University of Florida. There, a National Institutes of Health fellowship allowed him to focus on nutrition and zinc deficiency. Zinc, a part of more than two hundred different proteins or enzymes at work in the body, affects growth, appetite, and the immune system. Far from being a narrow niche, his interest in zinc has allowed him to study problems ranging from human

anorexia to livestock weight gains.

"Even in America, infants and older folks may be marginally zinc deficient," he says. "We're looking at specific tissues or functions that are altered by zinc and at the brain and appetite regulation."

At the UIUC, Shay teaches a human metabolism class to students interested in food and nutritional sciences. He also is developing agricultural seminar courses to help students learn about appetite control systems and the nutritional regulation of genes.

In addition, Shay is continuing his research on the effects of nutrition on gene regulation. Among the ongoing studies:

- **Zinc deficiency.** One goal is to identify specific biochemical and molecular sites that are critically affected by zinc deficiency. Shay is looking at individual genes whose functions are most affected.

"With zinc, there are elegant regulatory mechanisms that are specific and dramatic. If you add zinc to cells, genes turn on — it's a very rapid response," he says. "Improving zinc nutrition has implications ranging from growth, normal immune function, and even prenatal nutrition."

- **Brain peptides and neuropeptides.** Neuropeptides bind to certain cells in the brain and cause other interactions or behaviors to occur. Certain brain peptides increase ap-

petite, whereas others may create preferences for particular foods, such as fats or carbohydrates. Some peptides act mostly early in the day, then decrease; others are low in the morning but increase throughout the day.

"Neuropeptides can have tremendous impact," Shay says. Theoretically, people

**SHAY**  
*Assistant professor, Department of Food Science, and member of Division of Nutritional Sciences and Biotechnology Center*

**Education:**

- B.S., M.A., University of Massachusetts
- Ph.D. in biochemistry and molecular biology, University of Florida

**Working philosophy:**  
 This research may help scientists measure nutrient deficiencies, explain eating disorders, diabetes, and other health problems. It could explain how nutrients control the activity of certain genes and how nutrient intake relates to appetite and food choices.

**Neil Shay**

could eat foods that would control the expression of peptides. Or there might be pharmacological approaches to control levels of expression in peptides. For agriculture, finding ways to selectively enhance feeding behavior could improve meat production or help bring animals to market faster.

- **Anorexia.** Brain peptides and low zinc appear to be factors in the development of anorexia. Some people may be predisposed to anorexia. Zinc deficiency can inhibit the desire for food and cause loss of taste. An inability to distinguish salt from sugar is one example of taste loss.

"The ability to taste is one phenomenon. The desire to eat is a separate one," Shay says. "If you feed growing laboratory animals a normal diet, their weight will increase with time. If you feed the same animals a zinc-deficient diet, they will not grow at the same rate as their normal counterparts.

"Growing rats will eat more and more food; but, with zinc deficiency, food intake will remain constant or decrease slightly. We are trying to identify the neuropeptides responsible for this decrease in appetite."

- **Nutritional regulation of genes.** Conducted with H.R. Gaskins, UIUC Animal Sciences Department, these studies are aimed at one day producing natural diets or pharmacological strategies for reducing glucagon production that results from insulin deficiency in diabetics. For the experiments, scientists use a unique cell line derived from pancreas alpha cells. The glucagon-producing response of the cells to glucose and amino acid levels is tested using cells in culture. The cell culture system allows the nutritional regulation of glucagon production to be studied directly.

**W**illiam Sullivan developed a passion for teaching and an enthusiasm for landscape design from his mentor Bill Nelson, UIUC professor emeritus of horticulture. The Glen Ellyn, Illinois, native also felt a pull to the social sciences.

"While working on my master's degree, I became interested in the relationship between people and nature, especially in the ways that nature is supportive of human functioning," Sullivan says. He developed these interests further by taking several environmental psychology classes at the University of Michigan.

Sullivan's social interests are reflected in such publication titles as: "Cluster housing at the rural-urban fringe: The search for adequate and satisfying places to live," and "A yearning for conservation: The conflict between citizen attitudes and economic development."

An early interest in teaching found Sullivan in front of students even while he was a student, and it keeps him in the classroom today. He teaches landscape design and is working to introduce computer-aided design into the university's undergraduate curriculum.

His research is focused on landscape design, environmental planning, and plant-people interactions. Last year, Sullivan helped develop several successful multimillion-dollar research proposals. This new research will involve collaboration with an interdisciplinary group of scientists. Looking to the next few years, he says he is excited to be part of a group "held together by the quest to understand the relationships between people and nature" and working to address issues of "creating places that are healthy and supportive of human functioning." Some of these new projects include:

- **National Consortium for Environmental Education and Training.** A three-year, \$4.75-million grant teams Sullivan with colleagues at the University of Michigan, Howard University, Michigan State University, and Sonoma State in California. Funded by the U.S. Environmental Protection

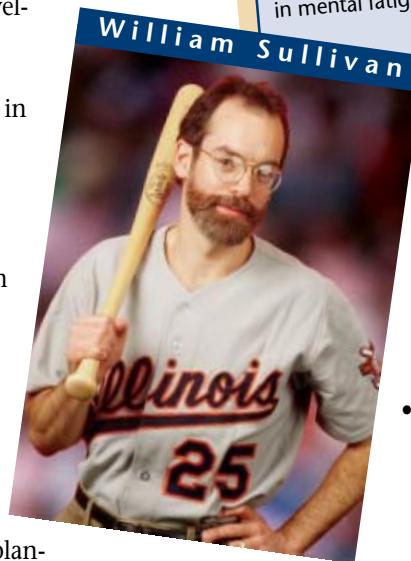
**SULLIVAN**  
Assistant professor, Departments of  
Horticulture and Landscape Architecture

**Education:**

- B.S., M.S. in horticulture, University of Illinois at Urbana-Champaign
- M.L.A. in landscape architecture, Kansas State University
- Ph.D. in environmental planning, University of Michigan

**Working philosophy:**

Natural environments and environments with natural elements have healing, positive impacts on human functioning. Contact with nature — a walk among trees or a window view of trees — produces consistent, measurable reductions in mental fatigue.



Agency, the researchers will look at innovative ways to enhance environmental education in K-12 classrooms.

- **The value of nature in urban public housing.** A two-year grant from the U.S. Forest Service will allow Sullivan and his collaborator, Frances E. Kuo, in partnership with the Chicago Housing Authority, to determine how the presence of nature affects people. They will look at how nature influences rates of absenteeism, job hunting, learning, and other factors associated with coping with poverty.
- **Environmental Extension Network.** This new pilot program, funded by the U.S. Environmental Protection Agency, supports an effort developed by Sullivan and University of Michigan collaborators to share information about environmental issues with small businesses and citizens.

Anita Povich, communications specialist, Office of Agricultural Communications and Education, and Tina M. Prow, science writer, Agricultural Experiment Station

# THEN

# & NOW

David Riecks and  
Nancy A. Nichols



*Learning is not attained by chance, it must be sought for with ardor and attended to with diligence.*

—Abigail Adams (1744–1818), *Letter to John Quincy Adams*, May 8, 1780



*In this age of innovation perhaps no experiment will have an influence more important on the character and happiness of our society than the granting to females the advantages of a systematic and thorough education.*

—Sarah Josepha Hale (1788–1879), editorial, *The Ladies' Magazine*, January 1828



*Things Change...*



COURTESY FARM SECURITY ADMINISTRATION, LIBRARY OF CONGRESS

*'Tis sweet to spend one's time in the cultivation of the fields. —Ovid (43 B.C.–A.D. c. 18), Ex Ponto, II, vii, 69*



*...Yet Stay the Same*



# Riding the Rainbow of New Communications Technology

*Nancy A. Nichols*

**N**ew digital information technologies are spurring revolutionary changes in the way universities disseminate research results and other information to the public. Soon there will be an electronic alternative to virtually all informational print materials produced and distributed by the University of Illinois College of Agriculture. From two-page

factsheets to 200-page books, all will be available via computers — in “cyber-space.”

Developments in telecommunications technology during the past few decades have catapulted us into the Information Age. Important tools of the Information Age include televisions, telephones, computers, FAX machines, CD players, and

VCRs. Every day the technology is becoming more affordable, more compact, and more personalized.

By the year 2000, an estimated 40 million households will be linked to a fiber-optic network that will bring us an unprecedented amount of information. Although much of it will be commercial entertainment, including 500-channel



*This visualization study shows inbound traffic measured in billions of bytes on the NSFNET backbone (September 1991). The traffic volume range is depicted from purple (zero bytes) to white (100 billion bytes). Data collected by Merit Network, Inc.*

TV and dial-up videos, a good deal of the information will be educational. The University of Illinois and other institutions throughout the nation are gearing up to take advantage of the new "information superhighway" to bring you more information more quickly and in more interesting formats than ever before.

Networking — the linking of computers and other electronic equipment in offices, laboratories, and homes around the world — is the key to improving the way in which the College of Agriculture shares its resources with the public. This new style of communicating has been building over a number of years, and it all started with something called the Internet.

## What Is the Internet?

An electronic web of thousands of computer networks around the world, the Internet reaches an estimated 2 million computer terminals used by up to 30 million people in more than fifty countries. Thousands of Illinoisans now use the Internet for work or pleasure, and the numbers are growing daily.

The Internet got its start as a single computer network called the ARPANET, created by the Pentagon in 1969 to transmit military data around the world. Access to the ARPANET was originally limited to the military, defense contractors, and universities doing defense research. In the late 1970s, cooperative, decentralized networks serving universities and business came into being. More coordinated networks sprang up in the 1980s, providing nationwide networking to the academic and research communities. At the time, software called the Internet Protocol was developed to provide a standard so that computers from different manufacturers would be able to communicate with each other.

Then in 1984, the National Science Foundation began building supercomputing centers around the nation for conducting scientific research, one of which is located on the UI campus in Urbana-Champaign. To link researchers

across the country with the five supercomputing centers, the National Science Foundation in 1987 established a new, very fast fiber-optic network called NSFNET, which soon replaced the ARPANET as the preferred mode of electronic communication among network users. NSFNET serves as the backbone linking the thousands of networks that now make up the Internet.

"Around the time the NSFNET was built, the Internet began growing by leaps and bounds, showing exponential gains in number of networks, human participants, and computers," writes Tracy LaQuey in her book *The Internet Companion: A Beginner's Guide to Global Networking*. Following the U.S. example, many countries around the globe soon set up their own networks and established links with the Internet.

A fact that is often not fully understood even by many regular network users is that no one entity or organization is "in charge" of the Internet. Rather, it's more like a confederation of compatible networks, each of which allows its users to communicate with users on other networks.

So, what began as a way for military researchers to collaborate on-line has ex-

panded to a global network we now call the Internet. The longer it has existed, the more the Internet has evolved into a communications tool for use by the general public, though fully a third of its usage is still by scientists and researchers.

## UI Researchers Get Connected

Researchers are using the new technology in two main ways: for collaborating with distant colleagues via electronic mail, or email, and for accessing information stored in distant databases. One such researcher is Harris Lewin, a UI animal geneticist in the College of Agriculture.

Lewin says that animal geneticists are a rather small group and that "everybody of significance in the world is on the Internet." He keeps up on the latest discoveries via a gene-mappers' bulletin board, a kind of network discussion group that allows scientists with like interests to share their ideas and discoveries informally. "The amount of information is increasing so rapidly that if you wait for the literature to be published, you're a year behind," Lewin says.

These days, scientists have a world of information at their fingertips. Not only are the UI library system's card catalog



Geneticist Harris Lewin regularly accesses animal-genetics databases around the globe from his office in the Animal Sciences Laboratory.

and other library resources available at the stroke of a few computer keys, but an enormous amount of information from scientific databases around the globe is also readily available.

Lewin regularly accesses faraway gene-mapping databases, including a swine genome database in Scotland and a cattle genome database in France. Genbank, a molecular biology gene-sequencing database, is another favorite. Lewin can do near-instantaneous gene-sequence matching via the database, which he accesses through the National Library of Medicine in Washington, D.C.

Before electronic communications, Lewin and his colleagues shared genetic data by mailing computer files on diskettes or just paper copies. "For a project in 1984, we sent out computer outputs that were 6 inches thick to several labs around the world," he says. At the time, his postage bills were quite high. "Now," he says, "I'm organizing a meeting to be held in Norway, and all materials, including invitations, are being sent out over the Internet."

The downside? "Now that I'm on email, everyone expects a response within 10 minutes," Lewin says. "Some mornings, I come in and find twenty messages from Europe in my email," whose senders expect a timely response. "It's a mixed blessing," he says.

Another way in which researchers are using email is to work more easily with distant co-authors. UI agricultural economist Sarahelen Thompson uses the network to collaborate with colleagues as far away as Taiwan. "What we send more than anything is manuscripts in progress," Thompson says.

"My previous style was mailing diskettes overnight at \$10 a crack." Now, instead of waiting a week for revisions, Thompson gets some manuscripts back the same day they were sent — and saves money doing it.

## College Comes Up with a Good IDEA

For several years, the UI College of Agriculture has operated its own computer

network. Known as IDEA, Illinois Dial-up Extension Access is a wide-area network run by the Office of Computer Coordination of the Cooperative Extension Service (CES).

When established in 1987, the network was geared mainly to help CES staff members, both on campus and in state-wide field offices, communicate and share information via electronic mail. It was an administrative time-saving tool. Since then, IDEA has opened its doors to all College staff and has expanded to include not only email but also subject-matter libraries and databases, an on-line news service (public bulletin board), and

a variety of enhanced administrative applications (such as organization-wide calendars of upcoming events).

Recently IDEA has taken the College's computer-based communication services far beyond the state border. During the past year, IDEA established a two-way public link to the Internet, at the same time adopting as its new user interface the "gopher" search-and-retrieval system now employed by thousands of other information providers. Anyone in the world with access to the Internet can now get on the public portion of IDEA and read about what is happening at the College of Agriculture or retrieve infor-

## New Library Brings Students Up to Speed

Plans for the new College of Agriculture Information and Alumni Center are on the drawing board, and its construction is on the university's priority list. This dream will soon become a reality; and, when it does, the College will at last have an information center for the Information Age.

Students will benefit most from increased access to rapidly expanding information technology. College of Agriculture librarian Carol Boast says that patrons are not able to make use of much of the technology that is available because the current facility doesn't have the space or the equipment.

The library now in use, located on the second floor of Mumford Hall, is inadequate for the demands of the College's 2,300 students and 600 faculty members. At 7,800 square feet, it seats only 50 people. Compared to the proposed building, which would contain 42,000 square feet of usable space, the current library can house only one-third of the College's 200,000 books and other materials. The rest are in other libraries, and some are even in storage.

Although the library has subscriptions to the major agricultural databases (AGRIS, AGRICOLA, and CAB, among others) on CD-ROM, they can be used by only one person at a time because there is only one station per database. This new technology takes the librarian out of the middle of the search for information. "And," Boast says, "students are literally standing in line to use the workstations."

Boast anticipates that, in the new facility, a network will make databases accessible from any computer terminal, and the new building will have nearly 100 available computers. Students will also be able to learn to use the technology in the new building's Microcomputer Teaching Laboratory. Such classes are impossible now, she says, because they would disrupt anything that was going on in the current library.

But students who are eager to get started have been teaching themselves. They are using the Internet to reach people all over the world when they need to send a message quickly. For example, students with environmental concerns used the

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IDEA Gopher Information Client v1.12
      Root gopher server: ilces
1.      ***** Help Information *****
2.      ** Search Extension Information ** <?>
3.      ** What's-New-on-IDEA-Gopher Server **
4.      Adult-Life-and-Aging
5.      Agriculture-Market-News/
-> 6.      Flood-Information/
7.      Food-Preservation/
8.      Food-Safety/
9.      INTERPAKS/
10.     IlliNet-Lines/
11.     Illinois-Agricultural-Experiment-Station/
12.     Mental-Substance-Abuses/
13.     News-Releases/
14.     Nutrition/
15.     State-Fair-Results/
16.     Urban-and-Community-Forestry/
17.     Vegetable-Crops/
18.     Yard-and-Landscaping/

Press ? for Help, quit, prev menu
Page 1/1

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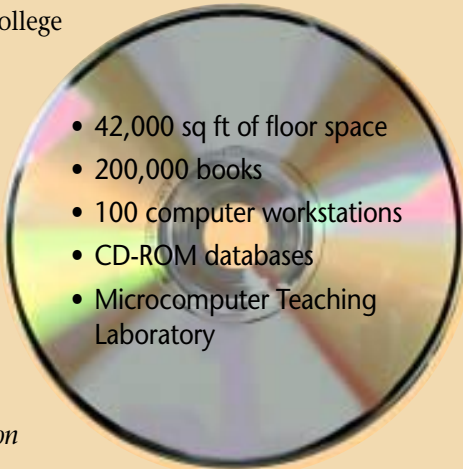
EnviroLink network recently to reach Sierra Club members with news of a petition drive to halt logging on public lands. Recipients then sent the message to other persons interested in environmental issues.

Satellite uplink and downlink facilities can also bridge physical distances instantly. Satellite facilities in the new library will make it possible for an Illinois student to enroll in a class taught at Kansas State or enable a faculty member to attend a meeting by teleconferencing instead of flying across the country the old-fashioned way.

So you won't have to be on campus to benefit from this new information center. Carol Boast's goal is to make the library accessible to everyone in the state. Right now, anyone who has access to the Internet has access to the library cataloging system. Bridget Lamont, director of the Illinois State Library, wants to see all 2,500 public libraries in the state equipped with the basic computer equipment needed for Internet access. When that happens, people across the state will be able to shop for information without leaving their home towns and maybe even their homes.

College Development Office director Lynette Marshall says that individual \$1-million donations for the new building have come from the Funk family in Bloomington, Richard and Sally McFarland of Indianapolis, and Florence Odell, whose husband was on the agronomy faculty for 30 years. But a broad range of support for the new building comes from smaller contributors, prominent among them college faculty and staff who see that the new library is badly needed.

Ground breaking for the new building could begin as early as this fall if the State Assembly votes to match the \$7 million in private funds already donated to the project. When the dream becomes reality, students in the College of Agriculture will have a head start in today's world. — *Phyllis Picklesimer, publications editor, Office of Agricultural Communications and Education*



mation from one of the network databases.

Journalists are among those who have found IDEA useful. A recent issue of *Quill*, a magazine for journalists, listed IDEA as a good source for inexpensive data. Last year, one of IDEA's databases focused on the Midwest flood and, among other things, provided journalists covering the event with "a handy list of state agency contacts and phone numbers."

In addition to providing the agency listing, a quickly organized CES flood-information team — including media specialists, computer specialists, and subject-matter specialists — put a wealth of information about how to respond to the flood damage on IDEA. In one month at the height of the flooding, IDEA registered more than 1,100 external connections across the Internet, and 96 flood-related articles were accessed 6,130 times. As Floyd Davenport, IDEA's system manager, observed, "I can't tell you how the information was used, but someone was definitely interested."

Besides the flood information, current databases include "Food Preservation," "Yard and Landscaping," "Urban and Community Forestry," "Market News," and "INTERPAKS" (a collection of educational materials pertaining to international agriculture). CES news releases and newsletters are also distributed over IDEA. The newsletters include the *Pest Management & Crop Development Bulletin*, which gives farmers weekly updates on pest problems and crop development during the growing season. *Home, Yard and Garden Pest Newsletter*, targeted at nursery operators and homeowners, is another popular network offering. These databases, news releases, and newsletters can be accessed through the Internet by IDEA's host name: *idea.ag.uiuc.edu*.

New IDEA projects include the development of an almanac server that will allow users to send in requests for information and more easily enable the College to make mass mailings. The almanac server will also let users subscribe to agriculture-related newsgroups. Also in the works is the Adult Agriculture Education project, sponsored by a consortium of agricultural education

providers around the state and featuring a database with details on upcoming events and activities in agricultural education statewide.

As part of its outreach effort, the Office of Computer Coordination recently teamed up with the Lincoln Trail Libraries System in central Illinois to provide its IDEA on-line information services to residents of the area via computer terminals in public libraries. The office also plans to provide training programs for new Internet users in rural areas across the state.

Further information on IDEA can be obtained from Dan Cotton, head of the CES Office of Computer Coordination, via Internet email (*d-cotton@uiuc.edu*) or by calling (217)333-9513.

## A National Agricultural Research Database

To give U.S. citizens even greater access to network resources, Vice President Al Gore and other federal leaders are pushing a \$2-billion, five-year program to build a National Information Infrastructure. The new infrastructure will increase the speed of the current NSFNET backbone and broaden the availability of networking in an effort to comprehensively link the nation's schools, hospitals, and other community centers to the Internet.

As part of this new federal initiative to provide electronic information resources, the USDA Cooperative State Research Service has begun an effort to produce a national agricultural research, extension, and teaching accomplishments database, connecting a variety of information users with the land-grant university system. The database will

give Internet users such as librarians, journalists, environmentalists, lawmakers, and businesses a broad range of accurate, timely, and understandable information about the nation's agriculture.

The database will be sorted by the following important topics:

- Food quality and safety
- Water quality
- Environment and natural resources
- Diet and health
- Family and youth development
- Sustainable agriculture
- Technology and agriculture
- Farm management
- Rural development and rural health care

The new database will be up and running within two years, with important contributions from the UI. According to Don Holt, director of the Illinois Agricultural Experiment Station, the College of Agriculture will provide information on the results of several promising research initiatives, such as genetic engineering of swine, high-oil corn, disease control in

vegetable crops, sustainable production, and vertical coordination in agricultural markets.

Holt hopes that the new database will benefit not only interested individuals but also the public at large. "Through media use of the database, the public should be better informed about the size, scope, and quality of agricultural research projects under way at the University of Illinois," he says.

## Audio Communications Go Digital

Advances in digital electronic communications within the College have not been limited to computer networking. As early as 1989, CES began converting to a digital system for audio communications when it upgraded TeleNet, the College's twenty-year-old dedicated audio-conferencing system. The computer-controlled audio "bridge," which is at the heart of the system, is now fully digital — offering cleaner, crisper sound for conference participants. Users

can dial into a conference from anywhere in the United States, and the system can accommodate as many as forty-eight simultaneous conferences. The system averages about eight conferences per day, making it possible for staff, administrators, students, and members of Extension's many publics to interact with each other — all via a phone call from their homes, offices, or even a mobile location.

Darin Eastburn, a CES plant pathologist who needs to provide timely information about plant-disease outbreaks around the state, is finding creative ways to use the new communication technologies. During the growing season, Eastburn

## Hitchhiker's Guide to the Information Superhighway

To learn more about electronic communications, try one of the publications listed here. Note that *The Whole Internet User's Guide & Catalog* is currently being revised by author Ed Krol, who is assistant director of the Computing and Communications Service Office here at UIUC. Krol says that, among other things, the revised edition will include much more information on World-Wide Web, one of the latest document-searching tools for the Internet.

- *The Internet Companion: A Beginner's Guide to Global Networking* by Tracy LaQuey. 1993. Reading, Massachusetts: Addison-Wesley Publishing Company.
- *The Whole Internet User's Guide & Catalog* by Ed Krol. 1992. Sebastopol, California: O'Reilly & Associates, Inc. (Currently being revised.)
- *Wired* magazine, published monthly. Single copies available on newsstands; subscription information available via email (*subscriptions@wired.com*) or by telephone at (800)769-4733.
- *The Virtual Community: Homesteading on the Electronic Frontier* by Howard Rheingold. 1993. Reading, Massachusetts: Addison-Wesley Publishing Company.

# Universities Help with Community Computing

Besides offering their own on-line information services, many universities are helping their local communities to establish community computing services. A current example is Prairienet, located in Champaign-Urbana and supported by the UI Graduate School of Library and Information Science. Other offices involved in the project are the National Center for Supercomputing Applications (one of the nation's five supercomputing centers) and the College of Agriculture's Office of Computer Coordination.

Prairienet is affiliated with the National Public Telecomputing Network (NPTN), a Cleveland-based organization. Patterned after the National Public Radio model, NPTN aims to provide inexpensive yet high-quality electronic communication services in communities across the nation. NPTN currently provides advocacy and services to fifteen affiliate "Free-Nets" across the nation, and that number is growing rapidly. About forty-five additional communities will become NPTN affiliates in the near future.

Organizers of Prairienet hope to link community members located in diverse places throughout east-central Illinois, including nursing homes, hospitals, schools, government offices, and businesses. The broad goal is to integrate computer networking into the region so that a wide range of people can use it for work and play, to improve the economy, to provide education, to increase civic involvement, and to provide access to developing information and communication services. It specifically plans to include a clearinghouse on early childhood education, a local events calendar, and dietary information and discussion groups.

Prairienet will soon be accessible at no cost in any public library in five counties in east-central Illinois, or Illinois residents will be able to get a free subscription for their home computers. Out-of-state users will pay \$25 per year for a subscription. More information about Prairienet can be obtained by dialing in from your home computer to (217)255-9000. Set your modem for 1,200 or 2,400 baud, N-8-1. Press **Return** a few times to get the login prompt, and login as "visitor." Internet users can "telnet" to *prairienet.org*. Or call administrative director Jay Greenberg at (217)244-1962.

Another local project affiliated with Prairienet is CCNet (Champaign County Network), an effort led by the Champaign County Chamber of Commerce and supported by the local Economic Development Corporation, Convention and Visitors Bureau, and Cablevision to provide quicker transmission of data than is available over the current Prairienet dial-up system. Five task forces have

been set up to steer the group's efforts: education; health care; small business; agribusiness; and community services, government resources, and libraries.

CCNet will provide access to Prairienet as well as to Mosaic, a new piece of software developed by the National Center for Supercomputing Applications. Mosaic allows users to gain access to documents, graphics, photographs, animation, and video that are stored on the thousands of computers linked to the Internet. The way Mosaic works is to present a document on a particular topic, which has key words and phrases highlighted. The user can choose any key word or phrase, initiating a search for information related to the key word or phrase throughout all Internet-connected databases. In a sense, it turns the entire Internet into one big searchable database. Information about CCNet is available from Mick Moore of the Champaign County Chamber of Commerce, (217)359-1791.

As their name implies, Free-Nets provide *free* networking services to members of the communities they serve. "What significantly distinguishes Free-Nets from other networks is that the Free-Nets provide a base-level set of resources that every citizen should have a right to," says Bob Pauls, executive director of the Shawnee Free-Net, another new network in southern Illinois. "Like public radio, we believe in the public having access to free, quality material as an alternative to commercially available services," Pauls says. Shawnee Free-Net is supported in part by Southern Illinois University at Carbondale. The pilot network is scheduled to begin operation this spring. For more information on the Shawnee Free-Net, call (618)549-1139.

In addition to offering free access, Free-Nets work to provide a friendly interface with the Internet, which can otherwise be quite confusing and intimidating. A good example of a user-friendly community computing service is Heartland Free-Net, serving Peoria, Bloomington-Normal, and other central Illinois communities. Heartland's menu system is set up so that even a novice can quickly get oriented to electronic communications.

Heartland Free-Net is supported by a number of public and private groups, including Bradley University in Peoria, Illinois State University in Bloomington-Normal, and Caterpillar, Inc. Registration is free to Illinoisans, \$10 for out-of-state users. For information, call (309)667-2544 in Peoria or (309)438-2300 in Bloomington-Normal. The Internet address is *heartland.bradley.edu*.

regularly participates in TeleNet conferences on crop conditions. In addition, Eastburn provides weekly updates during the growing season for commercial vegetable growers via voicemail messages (a digital telephone information line he operates from his office on the UI campus). He posts the same information on IDEA as well.

Another promising technology is "audiographics," which combines two separate digital-based technologies (audio and computer conferencing) to provide a richer, more interactive environment for distance learning. Using audiographics equipment, users not only hear what is said at each location, they can also see it.

"Audiographics has a lot of potential for long-distance disease diagnosis," Eastburn says. He is encouraging farmers to bring their plant specimens to CES field offices equipped with audiographics technology (currently in the Springfield area only). There, a picture of the diseased specimen can be sent electronically to the plant pathologists on campus in Urbana-Champaign for quick pre-screening. For accurate diagnosis, most specimens will still need to be mailed to the UI Plant Clinic for thorough lab analysis. But Eastburn says the new visual prescreening method is a vast improvement over the old method of having clients describe the disease over the phone.

"Put it under the camera, ship it over here, and I'll help you identify the disease," he says.

## Even Publications Get Wired

For the past seven or eight years, as anyone familiar with the term "desktop publishing" can testify, computers have profoundly changed how printed publications are produced. That has certainly been true in the College of Agriculture, where for several years all prepress publications work has been computer-based.

Now the College is about to enter a new era in which the document in electronic form may become the most important source document. At least that's

the goal of a three-year pilot project in the Information Services unit within the Office of Agricultural Communications and Education. Working closely with the CES Office of Computer Coordination, Information Services staff will work to transfer existing publications into a master digital format, retaining all the graphic richness of the paper-based original. Once these materials are in a digital environment, the "infobase" containing these electronic documents will have vastly more powerful searching tools than are possible in paper-based materials. The plan is to eventually make all of the College's informational publications available in this visually rich electronic format and to share it with the public either on CD-ROM or over the Internet.

## About the Future

It has been argued that the new electronic communications technology will spawn a new kind of global democracy, breaking the hold that politicians and other power brokers have had on highly valued information. Nowadays, information from global power centers such as Washington, D.C., is more free-flowing and easier to obtain than ever before. A vast number of government documents — from the President's speeches to Securities and Exchange Commission data on businesses — are now on the Internet.

The Internet could be a new communications model, allowing for unfiltered, "many-to-many publishing" rather than the traditional hierarchical one-to-many approach. A new "global village" is now possible, allowing people in distant places to share ideas, information, and concerns.


But the new technology also brings with it some concerns. For example, is there a limit to how much information the human mind can handle, and is the new technology exacerbating the problem? Ann Reisner, associate professor of communications in the Office of Agricultural Communications and Education, says that researchers these days are suffering from "cognitive over-

load" — an inability to synthesize the massive amount of new data. "We lose the ability to synthesize because information is coming in too quickly and there's too much of it," Reisner says. Other communications experts might argue that computers also have the potential to help rid us of unwanted information in the future through increasingly sophisticated searching and "filtering" features.

Other questions include:

- Because there is great expense in building and maintaining high-tech communications systems like the Internet, will the federal government opt for privatization of electronic communication networks, increasing fees for network users (many of whom now pay little or nothing)?
- Will the public have a say in how electronic communication evolves, or will the government and private industry make the decisions?
- Will information sources be held liable for the recommendations they make or advice they give over the Internet?
- How will the new technology affect copyright and privacy laws?
- Is electronic communication creating a virtual global community or a global information elite? (Will the costs of the required technology be prohibitively expensive for people in poorer nations? If English is the dominant language of the Internet, how will the world's 5 billion non-English speakers participate?)

New technology always brings new questions and challenges. In the case of electronic communications, a major challenge for information providers such as the UI College of Agriculture will be to put people's needs first — technology is only as good as its ability to improve people's lives. As we approach the twenty-first century, the College will continue to provide information based on the public's needs, using the new technology to meet those needs more effectively and creatively than ever before.

Nancy A. Nichols, *publications editor,*  
*Office of Agricultural Communications*  
*and Education* 



# College Milestones: Our Tracks in Time

*Tina M. Prow*

**T**here was a time when farmers planted by the phases of the moon and harvested about a third or less of the yield they do today — if they didn't lose the crops to weeds, insects, diseases, and weather. Rural areas were dark because providing electricity to remote farmsteads was considered unprofitable. In those days, malnourishment was common among the wealthy as well as the poor.

The need for basic food and agricultural research prompted legislators on March 2, 1887, to pass the Hatch Act, designed "...to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural sciences."

A year later, an Agricultural Experiment Station was organized at the University of Illinois. Building on research set in motion at the UI as early as the 1860s, Illinois Station scientists carried out more than 100 experiments in dairy, cattle, and crop management within two years. They published eleven bulletins. That momentum has continued for more than a century, helping Illinois farms become more efficient and profitable and improving the quality of life of every citizen.

Visitors to the UI Morrow Plots, a national historical landmark, can see one of the earliest research projects. Started by Manley Miles in 1876 to "study the long-time effects of different cropping systems with and without soil treatments on one

of our best dark-colored prairie soils," the Morrow Plots are the oldest continuous soil experiment plots in the United States and have the oldest continuous corn plot in the world.

## Breeding for Better Production

Corn breeding has almost as long a history at the Station. Two 1884 graduates, George W. McCluer and Thomas F. Hunt, conducted self-fertilization and cross-fertilization corn experiments as early as 1886. Archibald D. Shamel, Perry G. Holden, Edward M. East, and Louie H. Smith continued those experiments, which helped provide the foundation for hybrid corn. Many of their students became the breeders who developed hybrid corn for private companies. By 1939, an estimated 70 percent of Illinois corn farmers were planting hybrids and harvesting more grain than ever before. Hybrids are now the norm.

Early corn research also focused on manipulating oil and protein in kernels. Begun by Cyril G. Hopkins in 1896, experiments were continued by D.E. Alexander, Earl R. Leng, and John W. Dudley, culminating in a 94th generation in 1993. Researchers adapted new technologies, such as infrared spectroscopy and nuclear magnetic resonance spectroscopy (NMR), for this research. NMR is used routinely now in plant breeding as a nondestructive way to analyze seed.

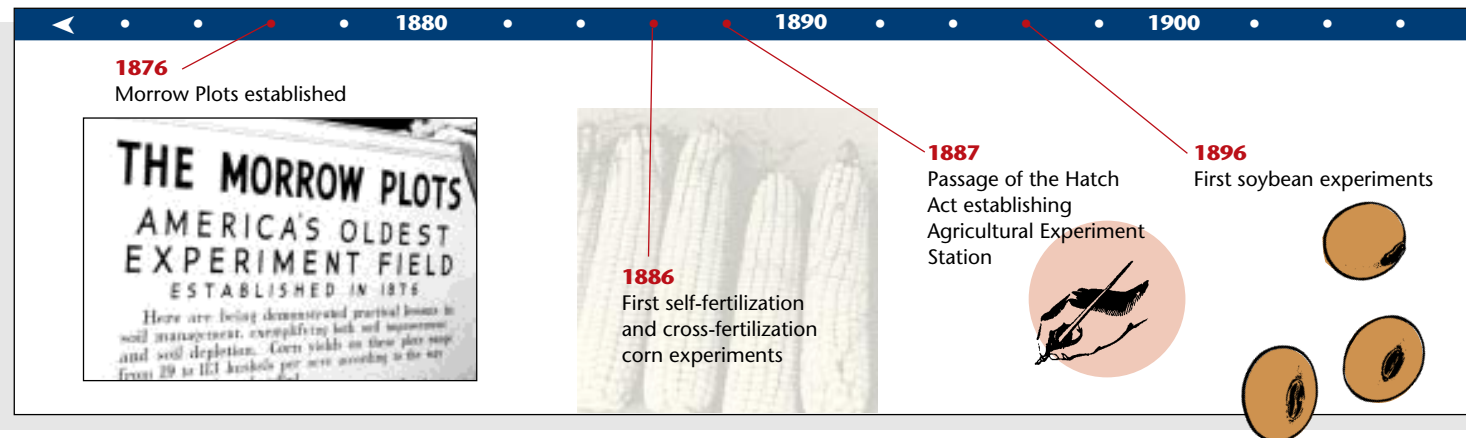
Station researchers also recognized potential for soybeans and began studying the crop in 1896, despite the fact that

few farmers planted soybeans. Clyde M. Woodworth worked to improve soybean varieties in the 1920s. By the 1950s, after UI scientists showed farmers that this legume could be harvested efficiently with a combine and used in feed, soybeans replaced oats as the second most important crop after corn.

Incorporating disease resistance into soybeans and other crops was an early goal of Station plant pathologists, who worked closely with scientists of the USDA Agricultural Research Service (ARS). The collaboration of plant pathologists and plant breeders made it possible to avert serious disease threats, such as wheat streak mosaic in 1940 and southern corn leaf blight in 1970. Station and ARS scientists were among the first to identify many disease threats, determine the causes, and find sources of resistance for breeders.

Early breeding programs were broader in scope than corn and soybeans. Although Illinois was not a leading oat-producing state, Charles M. Brown contributed to development of varieties that came to dominate oat production in the Midwest.

Similarly, Illinois did not lead the nation in apple production but did carry out some of the most innovative breeding and testing programs. Particularly important was research, conducted jointly with other states, to test a new English technique for grafting fast-growing apple trees to slow-growing bases. The resulting dwarf trees transformed the apple industry. Instead of growing 40 to 60 trees per acre, growers today plant 100 to 250



dwarf-stalk trees per acre and pick earlier, heavier, and higher-quality crops.

Breeding is only one crop research area where Station scientists made dramatic, lasting contributions to improve farm production. Scientists also pioneered research in crop physiology, particularly in such areas as effect of light on pollination, uptake of potassium, herbicide action, and nitrogen metabolism. Richard H. Hageman, whose writings were often cited by fellow scientists, used classical breeding techniques to alter enzyme levels in plants years before “genetic engineering” became common.

## The Chemical Age

The combination of better varieties and chemicals for pest control led to an agricultural revolution from the 1940s to the late 1950s. Corn yields went from 47 bushels per acre in 1945 to 94 bushels per acre in 1965. Entomologists, weed scientists, soil scientists, plant breeders, all working in their own fields, also worked together. Everything happened so fast — and for once, there was amazingly quick adaptation from plots to farms. It was the dawn of the Chemical Age. — *Pete Petty, Professor Emeritus, Agricultural Entomology*

At the forefront of this new era, Station researchers anticipated both the benefits and the problems of pesticides. Fred W. Slife, Ellery L. Knake, and Marshal D. McGlamery conducted some of the first chemical weed management studies in the country. The pressing ques-

tion was: Do weeds reduce yields enough to warrant spending money on chemical management? UI researchers looked at different weeds, herbicides, and management strategies at several of the Station’s research farms around the state.

As with herbicides, insecticides changed the way farmers managed insects. UI scientists conducted research to help farmers use pesticides wisely. At the same time, they remained alert for problems, sounding an alarm over persistence of such pesticides as DDT, aldrin, and heptachlor. In 1949, Petty organized what would become an annual conference to discuss pest management research findings under the banner: “wise and judicious use of pesticides.” Environmental concerns were evident in the first proceedings, which included papers on the effects of pesticides on aquatic life and wildlife. Early Station research served as a basis for the state’s pesticide applicator training program developed in the mid-1960s.

## Protecting Illinois’s Soils

Many of the management practices in place today hinge on soil data collected since 1937. Alfred U. Thor, James G. Laverty, Theodore R. Peck, and Russell T. Odell are just a few of the pioneers who developed methods for soil mapping, analysis, and testing used in Illinois and other states. As commercial fertilizers became available, Illinois researchers conducted some of the earliest fertility management research in corn production.

In addition to soil fertility, erosion

was a concern of Station researchers. George E. McKibben, working at the Dixon Springs Agricultural Center near Simpson, conducted some of the nation’s first no-till studies. His pioneering erosion-control work produced satisfactory corn yields on sloping soils. Those findings were an important addition to earlier erosion control studies, such as terraces, conducted by Station agricultural engineers. As the plow gave way on some farms to reduced tillage and conservation acreage, the Station’s early herbicide research proved pivotal to weed management.

## Improving Efficiency, Profitability

Farm cost studies, started by W.F. Handschin in 1917 and continuing today, give Illinois one of the most complete farm production and economic databases in the country. The need for information on economics, business, and marketing to help producers farm more efficiently and profitably became increasingly critical as both yields and input costs rose.

Helping keep agriculture on an even keel — stable and profitable — that was our goal. We had the largest Farm Business–Farm Management program in the country. It has been largely self-financed by Illinois farmers, the most innovative leaders in demonstrating good farming methods and profitable farming methods. — *Harold Halcrow, Professor Emeritus, Agricultural Economics*

1910

1920

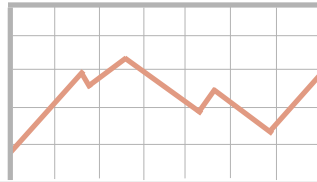
1930

**1916**

Tractor research begins, leading to use of rubber tires and gasoline

**1917**

Start of farm cost studies, leading to one of the world's most complete farm production and economic databases

**1930**

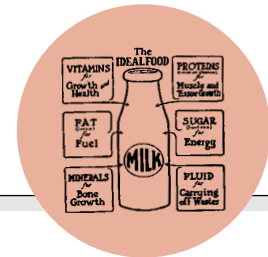
First oak-forest growth and yield tables produced with data from Sinnissippi Forest

**1930s**

Food scientists describe process for using aerosol cans for food products

**1936**

Julia Holmes and Janice Smith study calcium needs of children



In the 1920s, C.L. Stewart's plan for making payments to farm product exporters so that U.S. prices could be maintained above world levels became a cornerstone of the national farm program for corn, wheat, cotton, and other products.

Many of the ideas explored in the early days of agricultural economics laid the groundwork for some of today's issues. Crop insurance based on an actuarial structure, now a sixteen-state research project, was a theory Harold Halcrow put forward in 1948. Through the years, Station agricultural economists accumulated a wealth of information and analysis on alternatives to property tax and other tax issues affecting Illinois agriculture.

In marketing, the notion of making grain grades reflect differences in value, proposed by Lowell Hill in the 1970s, resulted in a 1986 amendment to the U.S. Grain Standards Act. Hill's proposal provided for more accurate descriptions and measurements of grain quality to help buyers and sellers arrive at fair prices, to improve quality, and to ensure equitable treatment among producers.

## Improving Nutrition

Although international markets are important today, a century ago the market for grain was primarily the state's livestock. Animal-science researchers were leading contributors to early knowledge of feed nutrition for beef cattle, dairy cattle, swine, poultry, sheep, horses, and even humans and their pets. UI scientists

defined more amino acid requirements of pigs and poultry than any other university in the country. Their contributions toward improving animal nutrition ranged from developing a high-energy broiler diet, to defining how to feed bacteria in the rumen, to more recently identifying taurine as a critical nutrient for cats.

Earl Swanson, a UI agricultural economist working with animal scientists, demonstrated a method in 1955 for calculating minimum cost for feed mixes using mathematics and the then-new computers. Initially ignored by the industry, the method is a standard procedure now.

University of Illinois scientists, from the beginning, have had some very new, very revolutionary ideas. Some research is not appreciated right away; it takes courage to continue research in the face of doubt and criticism. — *David Baker, Professor, Animal Sciences*

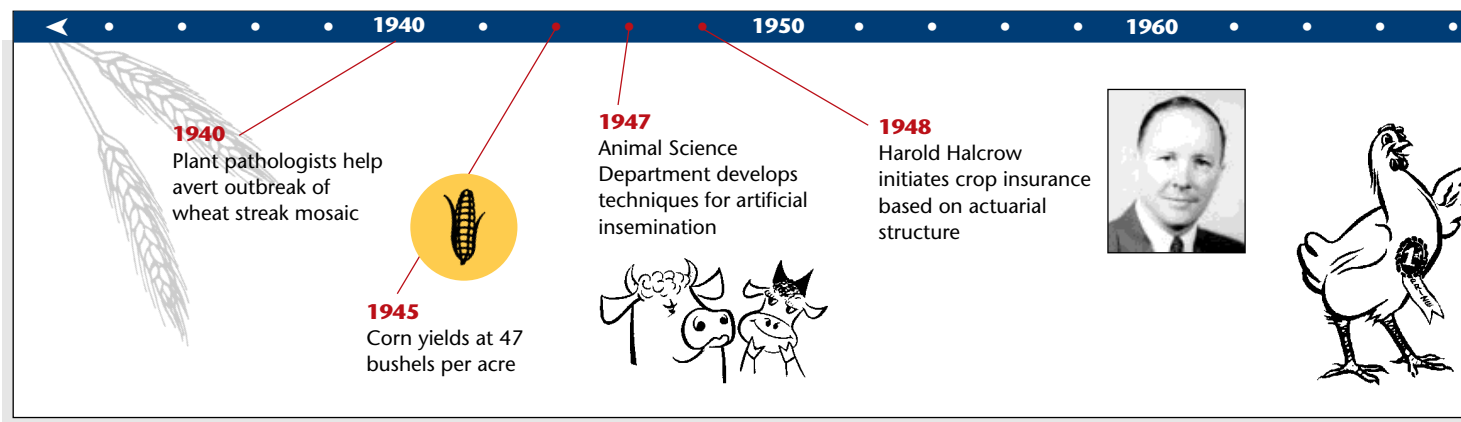
The first to demonstrate that a baby pig is unable to utilize sugar, UI animal scientists also changed swine production dramatically in the 1950s when Gene Becker showed that soybeans could replace meat scraps in a balanced diet. Extension specialists Harry Russell and Dick Carlisle carried this research to the field, where it was not accepted at first. Within a few years, however, 90 percent of the swine rations fed in the United States were built around corn and solvent-extracted soybean meal.

Also revolutionary was artificial in-

semination, developed from Glenn Salisbury's research in 1947. With this method of breeding, dairymen needed half as many cows, and stored semen could be used to produce offspring long after the source was unavailable. By the mid-1950s, the U.S. dairy herd was cut by half. This early research on artificial insemination, which included studies on timing for insemination, also proved valuable in human fertility research.

UI animal scientists have a history of providing key information to researchers working on human health issues. As early as 1915, Harold H. Mitchell was evaluating biologically the capacity of dietary protein sources, such as egg protein, meat protein, or vegetable protein, to meet requirements for amino acids. He researched the mineral requirements of animals and humans and made the first analysis of the composition of the entire human body. Building on his work, William Rose, a biochemist who in 1938 synthesized the last amino acid known to be essential, identified amino acids necessary to maintain good health. In 1965, H.M. Scott published the first work on an "ideal profile" of amino acids for poultry.

The early research allowed the UI to become the world leader it is today in chemically defined diets across species — chicks, pigs, cats, rats, mice, dogs, humans. There are implications for humans in much of the work in animal research. — *David Baker, Professor, Animal Sciences*



## From Farms to Supermarkets

Getting foods from farms to the food industry and ultimately to consumers is possible in part because of Station research in food uses, processing, packaging, and safety.

While colleagues in animal sciences assessed soybeans for livestock feeds, other researchers looked for ways to integrate the protein-rich crop into human foods. Jean I. Simpson evaluated methods for preserving and preparing green soybeans and soy flour, sprouts, milk, and curd in the 1940s. As a result, the UI became a major contributor of processes for preparing soy foods.

UI food science researchers were imaginative in the quest to bring more foods to more people. As early as the 1930s, researchers described a process for using aerosol cans for food products — canned whipped cream later resulted from a collaboration of chemists with dairy and food scientists. They also helped devise a method for continuous pasteurization of ice-cream mixes, an energy-efficient process most commonly used today. Slow to be adopted were plastic film packages for thermally processed foods and paper containers, staples in packaging today.

It took some 20 years for paper milk containers to catch on. Then developments mushroomed in related areas, such as homogenized milk in paper cartons. It became acceptable in part because consumers could not see that the creamline was missing. — *Joe Tobias, Professor Emeritus, Food Science*

UI dairy researchers provided some early bacteriological safety data on homogenization. Another development on the milk front was a preservation process Paul H. Tracy helped to perfect so that the military could have powdered whole milk during World War II. Robert M. Whitney used powdered milk to pioneer flavor chemistry, with a goal to prevent off-flavors. A significant contribution from that research was training of farmers and students, who would work in industry, to identify off-flavors and defects and their causes. This research led to innovations in food quality and safety.

What foods consumers chose to eat and why were the focus of Station surveys, among the nation's first on diet and health. A 1936 home economics study, directed by Julia O. Holmes and Janice M. Smith, on calcium needs of children was the first of its kind in the country. Basic studies to improve diets in the 1930s helped researchers demonstrate the importance of vegetables for vitamin A, show that lactose enhances absorption of calcium and magnesium in children and young women, and outline daily mineral, protein, thiamine, and riboflavin requirements. Over the years, human nu-

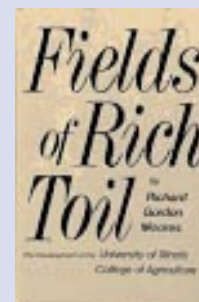
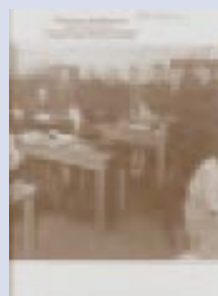
### Further Reading to Take You Back in Time

**A History, 1951–1988.** Department of Agronomy, University of Illinois at Urbana-Champaign. Robert W. Howell and Russell T. Odell, Professors Emeriti. 1988.

**Fields of Rich Toil.** The Development of the University of Illinois College of Agriculture. Richard Gordon Moores.

**Milestones & Memories from the First 50 Years of the Department of Agricultural Economics.** University of Illinois at Urbana-Champaign. Franklin J. Reiss, Professor Emeritus. September 1982.

**Station Centennial. Illinois Research.** Winter 1987/Spring 1988.



1970

1980

1990

**1965**

H.M. Scott publishes first work on "ideal profile" of amino acids for poultry

**1965**

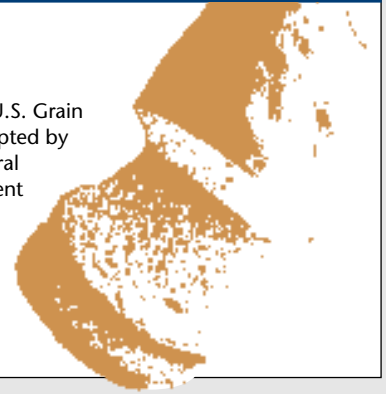
Corn yields at 94 bushels per acre

**1970**

Plant pathologists help avert outbreak of southern corn blight

**1986**

Amendment to the U.S. Grain Standards Act, prompted by research in Agricultural Economics Department



trition research has ranged from these basic studies of the nutritive value of foods to the relation of diet to heart disease, cancer, and immunity.

## Labor-saving Research

Especially in rural areas, life was forever changed by UI researchers whose work helped free farm families from labor-intensive, day-to-day chores. Station researchers designed kitchen space to make meal preparation less tedious and barns to make animal production more efficient. One of the most important projects was rural electrification. By measuring power used on model farms, Emil W. Lehmann and Ray I. Shawl showed that providing electricity to remote farmsteads could be profitable for power companies and beneficial to farm families.

Electrification removed some of the drudgery of farm activities. Producers didn't have to be workhorses; they could use their talents in other areas of the farm. — *Ben Jones, Professor Emeritus, Agricultural Engineering, and Associate Director, Illinois Agricultural Experiment Station*

UI research in machinery innovations helped free producers from work that was time-consuming, tedious, and sometimes dangerous. Because of tractor research, begun in 1916, farmers use rubber tires instead of steel wheels and gasoline instead of kerosene. Station researchers adapted combines to harvest soybeans, a key to increasing the acreage. In the

1950s, George Pickard's basic research led to the design of a combine used to harvest and shell corn in the field today.

As livestock agriculture evolved to intensive production, Station agricultural engineers pioneered work on handling livestock waste in livestock buildings. They conducted some of the earliest feed research on use of grinders and automated conveyance to make confinement livestock handling practices practical.

## Windbreaks and Trusses

While some Station scientists focused on food and agriculture, others made significant gains in forest genetics, management, protection, and wood technology. The first UI forestry plantation, The Forestry, predates the Morrow Plots. Research conducted at The Forestry helped foresters prescribe species for windbreak, fuel wood plantings, and other wood needs of Illinois residents. A remnant of the area still serves the public as Illini Grove, a recreation area on the UI campus in Urbana.

Another important area of UI forestry research is the Sinnissippi Forest, a privately owned forest in northwestern Illinois. Oak forest growth and yield tables generated there since 1930 are still used today. A staging area for UI and multiagency research, the Sinnissippi Forest continues to provide data on regional genetics, Scotch pine adaptability, and the impact of insect pest and disease organisms on Illinois forests.

In addition to finding better methods for managing and protecting Illinois

forests, UI foresters have provided leadership in genetics research. In the 1960s, J.J. Jokela's successful search for rapidly growing clonal selections of native eastern cottonwoods benefited poplar breeding programs throughout the world.

The result of UI forestry research to improve wood products is all around us. Charlie Walter's on-site treatments are used to protect wooden fence posts and utility poles from fungi and termites. Trusses with metal plates instead of nails, based on Don Percival's designs, have become an industry standard for their strength and durability. The wood industry currently is adopting Poo Chow's technology to simulate weathering of wood. This technique reduces the time required to predict durability from thirty years in field testing to two weeks in laboratory simulation.

These are just a few accomplishments of some Station scientists who worked, often in collaboration with researchers at the UI and elsewhere, to fulfill the Hatch Act charge to "aid in acquiring and diffusing...useful and practical information..." Special thanks to the following for resources, comments, and shared memories: David Baker, Wayne Bever, D.W. Chamberlain, Jeff Dawson, Harold Halcrow, Gary Heichel, Lowell Hill, Jeff Dawson, Ben Jones, Ellery Knake, Daniel Meador, Pete Petty, Earl Swanson, Joseph Tobias, and Willard Visek.

*Tina M. Prow, science writer, Agricultural Experiment Station* 🕒

## College Changes with the Times

In December of last year, the College of Agriculture faculty approved a reorganization proposal for the College. These changes, which were proposed by Dean W.R. Gomes but derived from the examinations and recommendations of several groups within the College, must go through several additional layers of approval by the university and state and probably won't occur for a year or more.

College faculty voted yes on a name change for the College. The new name would be College of Agricultural, Consumer, and Environmental Sciences. The College would contain seven academic units: Agricultural and Consumer Economics; Agricultural Engineering; Animal Sciences; Crop Sciences; Food Science and Human Nutrition; Human and Community Development; and Natural Resources and Environmental Sciences. There would also be two interdepartmental, intercollegiate programs: Human Ecology and Nutritional Sciences.

Don Holt, Director of the Agricultural Experiment Station, stresses that "we haven't eliminated programs—we've reorganized them to make them more efficient. Our research and training in these areas are still important, and we will support the same research programs, but they'll be located in different units.

"Our hope is that the new organization will increase our ability to compete for outside funds. For example, the new Department of Natural Resources and

Environmental Sciences will attract more attention to our research in these areas. We also think that the reorganization will reduce administrative costs, thus allowing us to put more money directly toward research." — *Terri Stone, Office of Agricultural Communications and Education*

## Farsighted C-FAR

A new coalition, Illinois Council on Food and Agricultural Research (C-FAR), is being formed with the mission to encourage a profitable, consumer-sensitive, and environmentally sound food and agricultural system in Illinois and the United States.

C-FAR's membership is far-reaching and includes food and consumer associations, farmer organizations, environmental groups, farm commodity organizations, government agencies, sustainable agriculture groups, and individuals interested in food and agriculture. C-FAR is independent of any one organization. It will advocate relevant, high-quality, and adequately funded research and related outreach programs.

Leonard Gardner, C-FAR's executive secretary, is excited by the group's considerable potential. "To my knowledge, this is the first time that anyone has made such a strong effort to bring about a coalition of these disparate parts," Gardner says. "While we don't pretend to represent all citizens of Illinois, we believe that our emphasis on research is

beneficial for society as a whole, not just for members of C-FAR."

C-FAR's mission is given greater urgency by Illinois's poor ranking in overall funding and in state revenue support for food and agricultural research (22nd and 29th, respectively), despite traditionally ranking fourth or fifth in gross agricultural production nationally. C-FAR hopes to put Illinois in the top ten for state support of food and agricultural research.

A long-term goal of C-FAR is to strengthen lines of communication between the food and agriculture industries and the campus-based research communities at the University of Illinois at Urbana-Champaign, Southern Illinois University-Carbondale, Illinois State University, and Western Illinois University. "Previously, individual groups and organizations went to the universities for resources separately," Gardner explains. "Hopefully, C-FAR can speak with a strong, unified voice to the research communities and to the budget makers in Springfield."

For additional information on C-FAR, call Leonard Gardner at (309)663-1144. — *Tina M. Prow and Terri Stone, Office of Agricultural Communications and Education*



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*In the next issue:*

## **Natural Resources and Environmental Sciences**

An in-depth look at one of the College's new research emphases, including:

- *Systems and ecosystems approaches to research*
- *The new Department of Natural Resources and Environmental Sciences*
- *Systems-based resource management*
- *Interdisciplinary research teams and sustainable agriculture*
- *How consumer choices affect the environment*
- *The many levels of environmental awareness*
- *Barriers to adoption of sustainable agriculture methods*
- *Project Learning Tree*

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