Welcome

A HEARTY WELCOME to OHIO 21, the new magazine of the College of Agriculture, the Ohio Agricultural Research and Development Center (OARDC) and the Ohio Cooperative Extension Service (OCES). The magazine is for all persons who have an interest in our activities and who support our efforts in research, undergraduate and graduate instruction, and our Extension outreach educational programs.

Because "agricultural programs" are so broad at The Ohio State University, entities such as the Agricultural Technical Institute, the School of Natural Resources and research and Extension programs of the College of Home Economics and the College of Veterinary Medicine are part of our effort as well.

The title, OHIO 21, captures the thrust of our major initiative: to have educational programs that will position Ohio agriculture and natural resources to effectively handle the challenges of the 21st century, now only 13 years away. OHIO 21 magazine replaces OHIO REPORT, a research focused magazine that was published by the OARDC for more than 20 years.

I believe the new magazine will better reflect and communicate our programs to Ohioans. It will be published twice each year, contain considerable color photography and other illustrative material and will be written so Ohioans can understand what we are doing and why. For example, in this issue our cover story highlights a major effort we have initiated in biotechnology research. Much has been said about biotechnology, and we want Ohio citizens to know our program’s direction, its emphasis, and its reason for existence.

Frederick E. Hutchinson
Vice President for Agricultural Administration; Dean, College of Agriculture; Director, Ohio Agricultural Research and Development Center

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On the cover: Clague Hodgson, a molecular biologist at the Ohio Agricultural Research and Development Center, and Dale Ring, a Wooster dairy farmer, examine gels of protein fragments under light. Gels reveal the chemical structure of proteins or genes.
One of these old remedies refers to mastitis as “garget.” Dairy producers have fought a long, expensive battle with this disease. Most have experienced tossing another mastitis remedy to a corner to gather dust.
MASTITIS: SOME HELP AT LAST

By Jacqueline Ullery

People in the dairy business all over the world want what K. Larry Smith knows about mastitis.

Smith, an Ohio State University dairy researcher, has figured out how losses from mastitis in dairy animals—the most costly disease in animal agriculture—can be cut by 40-50 percent.

No one, especially Smith, contends mastitis problems are over. But the possibility of saving nearly half of the $2 billion mastitis losses to the U.S. dairy industry annually, or half of Ohio's $68 million annual share, is causing Smith's phone to ring plenty.

In the last year or so, Smith has become a world authority on environmental mastitis, according to David L. Zartman, chairman of the OSU dairy department.

Smith is as likely to be invited to speak to researchers and veterinarians in Switzerland, England, and Canada or to address the National Mastitis Council in Columbus as he is to come to his neighbor's barn.

He says the story remains basically the same for all.

"We've discovered two basic types of bugs' or microbes causing mastitis—not just the one group we've been treating since the 1950s," he says.

In his opinion many dairy producers have done a fairly good job treating the familiar type, which he calls contagious mastitis pathogens. These include Staphylococcus aureus and Streptococcus agalactiae organisms.

Treatment has included post milking teat dipping with germicide and dry cow therapy, or antibiotics applied to all quarters of cows at the end of lactation periods. These practices along with cleaner barns, cows, and milking equipment have produced results, and producers need to continue these practices, according to the scientist. But here's the clue that calls for more effort.

"I've done all that and my somatic cell counts are low, but swollen udders milking out clotty or flaky milk—all the signs of mastitis—are still coming through my milking parlor."

Smith hears that frustration everywhere he goes. Low somatic cell counts, a routine test for determining level of the familiar contagious mastitis organisms in the herd, tell Smith that producer has done a good job controlling contagious mastitis. It says nothing about the environmentalists.

In the meantime, producers continue to throw away milk, spend big money on drugs and veterinary services, cull expensive animals with repeated mastitis-problems from the herd, or in-frequently, lose an animal from mastitis-caused death.

Some dairy managers at

K. Larry Smith has collected the largest database known on environmental mastitis organisms.
this stage are beginning to notice mastitis cases occurring more frequently in the herd but not lasting as long. That's typical for environmental mastitis, according to Smith. What's to be done about the new set of microbes, which includes the coliform bacteria and many staph and strep species except the two named for the contagious mastitis? “Most of the treatments for contagious mastitis work poorly for the environmentalists,” Smith says. “That’s especially true for antibiotics. That’s tough to get people to understand because giving an injection to make the problem disappear is easiest. Reducing environmental mastitis requires a combination of management tactics.” Understanding the difference in how the two bacterial groups operate for survival determines that management. Smith suggests thinking of them this way.

“Mastitis is my number one dairy problem—definitely! I’ve tried everything. When Larry Smith came to my barn and said the ventilation was poor and adding to the mastitis problem—I ripped the back side of the barn off.”

Jim Beardsley, Medina

Jim and his wife Linda, who together milk 125 Holsteins for owner Frank Ehrman, called Smith to ask to be included in the test when they found out about it from their county Extension agent and their veterinarian. The idea that they’d have to keep extra records and take time-consuming tests on their cattle didn’t stop their enthusiasm.

“We had hoped for a long time they’d work on mastitis,” Jim says. “It costs us a ridiculous amount of time and money and we’re doing everything we can to stop it.”
we were able to evaluate impacts of these other experiments on bovine mastitis."

In 1983 Smith spotted a connection between vitamin E and selenium levels and incidence of mastitis and published his findings in 1984. Work in Pennsylvania and Australia subsequently helped substantiate his findings.

"The late Dr. W. D. Pounden, OSU/OARDC veterinarian for many years, suspected a connection between diet and mastitis but just couldn't substantiate it," Smith says. "It's interesting how he was on the right track."

More pieces of the puzzle mesh together when Smith notes a major change in dairying in recent years—the switch to housing cattle in barns continuously rather than turning them out to pasture. In the process, cattle diets have become increasingly dependent on silage, predominately corn silage.

"Critical here is that most feedstuffs grown in dairying areas are selenium deficient and storing feeds, particularly corn silage, destroys vitamin E," Smith says.

That deficiency is linked to a cow's capacity to ward off effects of mastitis organisms. Coupling that deficiency with the increased environmental organism contact in the relatively closed barn adds up to the newer side of the mastitis problem. Environmental pathogens are not new organisms, but the situation change makes their antics more visible.

Should dairy cattle be sent back to pastures? Economically, no, Smith says. But he's quick to add that environmental mastitis can be controlled much better than it is now.

After doing his own research, comparing it with results of others, and collaborating findings with studies by dairy nutritionists and veterinarians, here are recommendations:

► Supplement cattle diets with selenium and vitamin E if they need it. Most do, Smith says. He says that's true of most dairying areas in the U.S. and many dairy areas around the world, especially cattle on corn silage. Certain levels of vitamin E and selenium work together in strengthening a cow's natural mastitis fighting defense mechanisms.

During the dry period, daily amounts recommended per cow are one gram of vitamin E and three milligrams of selenium. Recommendations also include injecting 50 milligrams of selenium three weeks before cows calve. During lactation, daily recommendations include 400-600 milligrams of vitamin E and six milligrams of selenium. These amounts help minimize environmental mastitis and also reduce problems with retained placentas.

Richard Billman, Congress

"What upsets me is that I'm doing everything everybody says to do for mastitis—and I still have it in my herd. It's a weird thing."

Richard and his brother Jim milk 165 Jerseys daily—keep about 400 head of cattle—and have one of highest producing Jersey herds in the nation, according to Hogan.

Richard says, "What bothers me is that back in 1972 we could go three to six months without a mastitis case, and now if we only get two or three a week we think we're doing great." More cases of mastitis of shorter duration are common with environmental mastitis, according to Smith.

The Billmans are picky about record keeping, cleanliness and so on, but Richard expresses a common frustration, "I just wish I didn't have as much mastitis."

John Emerson, Apple Creek

"There's no question mastitis has been my biggest loss in farming. Best cow I ever owned died from mastitis. I would have sold her for $10,000—that makes an impression."

Emerson, like the others, is a stickler for cleanliness. An industrial engineer turned dairyman 11 years ago, he glances at some of his equipment used with his 60 Holsteins and says, "Maybe I'll update and maybe I won't. We dairy producers are in a temporary and critical position right now. I see us forced to become a great deal more efficient. We don't need only to deal with local markets—we're faced with those world-wide. Those who have good quality products and low operating costs will make it.

"We have to become more efficient. When we can stop mastitis before it starts—we'll make an impact. Research is more vital today than ever."
MASTITIS

utereine infections, and cystic ovaries.

How can dairy managers be sure cows need selenium and vitamin E? Have blood samples taken and the plasma assessed, particularly at calving. Selenium levels below .07 micrograms per milliliter of plasma signal a need for selenium, according to Smith. Vitamin E is needed when levels go below 4.0 to 5.0 micrograms per milliliter of plasma.

▶ Take special care of cows during the dry period and at calving. "Half of all clinical mastitis in the first three months of lactation probably comes from the dry period," Smith says. "Yet the dry period is the usual time in a cow’s life when she’s sent to a mud and manure lot until she’s ready to calve.

"Cows are especially susceptible to new mastitis infections during the two weeks after drying off and the two-week period before calving. Calving time, one of the most naturally susceptible periods for infections, is also when vitamin E levels are the lowest naturally."

Three years of data gathering preceded Smith’s making that assessment. He also advises keeping dry cows in as clean and dry, well-ventilated housing as possible, which is needed when they’re milking, too.

▶ Keep cows clean, dry. Hot, humid weather is a challenge. Warm and wet conditions are like a luxurious incubator for environmental bacteria. Smith suggests using inorganic bedding such as sand for dairy operations that can handle it. Bacteria thrive on wet organic matter. They can’t survive on clean, dry sand. Good ventilation that promotes drier bedding helps.

▶ Use minimum water in milking parlors. Smith emphasizes minimum. For a long time, conscientious dairymen squirted water at the cows’ udders routinely as they came to the milking parlor.

But what can appear as a clean udder to the unaided eye is usually an udder caked with “invisible bugs.” When that udder is sprayed with water, the microbes collect in water droplets at the teat ends, ready to enter the streak canals when the milking machine is applied.

Smith suggests milkers wash teats only, not whole udders, and dry thoroughly. Then precip teats with an effective germicidal solution, wait 30 seconds, dry thoroughly with a clean paper towel, and attach the machine. After milking, dip teats again with the germicidal solution. Keep water use at a minimum.

Often, milking machines have been blamed for mastitis. Smith thinks clean, properly working machines contribute little to the problem.

He believes dairy operators will benefit from the new efforts. In the meantime, his mastitis research continues down even more avenues and he knows others he’d like the chance to pursue.

“I’d like to establish a mastitis laboratory here at OARDC that could help veterinarians and producers deal with mastitis better,” Smith says. “We don’t need new facilities. I’m mainly talking about adding another person or so to help with that service.

“For example, a producer calls me to his barn and I say do this and do that without having much data—no blood tests, no milk samples to examine. If we could culture cows first and collect other data from the herd, we could make more rational individual recommendations.”

He’d also like the opportunity to test new products. Smith says mastitis research is expensive and labor intensive and requires long-term commitment. His description is: “Cows just don’t line up and say, ‘we’ll all go dry on Monday morning.’

“Mastitis is a significant problem and will continue to be a big problem as the industry changes. High producing cattle are especially susceptible and as production goes up with use of growth hormones and biotechnological developments, the potential for more mastitis is definitely with us.”

Smith’s goal is preventative.

“Often a dairyman will show me a cow and say, ‘What’s the best thing I should treat this mastitis with?’ ” he says. “That’s like extinguishing a fire with a squirt gun.

“The best mastitis control is to prevent it in the first place.”

Checklist For Better Mastitis Control

☑ Administer recommended selenium and vitamin E when deficient.
☑ Give special attention to dry cows.
☑ Use little water for cleaning udders and dry with clean paper towel.
☑ Predip teats with a germicide. Dry with clean paper towel.
☑ Postdip teats with germicide.
☑ Ventilate barns well and provide as clean, dry environment as possible. Use sand or other inorganic material for bedding.
☑ Continue dry cow therapy.
☑ Keep milking equipment in clean, good working condition.

MASTITIS

OHIO 21
ECONOMIC OUTLOOK

More Adjustments for the Farm Sector

Most Ohio farmers will need to make adjustments in their operations to finish the 1980s, but the job will be easier for certain ones.

Dennis Henderson, Ohio State University agricultural economist, says a line still forming between the "haves" and "have nots" is setting agriculture's course for 1987 and beyond.

With individual Ohio farm operators, he describes the "haves" as those who generally operate large enough farms to take advantage of some economies of scale. They have lower debt ratios that are easier to handle as the value of their land equity decreases. They also tend to have more diverse operations, practice good management and generally have some livestock.

By contrast, the "have nots" face high debt and tend to be less well managed, less efficient and predominately cash grain oriented. Henderson says there are exceptions to these definitions and farmers on either
side of the financial fence will need to make adjustments to move through the latter part of the 1980s. However, successful adjustment will be much more difficult for those in the "have not" category.

Warren F. Lee, OSU agricultural economist, says about 30 percent of the state’s 20,000 commercial farmers face difficult financial challenges and owe nearly half of the state’s farm debt. He considers 9 percent of the 20,000 to be in serious trouble. These tend to be younger operators with larger operations.

The remaining 70 percent are financially stable, Lee says.

He says farmers do have some welcome news coming from several sources. Some lenders are more willing to renegotiate loans. Curtailed spending by farmers on capital and operating inputs has added to the decline in outstanding farm debt over the past four years. Unfortunately, the amount of available credit has also decreased since lenders’ operating costs have increased, and they are less willing to take on high risk farm loans.

The most encouraging news for 1987, however, comes from several sources. Some lenders are more willing to renegotiate loans. Curtailed spending by farmers on capital and operating inputs has added to the decline in outstanding farm debt over the past four years. Unfortunately, the amount of available credit has also decreased since lenders’ operating costs have increased, and they are less willing to take on high risk farm loans.

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Increased set-aside programs will decrease the acreage farmed and the amount of production inputs demanded, while increasing competition among sellers in the input markets. Excess supplies of chemicals, equipment and fertilizer were carried into 1987, Lines says.

Lower commodity prices also discourage production, causing less income this year—but the process could be a long one. While the “have nots” have suffered the most, nearly all farmers were hurting last year.

Land values continued to decline. An acre of Ohio farmland averaged $1,000 at the end of 1986—down from the 1980 peak average of $1,800 per acre. Near record feed grain yields increased surpluses and further depreciated their prices. Large numbers of farmers are dealing with financial stress and liquidation.

“For the most part, 1986 was another disappointing year,” says Paul L. Wright, OSU agricultural law specialist. “There are some folks around Ohio making money in farming but many are talking about tough times. The extent we’re dealing with liquidation proceedings and credit mediation makes tax law and other ongoing legal questions almost fun in comparison.

“There’s stress in the farm sector—both financial and emotional. But more and more farmers are talking about their problems. That’s good. It helps them realize they’re not alone and comparing notes lets them discover survival ideas working for others may also work for them,” Wright says.

Improving market conditions for certain commodities helped some Ohio farmers have fewer problems during the past year.

Animal industries shared somewhat brighter spots. An apparent leveling of the demand for red meat, which had been decreasing, and a smaller pig crop pushed hog prices up in 1986. Low beef prices stabilized some, particularly in the second half of 1986. And, consistently good to high lamb prices could be the best news Ohio livestock farmers had last year. The dairy herd buyout program and an increased demand for milk products helped balance supply and demand in the second half of the year. And, although the state’s milk production increased, dairy returns stayed somewhat the same.

Grain producers suffered much more than their livestock producing peers, according to Henderson. The problem, as it has been throughout the 1980s, is surplus. Too much grain in storage and continued record-setting yields keep prices depressed and have been major contributors to the financial crisis sweeping through agriculture.

Even new uses of these grains for human consumption in such products as corn sweeteners haven’t been
significant enough to turn prices upward. A significant increase in government payments kept cash grain producers' problems from becoming even more severe.

What's ahead? Henderson and the others say more divisiveness.

"We've seen more obvious division in agriculture between the 'haves' and the 'have-nots' in the past year than any time in recent memory," Henderson says. "This sets the stage for an outlook where the 'haves' should be in reasonably good shape during the next several years if they continue to use good management, and the 'have-nots' will end up in even worse financial trouble."

The commodity outlook for 1987 emphasizes the need for better management and belt tightening in the industry. Expected prices and surpluses don't offer much encouragement.

Cash grains continue to battle surpluses, and prices are not expected to return to the level of the 1970s. Corn producers will continue seeing some increased demand for their product in the snack food and sweetener markets but not enough to significantly reduce surpluses or increase prices. Record amounts of soybeans are expected, but bean growers should see a more competitive export market in 1987, thanks to continued low prices and a somewhat weakened dollar. Wheat producers can expect the burden of over supply to continue. Nationally, wheat production for 1986-87 is estimated at 2.1 billion bushels and prices are expected to drop significantly.

Milk prices will decline in 1987 along with support prices. But lower dairy termination program assessments included in the 1985 Food Security Act allow producers to return nearly the same revenue. Increasing demand for dairy products should continue keeping supply and demand in closer balance.

The poultry meat market is expected to expand modestly in 1987. Larger capacity in southern broiler houses will increase supplies in the only part of the meat industry that has grown consistently over the past several years.

Red meat supplies are expected to decline 2 percent to 4 percent in 1987, mainly from a reduction of up to 6 percent in beef supplies. Last year was the fifth consecutive year beef cattle numbers showed a decline. Beef prices are expected to improve this year as a result of further cutbacks in production.

Hogs were a bright spot for producers in 1986 and should continue to be in 1987. Inventory cutbacks that caused Ohio pig prices to jump should continue their effect on the market. If corn prices stay at projected levels and producers follow their reported farrowing intentions, 1987 could be another fairly good year for the swine industry.

Overall, agriculture is looking at another lean year, but despite all the negativity, Henderson says he sees some stability returning to the industry. Ohio farmers have experienced tough times, but Ohio farms are diverse enough to fare better financially than others in the Midwest.

"I see the emotionalism—the arm waving and hand wringing about the financial situation—being left behind," Henderson says. "We're not going back to the 1970s, but the decisions we're going to make in the government and on the farm will be critical in bringing back some stability. It will be on a lower scale, for sure, but hopefully it'll be a more balanced one."

What will improve Ohio's farm economy? Continued restructuring of agriculture, say Ohio State University economists.

They say key points that will influence that rebuilding in 1987 and beyond include:

- The industry must continue stripping out excess debt. More progress must be made toward relieving existing stress. Restructured loans, rental agreements with production and price clauses, and new investors either outside or inside the farm family are key areas.

- Government policy remains a big issue. The 1985 Food Security Act brought record budget outlays for agriculture in 1986 and 1987. These were triggered primarily by sharp increases in price deficiency payments to cash grain producers as the U.S. embarked on a low price grain policy to stimulate use. The jury is still out on whether the program is meeting its objectives or if more changes will be necessary.

- Diversity needs to be brought back into the cash grain sector. One of the reasons Ohio farmers are under less financial stress than those in some other states is their tendency to be more diverse. Adjusting enterprises would make cash grain farmers less dependent on one source of income and give them options for dealing with market conditions.

- Further consolidation of production resources will improve the efficiency of surviving farm operations. Commercial family farms are here to stay. Farmers need to consider innovative ways of obtaining capital, inputs and new markets.
Watching a professor clean a beehive on television is no big deal. But if that instructor asks if you understand what is being done and you know he cannot only see but hear your reaction instantly—that's something new.

That new experience is happening for Ohio State University College of Agriculture students and faculty, since the installation last April of an instructional television system that allows live audio and visual interaction between the College's Columbus and Wooster campuses.

Students in Columbus can be taught by faculty at Wooster or vice versa. Students or several faculty members can participate at both locations—depending on specific needs of the class.

Last fall, James Knight, professor of agricultural education, used the television link for the first time. He taught Ag Ed 790, a graduate course about creating better learning environments for students. Enrollees were 22 teachers from elementary and secondary schools—11 in Wooster and 11 in Columbus.

"The students participating at Wooster probably would not have had a chance to take this course without this television system," Knight explains. "Both teacher and students were apprehensive about television at first, but after two or three weeks our being on television was secondary.

"We all became comfortable with the technique and with each other," Knight says. He contends that teaching by television helped him improve his teaching methods. Some of the classes were taped and self-critiqued.

"This experience was not at all like television teaching of the past," Knight explains. "The possibility of immediate response, total sight and sound interaction, enhanced the procedure."

Some student reactions included:

"There is excellent camera work and visual quality and good sound on discussion sessions. It is human and interactive."

"I would rather be in a conventional setting, but this system makes it possible for those of us in the Wooster area to take classes."

"I am enjoying this experience. At first the idea of a television course sounded boring, but this is not the same at all."

Randy Spears, Extension videographer, is at the control console in one of the new interactive video classrooms available to OSU students and faculty.
COMES ALIVE
"This is a novel approach to teaching. It is interesting to have contact with students quite a distance away."

"There is the feeling that one is being watched but not knowing what is being watched."

"I think it is a useful system. I think it is great. It makes for more efficient use of the instructor's time and broadens the potential number of students."

In response to the question, "Would you take a course again using this system?", all students in Ag Ed 790 said, "Yes." Two said, "Absolutely."

The idea to link the two campuses in this way had long been the dream of Kenneth Reisch, associate dean, and Harold Bauman, assistant dean and business manager, both of the College of Agriculture. OARDC faculty needed more classroom teaching opportunities and traveling 90 miles to Columbus for one, two, or three times each week to teach students essentially cost an entire workday plus travel and meal expenses of $40 to $60 per trip.

Two nearly identically equipped classroom-studios are located in 244 Kottman Hall on the Columbus campus and 121 Fisher Auditorium at the OARDC campus in Wooster. Each classroom has three broadcast-quality cameras which can be operated by one person from a control room at the rear of each facility. One camera is mounted on the wall in the front of the room and another at the back. An overhead camera is fixed to a portable cart and is used with visuals such as overhead transparencies or printed matter. The cart also houses a VCR which permits the instructor to play video tapes.

The classrooms are electronically connected by a microwave signal between Columbus and Wooster via the Ohio Educational Broadcasting Network (OEBN). This state agency is located on North Star Road in Columbus and serves as the program distribution service for all public broadcasting stations in Ohio. A microwave transmitter on the roof of Kottman Hall sends the signal on its way over the OEBN network. At Wooster, a fiber optics cable carries the signal from a state-owned microwave tower near OARDC to Fisher Auditorium.

The system and installation cost approximately $250,000 and was funded by the College of Agriculture and OARDC. The Ohio Cooperative Extension Service purchased a video editing system and some additional accessory equipment for the control room in Columbus. OCES and OARDC are funding three television technicians to operate the system as well as to produce other video materials needed for teaching, research, and Extension.

The television system operates up to 15 hours each week, generally 8-9 a.m. and 3-5 p.m. Last September, OEBN installed a half million dollar satellite uplink transmitter on that site. The uplink also benefits the College of Agriculture, because the Ohio Cooperative Extension Service plans to eventually teach via satellite to its five district and many of its 88 county office locations. Satellite receiving dishes are being installed in the district offices and three satellite teleconferences have been scheduled for February and March 1987. Programs will be for Ohioans but anyone with a satellite dish in North America could tune in.

In addition to classroom teaching, the television link is used for departmental meetings and seminars. Research faculty members in the Department of Agronomy located in Wooster, for example, do not need to drive to Columbus for a departmental meeting. Furthermore, the College of Agriculture has had several faculty meetings with the television link saving travel time and costs for several dozen faculty members. In fact, the first use of the link last April 1 was a faculty meeting which featured Fred Hutchinson, Vice President for Agriculture and Dean of the College of Agriculture, and Edward Jennings, OSU President.

The television link schedule is essentially booked solid. Three classes were taught spring quarter 1986. Four classes were or are in progress for each of the quarters that followed.

Besides live television classroom teaching, each facility can be used as a production studio for taping and editing educational presentations for
later classroom use or other teaching such as the educational programs conducted by the Ohio Cooperative Extension Service. The facilities can also be used by students or faculty who want to improve their speaking and presentational skills. Many do that by watching themselves on tape. And, of course, these same classroom studios will be the originating studios for satellite teleconferencing programs.

The increased availability of home video tape players and satellite transmission are catalysts for a television renaissance. In the 1950s and 1960s considerable effort was made on many university campuses and some of the nation’s larger high schools to take the instructor to more students simultaneously by television. The lecture, either prerecorded or live, was piped into several classrooms to reach greater numbers of students. At a time when baby boom enrollments pushed class sizes higher, closed circuit television was thought to be a great way to increase productivity in academia. Efforts also were made to teach over the air, usually on public stations, to mostly adult students. Considerable teaching is done still with both closed circuit and broadcast television. But as the enrollment surge subsided, the instructional television boom gradually faded. Another major reason for the decline was boredom.

Much of instructional television used the “talking head” format—a stand-up lecture with the blackboard filled with major points or mathematical equations. No live interaction occurred between teacher and students. College students, who as youngsters were stimulated with Ding Dong School, Captain Kangaroo or Sesame Street, found most instructional television boring. On many campuses, students avoided tv courses. As the student to teacher ratio improved in the late 1960s to 1970s, less instructional television was offered.

How does OSU counter dull television teaching? Instructors are encouraged to meet with graphic artists of the Section of Information and Applied Communications in advance to make sure visual instructional materials such as slides, overhead transparencies, and video tapes are in a good television format. Increased conversation and discussion among students at both locations also is encouraged so neither group feels isolated by the 90 miles. Panel discussions and oral reports by students enhance the effectiveness of the classes. Those instructors who rely solely on the lecture method and blackboard notes are not fully using the capability of the system.

Television tends to accentuate both good and bad teaching methods. Excellent instructional skills generally look even better on television but the not-so-good techniques look even worse. Full-color graphics designed for use on television, and live interaction between Wooster and Columbus students help television teaching immensely.

Faculty, staff and students in agriculture welcome the challenge television instruction brings. The increased use of relatively inexpensive home video recorders, the use of satellite transmission, which now costs under $1,000 per hour, and society’s growing interest in electronic audiovisual media may mean television will become a major communications tool for agricultural programs at The Ohio State University.
Animal Biotechnology

Super Options

What research is being done and why

By Tom Storey
Super pigs, super cows and super chickens. Mention animal biotechnology and many people picture giant versions of farm animals that will flood an already saturated world commodity market.

In reality, however, this powerful research thrust at The Ohio State University/Ohio Agricultural Research and Development Center involves expanding the animals’ capabilities, not size. The OSU/OARDC scientists believe biotechnology is an opportunity for agriculture.

“Agriculture has traditionally focused on marketing conventional agricultural products,” says Floyd Schanbacher, associate professor of dairy science and spokesman of the animal biotechnology program at OARDC. “But we think biotechnology will create a closer alignment of agriculture to such industries as biomedicine, pharmaceuticals, and food and nutrition in ways not possible before.”

Clague Hodgson, assistant professor of dairy science and one of five molecular biologists in the program says, “The intent is to get away from overproduction and develop new and useful products.”
The program, however, is more than investigating new possibilities. It’s a bold initiative to strengthen an already respected agricultural research and instruction effort at OSU. By adding a biotechnology dimension, the College of Agriculture has strengthened its basic science program which complements its applied program.

“The entire research program is harder, faster and sharper,” Schanbacher says. “And this benefits both graduate and undergraduate students.”

It also is an investment by the state of Ohio. The OARDC program was created largely through the Ohio 21 plan, a strategic plan to position the state for better economic growth. The idea is to establish a dynamic research base, of which the OARDC program is one part, attractive to businesses ready to commercialize research results.

After only two years, five molecular biologists with recombinant DNA skills are on board and working with animal scientists. Equipment, including a DNA synthesizer or “gene machine” has been bought, laboratories have been renovated and research begun.

What kinds of ideas are being pursued?

The most exciting—and the most scientifically challenging—possibility of biotechnology is “molecular” farming. This is the “Star Wars” aspect of biotechnology research, says Hodgson, formerly a biomedical researcher in the Baylor College of Medicine, Houston, Texas.

Molecular farming would involve using farm animals such as cows or chickens as “biological factories” to produce commercially valuable proteins. The animals would secrete the protein in their milk and eggs. Farming would remain relatively the same with one exception—end products would be different.

“The chicken oviduct and the bovine mammary gland currently produce proteins in large quantities daily,” Hodgson says. “Either system might therefore be adapted for production of a wide spectrum of useful industrial proteins using genetic engineering technology. These systems also may be cheaper and more efficient than conventional processes.”

The milk or eggs could be sold to companies which would capture the protein through a separation process. Thus, a sector of the agricultural economy, currently depressed and burdened with surplus, could effectively be used to produce polymers, enzymes, vaccines, hormones, or nutritional supplements, Hodgson says.

Another possibility of molecular farming is creation of novel proteins with new uses. For example, enzymes might be modified to catalyze reactions over a broader range of temperatures or chemical conditions, or to catalyze entirely new kinds of reactions. These engineered proteins, which would have unique structures and improved properties, would be produced by altered

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**Why Study Genes**

What are genes and why study them?

Whether in plants or animals, genes are units in a cell nucleus composed of deoxyribonucleic acid, or DNA, a very long molecule consisting of four chemical bases—thymine, adenine, guanine and cytosine.

A simple bacterium typically has 3,000 to 4,000 genes per cell, while higher organisms can have many thousands of genes per cell with each one varying in length.

The reason genes are so important is that they are the “mainframe computers” of the body. In addition to carrying hereditary information, they regulate the basic biochemical processes of life by controlling the production and release of important proteins. Each gene encodes for a certain protein.

The central concern of biotechnology research is what causes a gene to produce, or express, the protein it encodes. Understanding how genes construct proteins and how proteins function will lead to improving genetically based processes such as growth, reproduction, digestion and disease defense.

“If we understand how genes are regulated, what causes expression, and how proteins interact, we can begin to improve the performance and expand the capabilities of farm animals,” says Douglas Foster, assistant professor of poultry science and a molecular biologist at OARDC.

The proteins genes manufacture have diverse talents and are critical to healthy survival. Some, called enzymes, catalyze biological reactions—pepsin aids in digestion. Others give the cell structure, as in silk or hair. Some, called hormones, are chemical messengers that modify and coordinate the activities of cells. Still others recognize and bind to other molecules, such as antibodies.

Genes make proteins with uncanny precision. A double strand of DNA uncoils and separates, exposing its genetic code, the sequence of its chemical bases. An enzyme copies that sequence of bases and synthesizes a strand of messenger RNA, which floats to a ribosome. The ribosome reads the messenger RNA three bases at a time and finds the matching transfer RNA. It repeats the process, reading the next three bases and picking the proper transfer RNA, and then knits the second amino acid to the first. Eventually, there is a chain 30 to 1,400 amino acids long that folds up on itself and becomes a protein. Which protein it is depends on the
sequence of amino acids.

Scientists understand this process, called protein synthesis, fairly well. What they don’t know is what mechanisms trigger it.

Biotechnology centers on manipulating genes, enzymes, hormones or other biological substances in beneficial ways. It’s defined as any technique using living organisms, or parts of living organisms, to make or modify products, or to improve plants or animals. Most of the products being developed fall into two very broad categories; chemical substances made using genetically engineered organisms, or the genetically engineered organisms themselves.

Recombinant DNA technology allows scientists to isolate genes, purify them, characterize them, copy them and then reintroduce them into cells. The process: with highly specialized enzymes, scientists snip individual genes from a complex DNA molecule and recombine them on a bacterium’s plasmid, a circular piece of DNA found outside the chromosome. The altered plasmid is reintroduced into the bacterium. By growing the engineered bacterium in cell culture, scientists obtain large amounts of genes and their proteins. Before the advent of this technology, essentially nothing was known about the properties of genes or their proteins because they were essentially unavailable for study.

Although the basic technique of recombining DNA is now fairly well established, its application in the laboratory still entails considerable technical difficulties. With these technical challenges and the sheer number of genes in a cell, finding one specific gene could take as long as three years. Consider that if a DNA molecule was stretched to one kilometer in length, a single gene would be a millimeter’s worth.

Biotechnologists at OARDC have completed “gene libraries” for avian species and dairy cows that contain several thousand genes. These libraries are an immense aid when looking for a specific gene.
BIOTECHNOLOGY

By replacing disease-causing genes with genes for other proteins, viruses could incorporate beneficial genes into the DNA of their hosts.

Two other research projects focus on cost cutting.

Rosalia C. M. Simmen and Frank A. Simmen, both from the Baylor College of Medicine and assistant professors of animal science as well as molecular biologists, are concerned with improving reproductive efficiency in swine. Sows begin pregnancy with 16 embryos but mysteriously lose half of them before birth. Another 15 to 20 percent of newborn pigs die a few days after birth. Improving prenatal and post-birth survival by 20 percent would save U.S. hog producers an estimated $400 million in production costs each year.

Rosalia Simmen is identifying pig uterine proteins essential for embryo survival. One found in large amounts is uteroferrin protein, which helps transfer iron from the mother to the fetus. For an unknown reason, the level of the protein falls off considerably in late pregnancy. Rosalia Simmen plans to isolate and characterize the uteroferrin gene, which is responsible for uteroferrin protein, to see how it's regulated during pregnancy.

"It could be that imbalances in the levels of steroid hormones, present in large amounts in late pregnancy, are blocking the release of uteroferrin protein," she says. "It also could be that the gene shuts down or becomes involved in some other function."

Rosalia Simmen also intends to identify other uterine proteins, and their corresponding genes, and determine if they are beneficial or inhibitive to fetal development. The goal is, through genetic engineering, to boost levels of beneficial proteins and cut amounts of inhibitory ones.

Frank Simmen is examining polypeptide growth factors, tiny proteins in sow colostrum, to determine their influence on growth and tissue development in newborn pigs. Preliminary tests indicate at least two distinct proteins that stimulate growth. One is somatomedin, an insulin-like growth factor.

He intends to identify growth factors present and find out what they do in the baby pig. He also wants
to determine how these growth factors are regulated during lactation. Then he hopes to isolate and characterize the genes responsible for their manufacture and release.

"Increased production of a more nutritious colostrum is theoretically possible by introducing extra genes for milk production into the nursing sow," Simmen says. "Once identified and characterized, such genes could be useful in improving newborn survival and reducing the length of time before weaning."

In still another project, Foster, formerly with the Mayo Clinic in Rochester, Minn., is studying pituitary hormones in broiler chickens. He is attempting to understand better how pituitary hormones work and what triggers their release. He believes this could lead to more efficient use of rations and leaner broiler meat.

"With these hormones present at increased amounts, a broiler may need only 1.5 pounds of food rations for every pound of weight gain," Foster says. "The current rate is 1.9. Given that 4.7 billion chickens are produced annually, and that more than 70 percent of production costs is feed, this could mean a substantial savings for the poultry industry."

The researchers warn, however, that several questions must be answered before genetic engineering of any farm animals becomes practical. For example, they are not certain whether new proteins or elevated levels of hormones would upset metabolism and cause harmful side effects.

Also, the expression of an inserted gene can be influenced by where the gene is inserted into DNA. So far, controlling where a gene lands on the chromosome of an animal cell is not possible. Yet this position can affect not only the expression of the inserted gene but also the regulation of the host cell's DNA. Inserted DNA could separate two sections of a functioning gene and block its action.

"We don't understand a number of physiological consequences of inserting genes yet," Schanbacher says. "Although there are some dynamic possibilities, one has to be cautious about drawing too many conclusions of what the value of this technique will be."

Potential applications aside, the major reason for studying genes and proteins is to find out how they do what they do. Currently, not enough is known about how genes function in biological systems. The data generated from OARDC biotechnological research will not only serve agriculture, it will broaden the fundamental knowledge base of biology in general.

"The areas such as gene expression and gene regulation that we'll be investigating are common to biological systems," explains Frank Simmen. "Once the principles are understood, they'll have widespread application."
BIOTECHNOLOGY

What's Emerging in Plant Biotechnology

Despite unexpected delays in laboratory renovation, a plant biotechnology program has been established at The Ohio State University. Five molecular biologists have been hired and research has begun in temporary labs.

The molecular biologists are: W. D. Bauer and Joseph Kamalay, agronomy department; Richard Sayre and Thomas Sims, botany; and Terry Graham, plant pathology. Kamalay is the senior member of the team, joining OSU in October 1985. The others came on board in 1986.

Aside from teaching molecular biology and integrating its concepts into plant research, the program's goal is to understand plant functioning and improve plant traits through genetic engineering. This requires a working linkage among molecular biologists, physiologists and plant breeders.

Kamalay's research focuses on identifying, isolating and characterizing plant genes involved in the senescence, or aging, of leaves, flowers and pods, and genes that are induced by hormones. The presence of hormones, such as auxins or cytokinins, in plant cells will activate or "turn on" certain genes which, in turn, will synthesize the proteins needed for a specific biological activity. Understanding the mechanisms that trigger this process will lead to artificially controlling gene expression and agronomically important processes such as senescence.

Bauer's research is concerned with the process of symbiotic nitrogen fixation. Roots of soybeans are invaded by soil bacteria called rhizobia that convert nitrogen from the air to ammonia, avoiding the need for fertilizer application. Bauer is seeking to develop more effective rhizobia for inoculation. He is also working to understand how the host plant regulates infection by these bacteria so the symbiosis can be optimized.

Sims is attempting to isolate and manipulate genes that control whether pollen is able to fertilize the ovary after flowering. Many plants have strong barriers to self-fertilization. These barriers can pose major difficulty for efficient plant breeding. Sims' research will involve not only isolation of the genes responsible for these barriers but also the "engineering" of these genes. The altered genes will be reintroduced into the plant to either eliminate the barriers to fertilization or to establish new ones to facilitate hybrid production.

Sayre has initiated molecular genetic research to characterize the machinery of the chloroplast that converts sunlight and carbon dioxide to sugar and energy. In part, his research is concerned with the structure and function of the photosynthetic protein that is the site of action of major herbicides.

Graham is learning how plants defend themselves against diseases. He is characterizing the molecules that act as signals when a pathogen induces defense responses in the plant. This research is directed towards discovering new chemical and genetic means to elicit these defenses and enhance plant protection.

For example, information Frank and Rosalia Simmen generate on reproductive physiology in swine may very well offer clues to high infant mortality rates in humans, which is a problem in many areas and especially third-world countries.

"Pigs are an excellent research model," Frank Simmen says. "We could just as easily talk about our research to the American Medical Association as we could to the National Pork Council."

Having research that could have wide application also diversifies funding sources. Non-agricultural organizations are already interested in contributing. Hodgson's work on gene insertion interested the March of Dimes, whose goal is to eliminate genetic defects. The organi-
On a tour, Dale Ring, Wooster area dairyman, tries his hand with the gel reader that helps Clague Hodgson read DNA codes.

On campus, the momentum for the program is high. Schanbacher credits an emphasis on teamwork, a flexible administrative structure and an interdepartmental, interdisciplinary approach. Each molecular biologist holds an appointment in dairy, poultry and animal science. They also share lab equipment and tissue culture facilities and participate in weekly meetings to go over current scientific research and laboratory data.

Originally, there was concern about bringing biomedical researchers into an agricultural setting. Some feared that with their limited agricultural background, the molecular biologists would not be widely accepted. But the interplay between the two groups of scientists has occurred more rapidly than anyone anticipated.

"Molecular biologists alone cannot solve agriculture’s problems," Foster says. "The way we’ll be able to help is by providing information about the basic chemical aspects of gene expression to animal scientists interested in modifying the genetic content of animals, or artificially regulating gene expression. The interplay between molecular biologist and animal scientist is crucial."

Most people are just beginning to learn about the OARDC animal biotech program, says Herman Brubaker, a dairy farmer in West Alexandria and president of Milk Marketing Inc., a large dairy cooperative in Cleveland. However, he believes most farmers support research geared toward creating new opportunities.

Schanbacher says, "With appropriate resources I believe Ohio State University has the opportunity to become the Silicon Valley of agricultural biotechnology. "But if biotechnology is super anything, it's super options. We intend to provide options and let industry and society decide how to implement them."
A curious plant that grows from logs, not soil, is being tested as a potential new Ohio-grown crop by an Extension forester and several local volunteers in southern Ohio.

The plant is the shiitake, pronounced shee-ee-taw-kay, mushroom. Tan to dark brown, it is a fleshier mushroom than the button-type familiar to most Americans. Raw, it is slightly spongy. Sauteed or fried, the texture is comparable to that of pork or lobster. Its taste includes the delicate earthy essence of most mushrooms, but it also has a light woody or nutty flavor.

Loved by oriental populations for centuries, the shiitake mushroom is only recently turning up more often as a fresh produce item in the United States in certain grocery stores and in some restaurant entrees. The mushroom is imported mainly in dehydrated form.

It's one of Japan's chief export crops. The U.S. spends several million dollars each year importing it.

With the mushroom's growing U.S. popularity as a gourmet fresh produce item, leaders in the Community and Natural Resource Development program of the Ohio Cooperative Extension Service decided to examine if it had possibilities as an Ohio-grown crop.

Steve Bratkovich, Extension south district forestry specialist, started a test site at Canter's Cave just north of Jackson in 1985. Goals were to determine if the mushroom can be grown in Ohio climate, to find the ingredients of good management in that climate and to document potential grower costs of production.

Because shiitakes grow from wood, the experimental site at Canter's Cave resembles a strange log pile. Often, the logs, four feet long and from four to six inches in diameter, are stacked on end in single rows against thin wooden railings. The image is somewhat suggestive of stacked arms in an infantry camp.

Among those logs at times helping Bratkovich with the project is a team of volunteer landowners interested in mushroom farming.

So far, they've had the best results with oak logs they inoculated with a shiitake spawn strain from a company in Virginia. This particular combination has surprised everyone with its rapid and continual fruiting. While literature on shiitake growth generally says first harvest after inoculation usually takes one to two years, the Canter's Cave oak, inoculated in spring of 1985 produced a small fruiting in the fall of the same year. Last year the same logs fruited not just the expected spring and fall seasons but continually, off and on, from spring through fall.

Bratkovich doesn't know exactly what accounts for such hyperactive fruiting, except that the spawn material is an extremely active strain and is especially suited to southern Ohio climate.

He also tried beech logs as a host material since beech is abundant in the state, but those logs show only limited fruiting. That the oak has been doing well is not surprising to Bratkovich. Oak is highly recommended in shiitake literature.

Tan to dark brown, the shiitake mushroom grows from oak logs and has a slightly woody or nutty flavor.
MUSHROOM OF THE FALLEN TREE

By David Tipton
“The word, shiitake, is Japanese for mushroom (take) of the fallen tree (shii),” Bratkovich says. “The American oak is very close in botanical structure to the type of fallen tree in Japan that supports shiitake fruiting.”

Inoculating wood with shiitake spawn, which is available now in the U.S. from several suppliers, requires first that logs be gathered that have been cut in the dormant stage and aged for at least two or three weeks.

The two-week wait is crucial. Shiitakes will not infest living wood. If logs are cut while dormant, the sugar content of the sap is high, which aids shiitake growth. Wood temperatures are also lower during dormancy, which restricts growth of competitive fungi.

Next, a large number of holes about three-fourths inch deep and a half inch in diameter are drilled into the logs. Holes are spaced every six to eight inches in length-wise rows, and these rows are spaced two to four inches apart and staggered around the circumference of the log.

This large quantity and placement of holes provides an abundance of points for the minute network of mushroom roots, called mycelium, to take hold quickly and evenly.

Spawn, which may be bought in an impregnated plug or mixed in sawdust, is inserted into each hole. Plugs are inserted with a mallet. Sawdust is packed into the hole and sealed with paraffin, cheese wax or similar material.

After inoculation, which is needed only once for a log, the shiitake growing procedure is a matter of maintaining a certain level of log moisture and heat.

Usually literature on shiitake cultivation recommends stacking the logs in a crosshatch pattern after inoculation to preserve moisture and promote good airflow.

At Canter’s Cave, however, Bratkovich and his cooperators placed logs initially against and on top of each other. Stacking them this way retained more initial moisture, Bratkovich maintains.

At the first sign of surface mold, though, the logs were rearranged into the crosshatch pattern. This stopped surface mold growth and the shiitake mycelium completed colonization of the logs. Completion is evident with a fuzzy white fungal growth on the log ends within the sapwood ring. Shortly after this occurs, and depending on climate, the shiitakes start budding through the surface of the log.

Cool nights followed by warm days of high humidity are ideal at this stage. When humidity drops and remains low, logs must be moistened.

Bratkovich tried wetting logs two
ways. Soaking them for one to three
days in a trough worked best. He
also tried using a lawn soaker hose
on others. He says using the troughs
was more work, but the water bill
was higher with the sprinkler
method.

Soaking with the troughs had an­
other benefit. Done just prior to
expected fruiting, especially after ex­tended dry weather, soaking ap ­
appeared to enhance shiitake fruiting.
Bratkovich claims more work needs
to be done with that process.

In fact, he says the site at Canter’s
Cave needs to be continued several
years before an adequate picture of
Ohio shiitake cultivation can be
really seen and understood. He and
his crew have tried several combi­
nations of wood, kinds of spawn,
and different management. But Brat­
kovich claims they need to do more.
He’s also comparing Ohio results
with work with the mushroom in
several other states.

Even at this early stage, Bratkov­
ich and his cooperators have deter­
mined the mushrooms certainly can
be grown in Ohio. However, they
do call the operation fairly labor
intensive.

Initial start-up costs, particularly
for a seasonal supplemental business,
can be low, especially if a person
already owns land with oak trees on
it. Total costs would be considerably
more, of course, for those wanting
shiitakes for a year-around business,
which would require a building with
lighting, heat and humidity.

Though economic projections
about the future shiitake market will
not be developed until late this year,
Bratkovich feels the informal signs
are encouraging. He notes the 400
inquiries he received after a story
about the effort appeared in a met­
ropolitan newspaper.

Bratkovich says several larger food
companies are beginning to show
interest. He thinks some may con­
duct full-scale analyses soon to de­
terminate the shiitake market potential
in the United States.

In the meantime, Bratkovich and
his crew will continue their work.
Visitors to the Canter’s Cave site
often get a chance to see and hear
about results. Many that arrive at
the right time of fruiting get to taste
a fresh shiitake.

Steve Bratkovich singles out one of his
fruiting logs to show how the shiitake
appears in its blooming stage.
RE:FIT HELPS FARMERS FIND HOPE IN NEW PLACES

Some folks forced from their traditional roles in production agriculture are finding new hope in places they haven’t considered before.

They’re getting help from a new Extension program called RE:FIT, short for Rural Economics: Farmers in Transition.

Joseph E. Heimlich, Extension Community and Natural Resource Development program assistant, says farmers often enter the program displaying discouragement and low self-esteem. But a surprising amount are leaving with confidence and feelings of self-worth.

“They don’t necessarily leave with new jobs, but their attitudes definitely improve,” Heimlich says. “This program helps them see that even though farming may be their first career choice, they have other marketable skills and interests.”

Most learn that farming gave them experience for other jobs. Before RE:FIT, 18 percent of the participants said they believed they had marketable skills. After the program, 100 percent reported that they did.

But finding they have other interests is the big one, Heimlich says. They realize that some other jobs do give them opportunities in line with those interests.

The RE:FIT program offers a combination of crisis counseling, career planning and self-assessment. So far, 28 counties have this program operating through local county Extension offices, and Phil Grover, state CNRD specialist, expects it to go statewide soon.

A new segment to the program will be added this summer. Then, county Extension offices will offer do-it-yourself RE:FIT discussion guides for use with organizational and social groups.

With descriptions based on situations in a variety of agricultural dilemmas, the guides help people recognize impending crises early when strategies for changes, alternative careers, and training can begin before emergency strikes.

In the RE:FIT effort, Extension works closely, particularly as a referral service, to such other agencies as those within the Ohio Job Training Partnership Act of the Ohio Bureau of Employment Services, the Division of Vocational Education of the Ohio Department of Education, Ohio Council of Community Mental Health Agencies, and the National Center for Research in Vocational Education at OSU.

AG ENGINEER FINDS MANY SPRAYERS IMPROPERLY CALIBRATED

Poorly calibrated chemical sprayers are robbing growers’ pockets.

Too little chemical applied can result in poor pest control and reduced yields. Too much chemical can injure a crop, waste money and add to pollution problems.

H. Erdal Ozkan, Ohio State University Extension agricultural engineer, has been conducting computerized sprayer calibration clinics all over the state. So far he’s finding that only 20 percent of the sprayers calibrated were reasonably accurate. Ozkan considers a plus or minus five percent of error as reasonable.

Under his terms, roughly one-third of the applicators applied too much spray. If results from the clinics thus far are indications of the statewide sprayer inaccuracy, Ozkan estimates Ohioans are wasting about $8 million dollars in herbicides alone each year.

That doesn’t include similar losses for insecticides, fungicides and fertilizers. It also does not take into account wasted applications to orchards, vegetables, and lawns and turfgrasses. If it did, Ozkan believes total state loss would easily reach $100 million a year. Growers, Ozkan, and county Extension agents are working together to control the problem.

H. Erdal Ozkan, county Extension agents, and growers are improving sprayer calibration.
# NEW PUBLICATIONS

## ATI DAIRY TECH GRADS AVERAGE THREE JOB OFFERS

Agricultural Technical Institute in Wooster has more job offers to fill than graduates. Some people find that situation ironic in the midst of much doom-flavored agricultural talk these days.

The Dairy Cattle Production Technology curriculum at the two-year degree institute is a prime example. Graduates from the program last year averaged three job offers per person.

Royce Thornton, who heads that Ohio State University dairy program, says he believes contributing reasons are that milk consumption has gone up slightly, dairy owners are hiring more employees, and more advanced training is needed to keep up with new dairy technology.

ATI has responded by stepping up the program with help from funding through a special five-year Academic Challenge Grant from The Ohio Board of Regents and from the State of Ohio Capital Improvement Funds.

The expansion has led to hiring an additional faculty member. It also includes the building of high-tech, computerized dairy facilities scheduled for completion this summer.

Thornton says the major innovation in the new 100-cow dairy unit is the integration of various computer systems to monitor feeding, milking, record keeping, financial analyses and long-range planning.

This master computer system will transmit directly to the classroom and also allow access to national data bases. The plan is to increase student learning and opportunities in many ways, including more participation in regional and national dairy activities.

## INSTITUTE HELPS STUDENTS FIND PROFESSOR FRIENDS

Ohio high school students with outstanding credentials and a keen interest in science should check with their science teachers about the new Governor's Summer Institute for the Gifted and Talented.

Last summer, 22 energetic high schoolers attended the College of Agriculture for five days as part of the first-year Institute. They heard lectures about scientific method, had computer training, took a field trip to Ross Laboratories, completed library assignments and met with faculty.

The students described the week as intense but fun-filled. At the week's end, each student made presentations of research proposals to their professors and peers.

Many have continued working through the year with research topics they explored during their special week. Subjects range from work with genes in biotechnology to nutritional studies. Several students continue to contact their professor friends made during the event.

Edward E. Darrow, assistant dean in the College, says the program is designed to stimulate interest in scientific careers and to show these gifted students that The Ohio State University is a great place to study.

Participants are nominated by their high school science teachers.

Institute dates this summer are July 6-10.
NEW SOYBEAN VARIETIES ARE READY FOR GROWERS

Gnome 85, Ripley, and Sherman are three new Ohio soybean varieties available to producers as certified seed. They're expected to be popular with Ohio growers along with the Century 84 and Zane varieties released last year.

Breeders releasing the three new varieties are R. L. Cooper, USDA/ARS scientist, and S. K. St. Martin and B. A. McBlain, researchers with the Ohio State University/Ohio Agricultural Research and Development Center.

They describe the new varieties this way:

► Gnome 85 is an early determinate semidwarf variety resistant to races of phytophthora rot currently prevalent in Ohio. It is adapted to much of northwest Ohio and has about the same maturity as Zane or is about five days earlier than the semidwarf varieties of Hobbit or Sprite. It is suggested for highly productive environments where phytophthora rot resistance or an early maturing semidwarf variety is desired.

Like all semidwarf varieties, Gnome 85 should be solid-seeded in 7- to 10-inch rows at about four seeds per foot of row, or 100 to 120 pounds per acre, for maximum yields.

► Ripley is a determinate semidwarf variety adapted to southern Ohio south of I-70. It is an early maturity group IV variety similar to Sparks and Pixie varieties. However, Ripley has consistently outyielded Pixie and is recommended to replace Pixie. Ripley has also yielded better than Sparks, even in 30-inch rows.

In addition to its high yield potential, Ripley is highly tolerant to phytophthora rot and should yield well where the disease has been a problem. Maximum yields will be obtained in 7- to 10-inch rows seeded at three to four seeds per foot of row, or at 90 to 120 pounds per acre.

► Sherman is an indeterminate variety of mid-maturity group III, similar in maturity to Harper variety, and three to four days later than Zane. In field tolerance to phytophthora rot, it is superior to Amcor and Elgin varieties, similar to Harper, but less tolerant than Zane.

Sherman was released because it exhibits superior yield potential and is recommended to producers for fields where phytophthora rot is not a problem. It appears to perform better than other varieties under water-stress conditions and may be considered as a later maturing alternative to Amcor.

Most new soybean varieties require from eight to ten years of research before they are ready to be released to the public.
1987 Field Days

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<td>Molly Caren Agricultural Center, London</td>
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WETLANDS OFFER SURPRISE BENEFITS

Many people are beginning to realize some surprising benefits from wetlands, areas of the globe once considered mainly useless.

These areas, neither quite land nor water but a combination of both, have been a neglected part of the landscape, according to William J. Mitsch, Ohio State University professor of natural resources.

"While wetlands have always been prized for their fish and wildlife habitat value, only recently are people realizing wetlands can improve water quality, prevent flooding, control droughts and provide recreational opportunities," Mitsch says.

Many wetlands have been drained over the years to make way for urban development and agriculture.

"Now, researchers are experimenting with creating artificial wetlands, and the resultant multiple-use environment is encouraging," Mitsch says.

Mitsch is teaching a new course about wetland ecology and management in the OSU School of Natural Resources. He presented an abbreviated version of the course at the University of Copenhagen, Denmark, recently.

Mitsch and James G. Gosselink have co-authored the first comprehensive textbook about wetlands. The book, "Wetlands," was published in 1986 by Van-Nostrand Reinhold Company.

Wetlands Can Improve Water Quality and Prevent Flooding