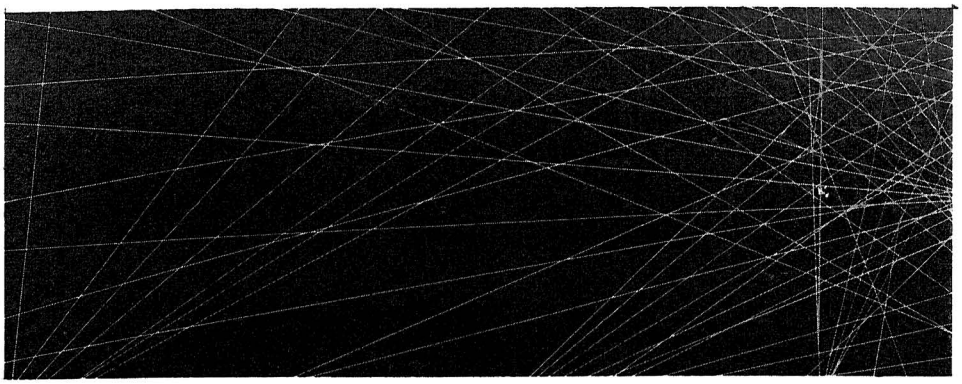
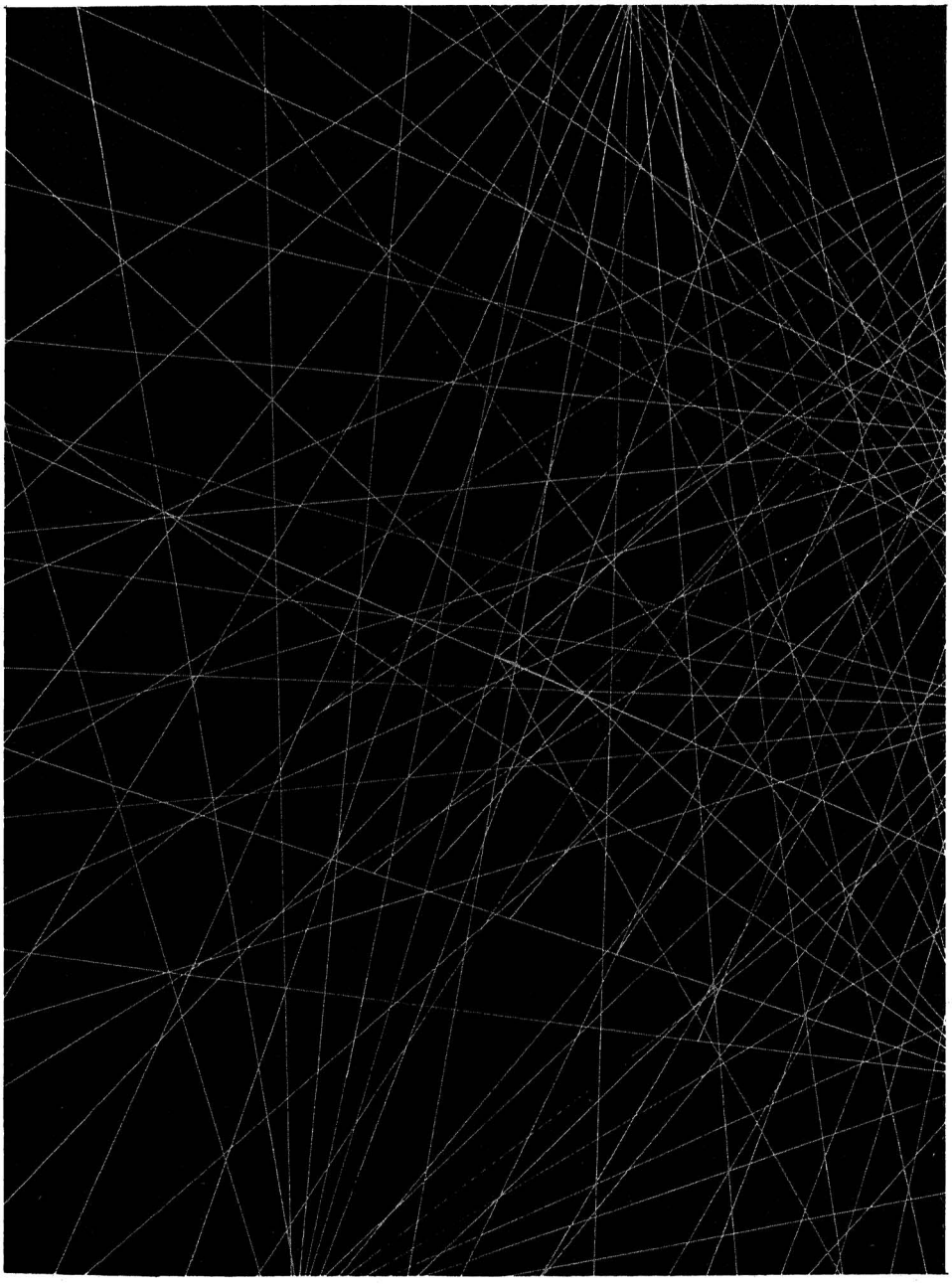
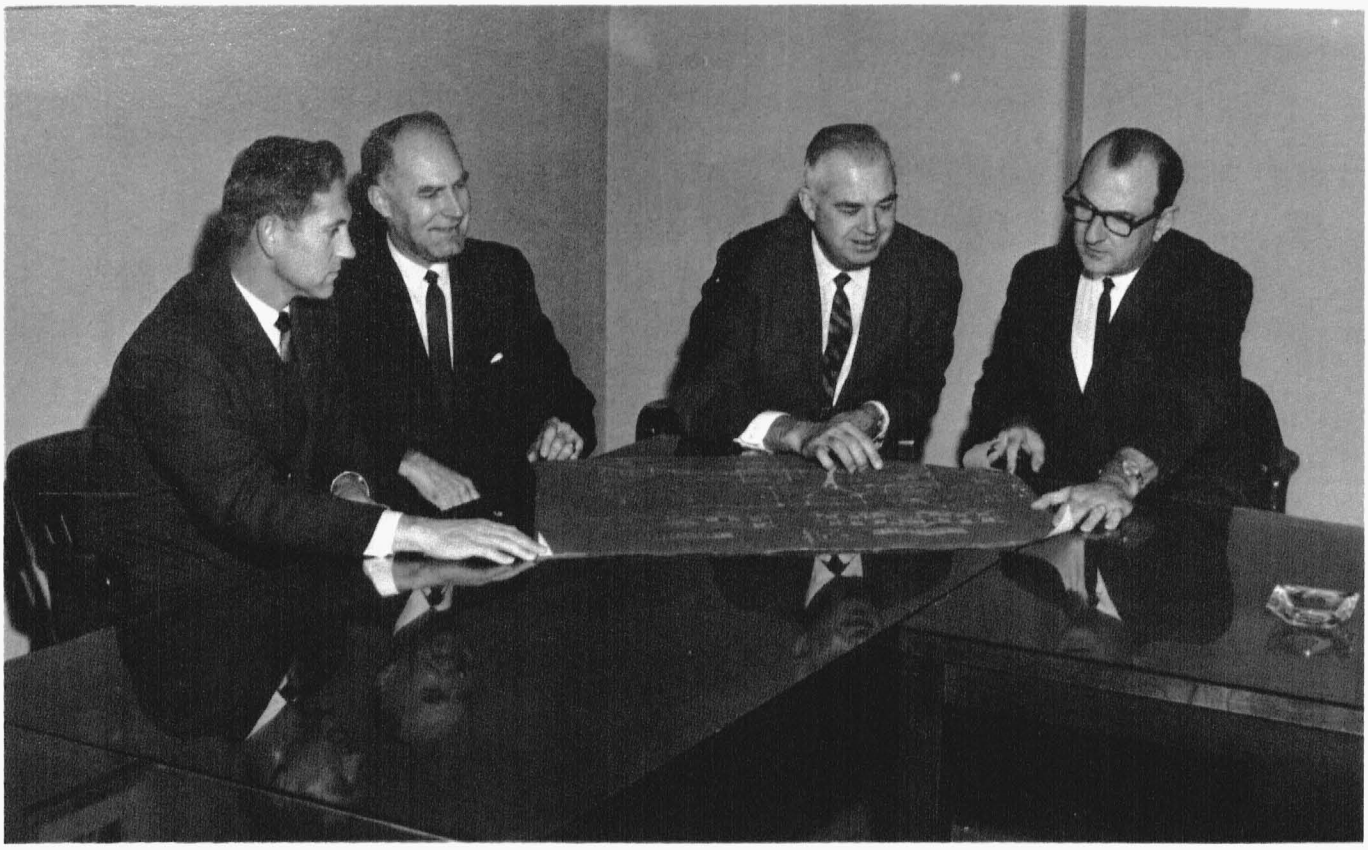


PATHWAYS OF KNOWLEDGE

HIGHLIGHTS OF 1966 • COLLEGE OF AGRICULTURE • UNIVERSITY OF MISSOURI • B856





- RICHARD J. ALDRICH - Associate Director
- HOMER C. FOLKS - Associate Dean
- ELMER R. KIEHL - Dean, College of Agriculture and Director, Agricultural Experiment Station
- SCHELL H. BODENHAMER - Associate Dean

COLLEGE OF AGRICULTURE
PATHWAYS OF KNOWLEDGE
UNIVERSITY OF MISSOURI

A MESSAGE . . . .

Elmer R. Kiehl — DEAN, College of Agriculture

A college of agriculture is much like any other organization or company. It must keep pace with changing times or it will operate like a one-cylinder engine in a jet engine age.

Let's look at developments taking place which illustrate our changing situation.

Type of Information. As technology becomes more complex, questions of *why* things happen come up more frequently than questions on *how-to-do-it.* This means greater research emphasis on basic principles of plant and animal growth, soil and water reactions, and why and how people are affected by change.

Students must study chemistry, nutrition, genetics, physiology, sociology, and other basic processes in depth. One of the greatest challenges in teaching today is to give students the kind of training that prepares them for both the jobs immediately ahead and those jobs they will be doing 10 years from now.

Extension specialists and agents are meeting the demand for in-depth training by conducting more formal courses and workshops. Also, some field staff members are working on an area rather than county basis. This permits agents to specialize on specific subjects.

Concentrate Efforts. Since we don't have the resources to tackle the basic problems in all areas, we are reducing our number of research projects so that we can concentrate on a few. We choose to strive for excellence.

This means our extension staff will adapt more research from other states to provide a well-rounded information program.

Problems Are Complex. Many problems cannot be solved by one department within the University. For example, eight departments were involved in preparing our *Beef Feeding* and *Forage Production* educational programs.

The "teaching team" for our new Animal Science course includes professors of animal husbandry, dairy, poultry, entomology, and veterinary pathology. Popularity of the course is shown by the enrollment climb from 57 the first semester the course was taught to 267 by the fourth semester.

Currently, the College of Agriculture is working with the Schools of Medicine and Veterinary Medicine on an environmental health program related to both man and animals.

This interdisciplinary work is a trend that needs continued encouragement.

Faculty. The faculty, too, is subject to change. Men who built the reputation of the institution in the past retire and new young men must establish themselves as leaders in their fields. It is vital that our College have the resources to attract and keep its share of the best scholars in the nation.

Summing Up. In a recent book, *The College of Agriculture: Science in the Public Service,* the authors C. E. Kellogg and D. C. Knapp observed that American colleges of agriculture have had a hundred years of distinguished public service. "Yet," they say, "the understanding and respect of each generation must be earned anew."

The opportunities are great. We intend to meet the challenge.

A few highlights of the year's College research, teaching, and extension programs follow. They are examples of many which contribute to the well-being of Missouri citizens.

Experimental feedlots at Weldon Springs.

CHAMBER OF COMMERCE AIDS RESEARCH

● The experimental feedlots completed recently near Weldon Spring represent a new relationship between the University and an agri-business group aimed at improving the economic growth of an area.

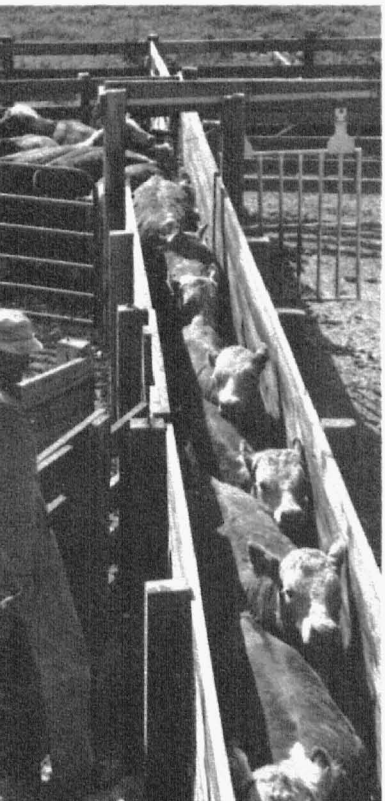
The facility was made possible by a grant from a specially formed Agricultural Resources Development Corp. of the Chamber of Commerce of St. Louis. They, like we at the college, were concerned about the relatively small number of beef cattle that are finished in Missouri, despite the fact the state ranks sixth nationally in beef cow numbers.

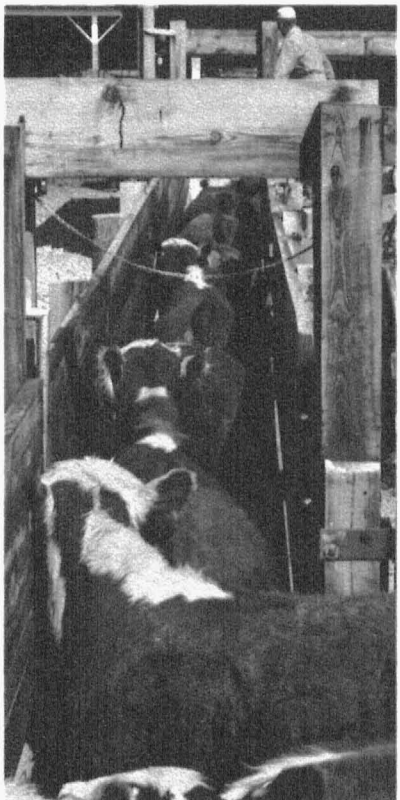
The Weldon Spring feedlots serve two purposes, research and demonstration of input-output relationships to cattle feeding. The testing is done under realistic feedlot conditions.

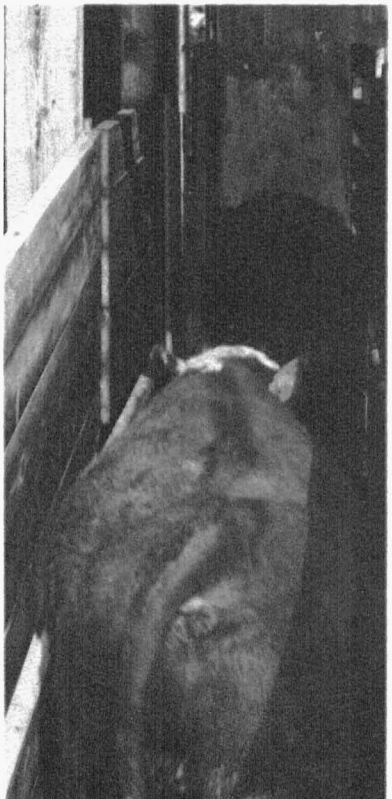
By constructing and demonstrating new facilities and equipment adapted to Missouri, it is hoped more home state cattlemen will become interested in cattle feeding possibilities.

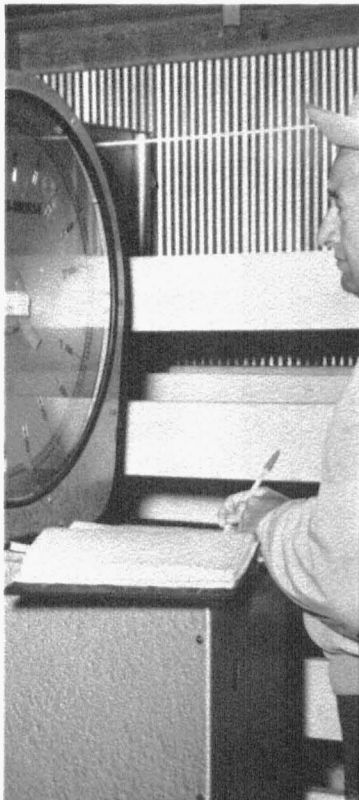
Results of the first year's tests comparing costs and gains with different facilities are being analyzed now and the first report will be available soon.

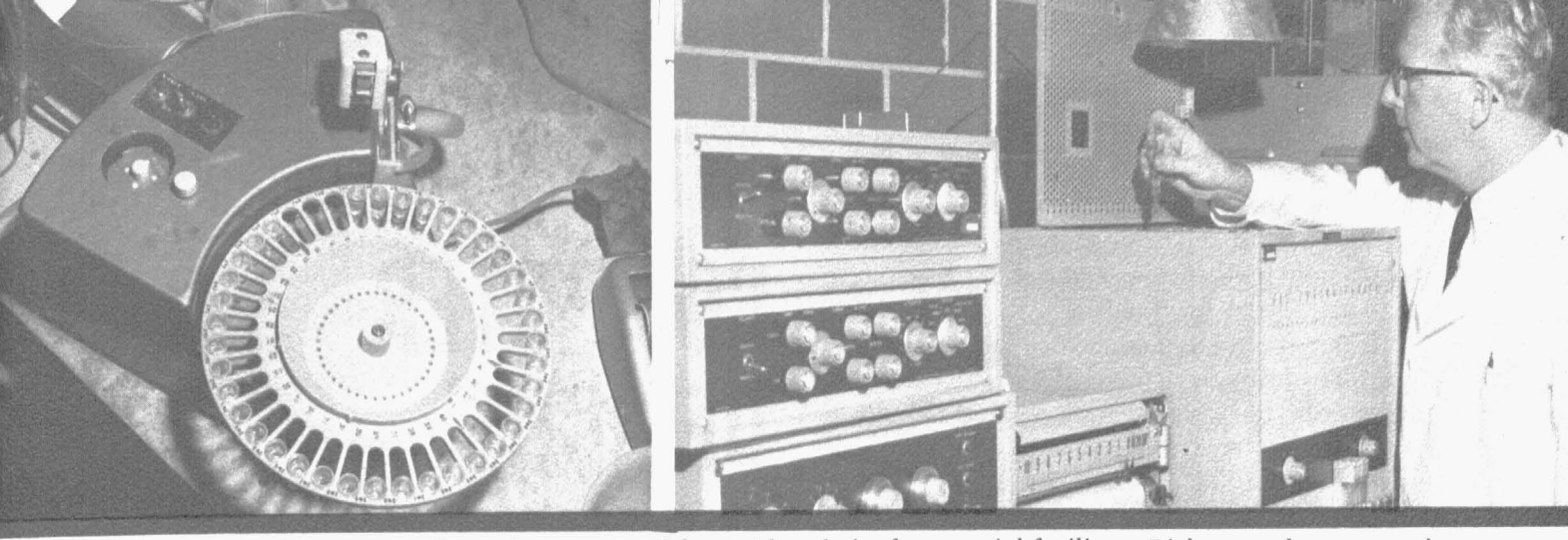
Below are scenes in the weighing facilities pictured at right in aerial photo above.











▲ *Left, samples in tray on flame photometer used for rapid analysis of commercial fertilizers. Right, gas chromatograph used in fast Missouri-developed method of measuring amino acid content of substances.*

MISSOURI METHOD

● "The Missouri method" is becoming a part of the common terminology in chemical laboratories of the world as a result of the work of Charles W. Gehrke, supervisor of the University's agricultural chemistry laboratories, and graduate students who assist him.

Of current interest to chemists everywhere is Gehrke's development of a speedier method of measuring, in biological samples, the amounts of all of the 20 natural amino acids—the building blocks of protein molecules essential to all living matter.

The MU research represents a major breakthrough in chemistry circles. With biochemists and geneticists pushing ever nearer to secrets of life in the protein structure of cells and with scientists in medicine on all-out drives to conquer cancer and viruses that involve protein derangement, the new development comes at an opportune time. It will also aid scientists in their search for new protein sources to fill a hungry world's burgeoning needs.

The scientists need this method to speed their studies. Old methods took 24 hours and were costly and difficult. This method takes less than one hour, is simple, and considerably cheaper. Also, all 20 of the natural protein amino acids can be analyzed at the same time.

The Missouri method uses a laboratory apparatus called a gas chromatograph. Chemicals that are injected into the chromatograph are converted to volatile molecules with heat. The volatile gases are separated, then burned by an invisible hydrogen flame. The burning of the different volatile molecules results in small electrical signals that can be recorded automatically on graph paper.

The new method is not only much quicker but can be automated to the point where the substance being tested is injected into one machine and a punched tape comes out of another which operates a typewriter to record 20 numbers for the quantity of each of the 20 amino acids present.

The method for amino acids is not the only *Missouri method* this laboratory is noted for. Missouri methods for potassium and phosphorous have been officially approved by the Association of Official Analytical Chemists (AOAC) for testing these elements in fertilizer. Should the AOAC accept the Nitrogen method Gehrke and his colleagues have developed this year, all three of the major fertilizer elements (N,P,K) will be tested, nationwide, by the *Missouri methods.*

Gehrke's laboratory runs the State Inspectors' tests of commercial fertilizers to check the accuracy of their labels. "Under analysis methods used five years ago we could handle 100 samples a week and results would not be available for several weeks," Dr. Gehrke says. "With our new methods we make 150 analyses in two days and results are out in less than a week."

COMPUTER DESIGNS MACHINE

● Ag engineers frequently tackle strange and fascinating assignments for industry. Take the one Don Brooker and his graduate student assistant, Richard Mueller, attacked this year: How to cull bad black walnuts from good ones without cracking them open.

They solved the problem.

Before they were through they had weighed 480 nuts, individually, in and out of water to determine their specific gravity; figured the air drag on nuts of all sizes as they were dropped in an air stream; programmed a solution on a computer; and built an impressive looking separator according to the computer's directions.

It worked!

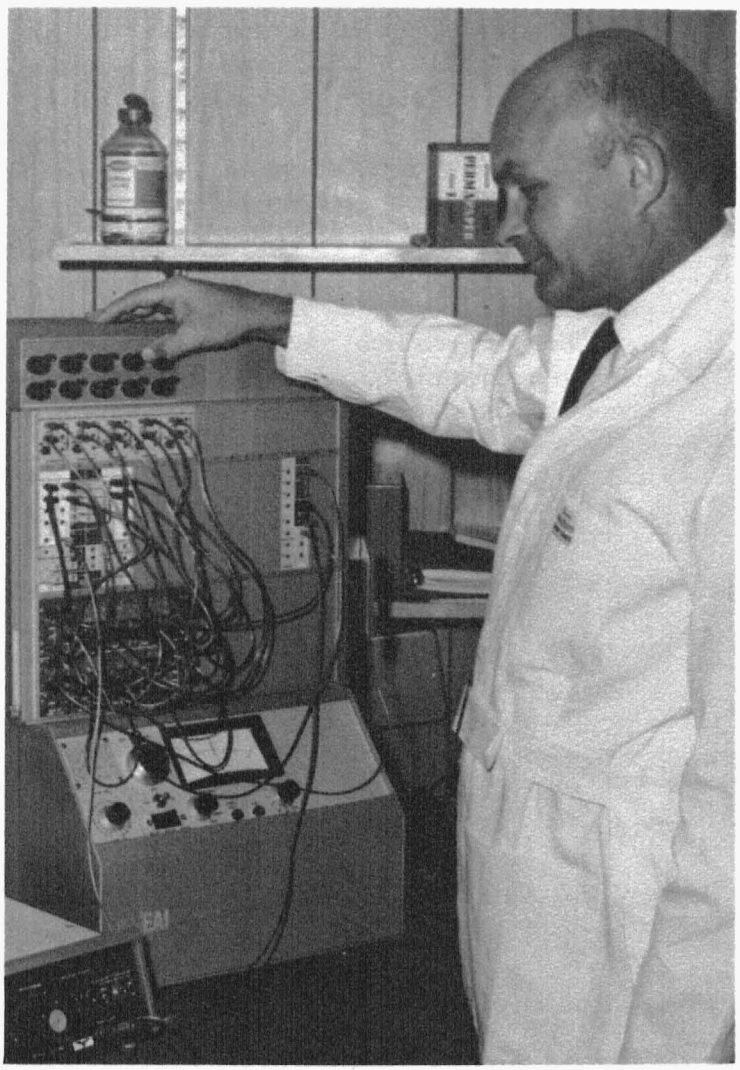
To other engineers that was the most interesting part of the project: They were able to design a theoretical machine with a computer that would work when actually built.

To the multi-million dollar black walnut industry in Missouri, however, the big saving in tedious hand labor required to separate bad nut meats from good ones is the welcome outcome. The whole-nut separator also saves the cost of cracking and processing bad nuts.

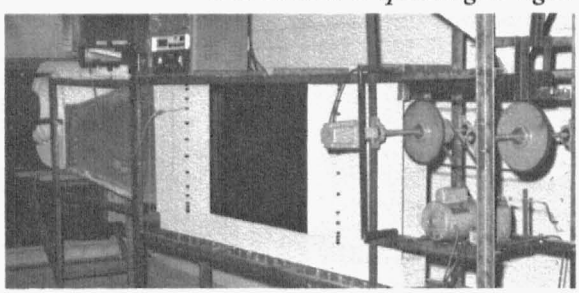
Wanted now: A machine that will separate shell particles from nut meats by air jets, sound waves or some means other than the mechanical discs and screens now used. Present methods break up the nut meats too much.

Brooker believes that if a thorough study of the walnut's structure and qualities, such as stress points, is ever made, a way may even be found to remove walnut meats in halves like pecans.

The biggest black walnut processing plant in the country, located at Stockton, Mo., cooperated in this study. This plant handles an average of 15 million pounds of nuts a year. The plant produces two byproducts from the shells, an abrasive for the aircraft industry and a crack filler for oil drillers.



● *The walnut sorting machine below was designed with the computer* ▶ *Don Brooker is operating at right.*



INSECT PATROL

● Most Missourians are familiar with the weekly insect reports carried by newspapers and radio stations. But few know about the insect scouting service that makes the reports possible.

With very limited personnel the University Extension Division's "insect patrol" has reached a high level of performance in protecting Missouri crops and livestock.

This performance is made possible through the Cooperation of personnel in several state and federal agencies. The one insect scout hired full time to travel the state checking fields and livestock receives weekly reports on conditions found by State Health Department personnel, the State Entomologists, the forestry section of the Conservation Commission, and the U.S.D.A. Plant Pest Control station at Sikeston. He also receives supplemental help from three other Extension entomologists who report on scouting they do while handling different assignments.

Cotton producers of the Delta region support a special scouting program for their crop under direction of an Extension entomologist based on the Delta Research Center, Portageville. Their information is pooled with that of the other specialists. County agents and insecticide dealers also report outbreaks of crop pests.

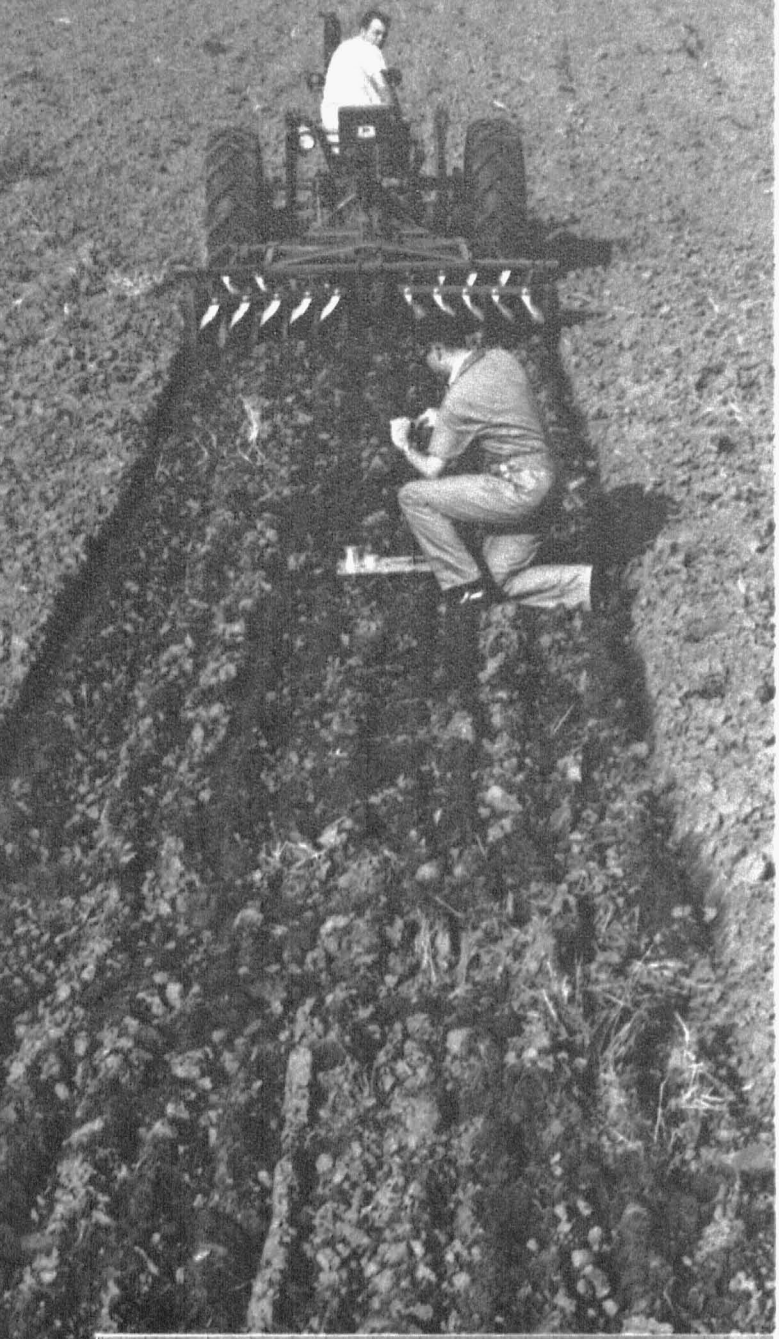
The trained scouts use standardized procedures for counting insects per plant or so many square feet so estimates can be made for total population.

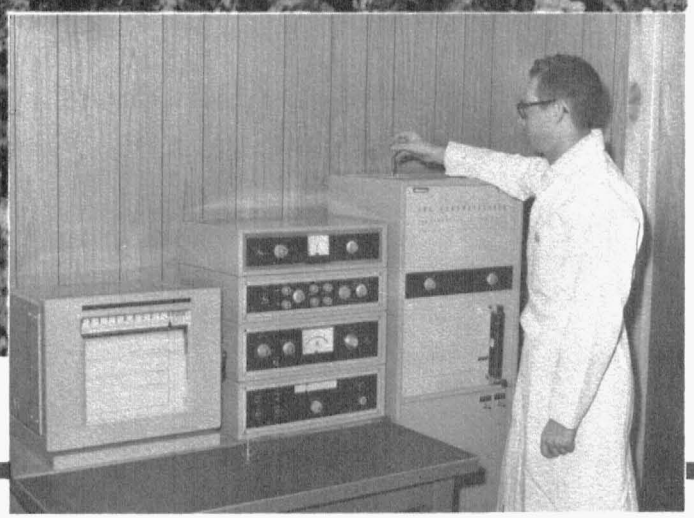
There are several hundred potential insect pests in Missouri, the University's Extension survey entomolgist says in explaining the scouting program. Fortunately, most of them are kept down to compatible numbers by natural enemies and climate most of the time. The purpose of scouting is to detect outbreaks where insects begin to do enough damage that it pays to start controls. These outbreaks can be statewide but more often are of local or regional scope.

Every Friday morning during the growing season the University Extension entomologists meet to pool their scouting information and determine the insect picture in Missouri. Their findings are mailed in the "Insect Situation" report which reaches news media each Monday morning. Ag agencies, chemical dealers and custom applicators are included in the mailing list and farmers can get on it by merely sending in their address.

Another function of the scouting project is to detect the appearance of new insect pests in Missouri. The team detected the western corn rootworm the first year it moved into Atchison County, three years before it caused damage. They kept track of the rootworm's southeastward movement into the state and were ready with recommendations when it did reach damaging proportions.

Insect Scout Gene Munson checks stalks for European corn borer. ▶





● A surprising error scientists have been making when studying chemical soil treatments has been uncovered by a young agricultural engineer, Maurice Gebhardt, and coworkers. They were measuring how implements placed chemicals in the soil, trying to get information needed for recommendations on herbicide application and machinery design, when they found the error.

In the past, it was generally assumed that a rotary cultivator mixed chemicals fairly thoroughly to the depth it was operated. But the Missouri engineers found the herbicide concentrated in the top two inches of soil after spraying it on the surface and working the ground to a three-inch depth with the cultivator. This was about the same result they got spraying the herbicide on the surface and not working it in. A disk working the soil to a five-inch depth, on the other hand, concentrated the herbicide in the bottom third and fourth inches.

Based on this evidence, shallow disking may be the recommended means in most cases, being a cheaper method than the power rotary operation.

The evidence is fairly conclusive. They used a gas chromatograph, a relatively new and highly accurate measuring device, and an analysis procedure worked out with the herbicide manufacturer, to determine the herbicide deposit at various depths.

Four-inch cores of soil were taken randomly across the paths of the cultivator and disk and from a check strip, 36 cores in all. Each core was separated into four sections representing the different depths, making a total of 144 samples. Extract from each of these samples was tested for herbicide content with the gas chromatograph.

This was believed to be the first time precise data had been obtained on herbicide placement. The results are already changing some thinking on past experiments where chemical placement could have had a bearing. The findings also open a new field for further research.

◀ ***Graduate student Kenneth Read collects soil cores in path of implement and tests extract from them (inset) in gas chromatograph for fertilizer placement.***

EASY WAY BEST

● A livestock forage manual developed by eight departments of the University College of Agriculture will form a basis for an extensive educational program on forage production in the next few years.

The manual is designed to help livestock producers and agricultural advisors answer questions on producing forage, maintaining productive stands, economic considerations in fitting a forage program to the land, and proper combinations of forage and livestock.

Nearly 12.5 million acres of Missouri land are poorly adapted or unsuited to row crops. And although the state has more acres devoted to pasture and hay than to row crops, yields of forages have not kept pace with those of the other crops.

The slow rate of forage development indicates these acres present a large under-used resource. If profitable increases in production can be accomplished comparable to what has been done with grain crops, the result will be a vast benefit to the state's farmers and over-all economy.

The value of increased forage production must be based on livestock prospects, since forage is sold primarily through livestock.

Total domestic demand for livestock and livestock products is expected to increase to about 40 or 50 percent above the high 1965 production rate, which was near the top of the production cycle. Projected domestic use of milk products by 1980 totals around one-fifth larger than the 1964 use.

The increased milk demand may possibly be met by increased production per dairy cow. But the demand for more beef means a demand for more feeder calves, thus more beef cows and more forage.

The college's educational programs on forage production will help Missouri achieve a major role in providing the increased beef needs.

MISSOURI FORAGE MANUAL

CLOUD COVER AND RADIATION

● Ag Engineers Larry Pochop and Milton Shanklin have devised a technique—the first anywhere, they believe—for measuring cloud cover. With it they are studying the relation between area of cloud cover and amounts of radiation that reach earth from the sky.

Such information is invaluable to biologists and others studying relationships of the life-sustaining solar energy to plants, animals, and their environments.

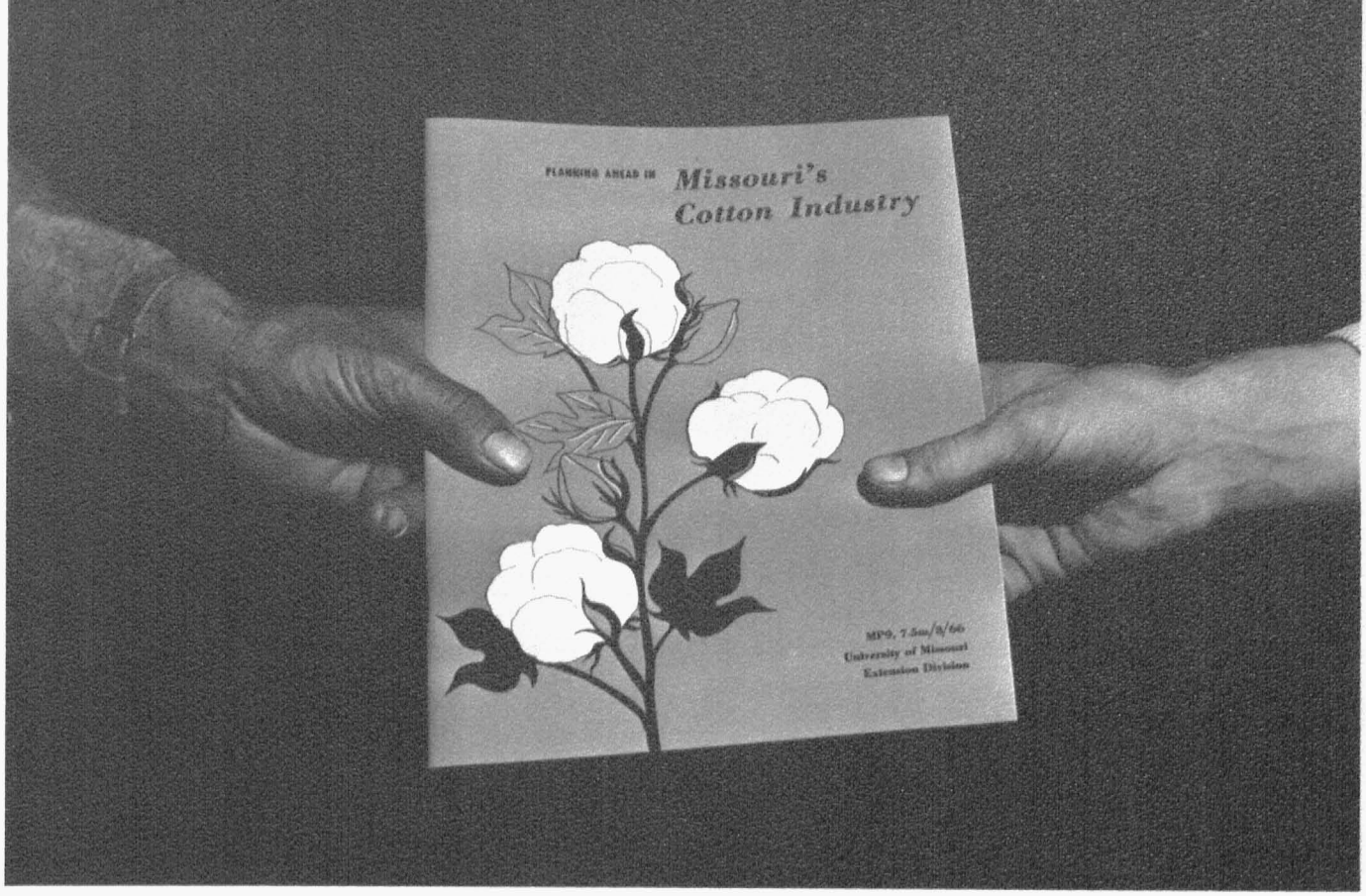
The two engineers have a Nikon F camera with a "Fish Eye" lens that takes pictures of the whole 180° of sky mounted on top of the weather bureau building at the Columbia Airport. The camera is geared and motorized to snap pictures every hour and they installed a radiometer next to it to take simultaneous readings of the energy coming through the atmosphere.

Area of the cloud cover recorded on the photographic film is measured mechanically with a device they constructed. It contains a photocell that scans the pictures.

Shanklin is faculty advisor on the work which is serving as Pochop's doctoral project.

▲

Circles are pictures taken of entire sky by "Fish Eye" camera lens, right. Paddle is synchronized to travel with sun, shading lens.



More than 120 Delta cotton growers took part in the study leading to this publication.

MISSOURI COTTON INDUSTRY

● The University is often called upon to help solve local problems. A good example is a study undertaken jointly by cotton producers of southeast Missouri and the University.

Rapid changes are taking place in the cotton industry that affect the region. Legislation reducing cotton acreage and mechanization have resulted in shrinkage of job and business opportunities provided by cotton. Many gins are going out of business. Competition is stiff from big chemical companies that conduct huge research and promotion programs for their synthetic fiber products.

The cotton crop is worth around $90 million a year to the Delta. As E. B. Gee, Jr., a large scale grower in the area pointed out, most community leaders would go to considerable effort to attract a new industry with a payroll of this size. The leaders of this area feel it makes good sense to put forth huge effort to preserve and expand this old one.

With help of University extension workers a committee of 128 people, including growers, ginners, farm leaders, government agency employees, and research scientists, was organized into 15 subcommittees to study the cotton situation and make recommendations.

A summary of their efforts was published in a bulletin, *Planning Ahead in Missouri's Cotton Industry,* which was presented at a program kickoff dinner at the Delta Research Center, Portageville, last October.

Purpose of this cotton program development effort is to enhance future success of the industry and enable it to give its greatest possible economic contribution to the Delta area. This study will help point up the situation in the Delta cotton industry at present, what the goals or objectives for the industry should be five to 10 years from now, and what steps need to be taken to attain these goals.

The efforts of the committee also contain valuable guides for the University on what the region will want and need in the way of cotton research and extension education over the next decade.

▲ *Myron Bennett, farm management field man, studies records with farm couple (inset) and works on data with Brown at University's computer center.*

● Farmers are turning to computers to help solve the complex farm management problems of modern agriculture.

Today's commercial farms are getting large in acreage, money invested, production, and sales. Associated with this growth are many problems that are difficult to answer.

This past summer the University announced plans to set up a pilot program in Carroll, Chariton, and Saline Counties to study the use of computers on the farm. Within days, 50 farmers, the maximum allowed, signed up and paid $150 to join the new Farm Business Management Assn.

In the business world many companies are already using computer techniques to help make business management decisions. In this pilot program, the University will work with farmers in adapting these techniques to farm use.

"We will use computers in as many ways and as much as possible to answer questions farmers want answered about their farm business," according to Tom Brown, extension farm management specialist.

Basically the association will provide an electronic accounting system. Foundation of the program will be the mail-in electronic record program which has been established 6 years. From this, data can be gathered to use in major farm planning, linear programming, and detailed enterprise record keeping.

Linear programming is just a more advanced way of doing comparative budgeting which Balanced Farming has been teaching for years, Brown said.

The telling difference is detail and speed. Working with the old method it could take a Balanced Farming agent and a farmer all day to budget a couple of different farm alternatives. The computer can analyze hundreds of alternatives in seconds. And the computer won't make the simple arithmetic mistakes that humans are prone to make.

The computer can also be used on other management decisions. It can figure least-cost feed rations, determine best use of fertilizer, evaluate government programs for a farm, and apply price outlook to farm planning.

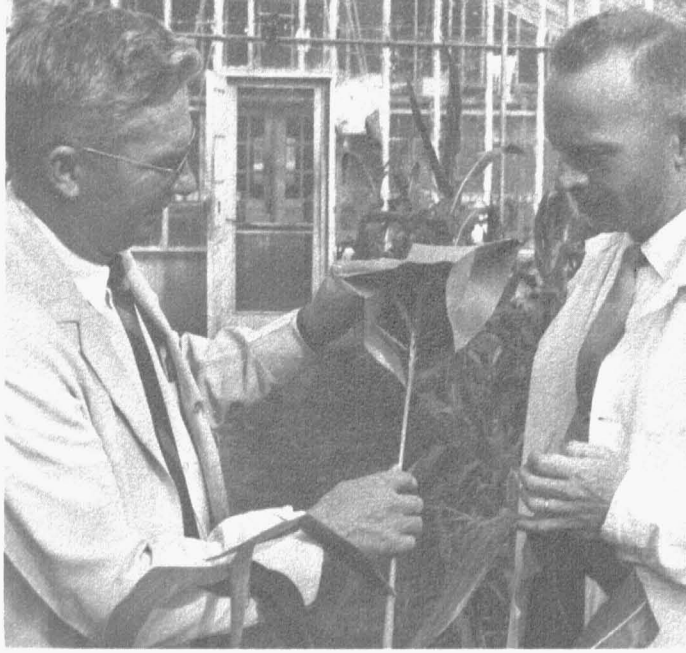
The pilot program has three purposes, Brown says:

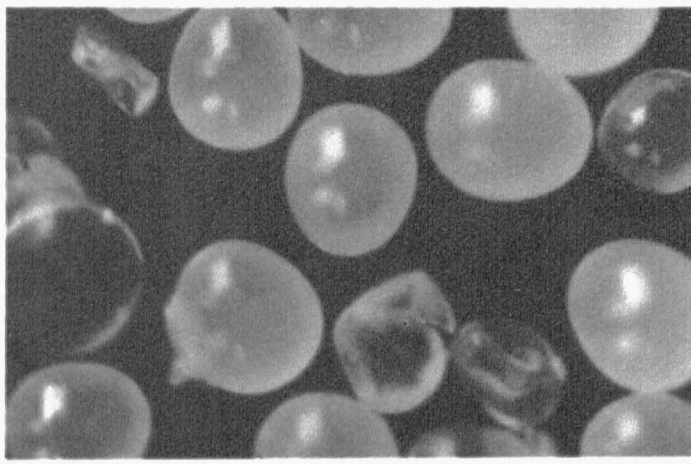
1. To find the management problems that farmers want solved.
2. To see if computers can be used successfully in solving them.
3. To see if Missouri farmers are willing to pay for such services.

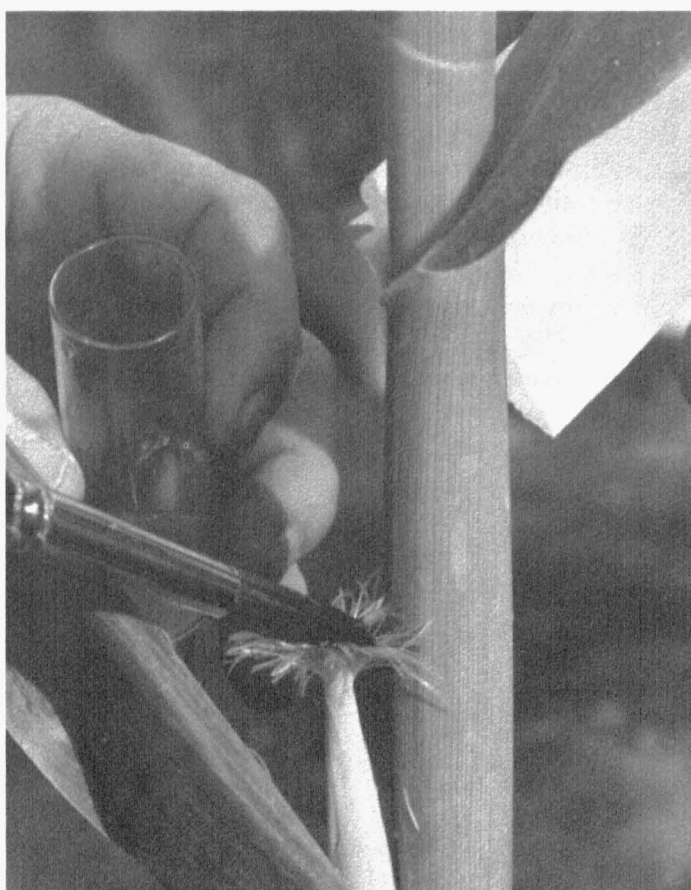
The $150, which is less than half the expected cost of the program, will go to pay for the mail-in record program, computer use, travel, and secretarial help for a farm business management specialist. The University is providing a full-time specialist to work in the area with the farmers in the program.

FARM MANAGEMENT COMPUTER SERVICE

EXTEND CORN POLLEN LIFE







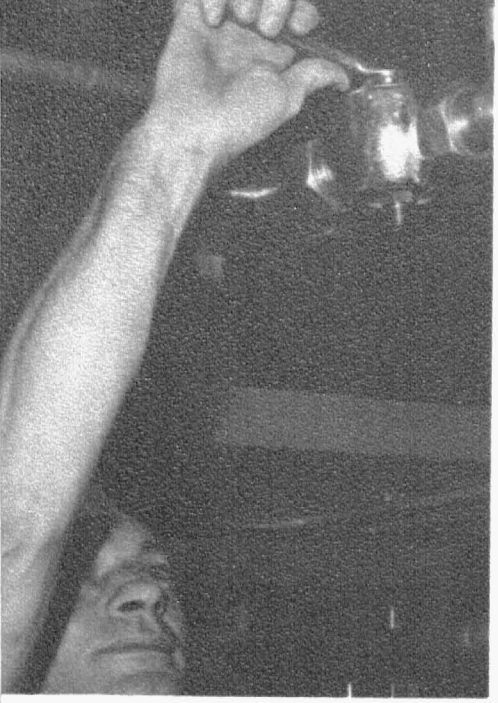
● Past genetic research with corn and higher organisms has been limited because most reproductive cells are so difficult to treat with substances in an experiment. They are either buried too deep in other tissues to get at them or they are so fragile they are generally killed by any treatment. Two field crops geneticists, Edward H. Coe and Myron G. Neuffer, have developed a new technique for handling corn pollen that extends its life and will likely accelerate future progress in this field of study.

The new technique, discovered by Coe, consists of using mineral oil to suspend fresh corn pollen. The life of corn pollen under normal conditions is only an hour or so, while in mineral oil, pollen can live for several days. In effect, this technique protects the germ cells and prolongs their life while at the same time permitting easy access to them through the suspending liquid.

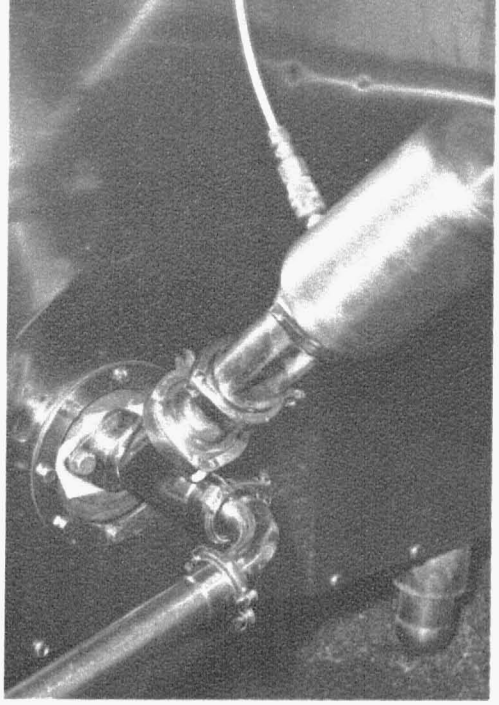
Application of these advantages is being made by Neuffer who is using the mineral oil as a carrier for a chemical that has been highly effective in producing genetic changes in plants when applied to seed. Treatment of pollen with the chemical should be more efficient because the chemical can be applied accurately in the mineral oil.

In applying this treatment to corn, the chemical is dissolved in mineral oil and the pollen is suspended in the solution. The mixture is applied to corn silks with a brush. The resulting seeds are examined for changes caused by the chemical's effects on the corn plant's genes. This method has been very successful in producing genetic changes in corn. The altered plants and grain are then examined for desirable new characteristics.

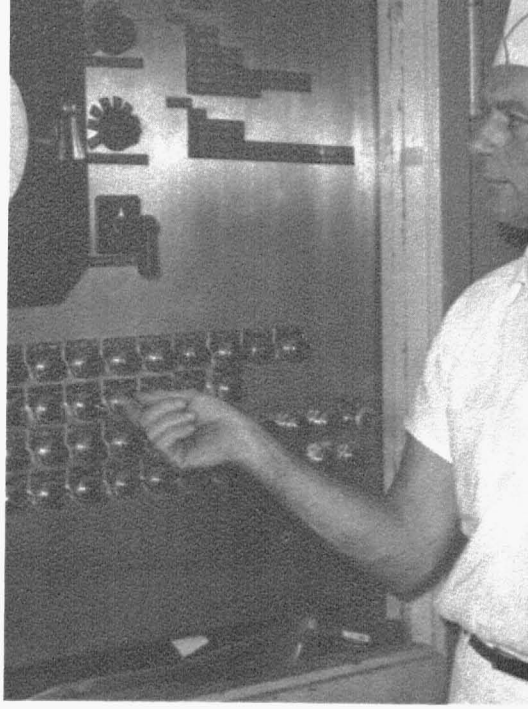
Neuffer (left) and Coe collect pollen (top), suspend pollen (center enlargement) in mineral oil for treatment with chemicals, then paint on corn silks to obtain mutants. ▶



Old hand valves...



replaced by pneumatic valves...



enable plant automation.

DAIRY PLANT AUTOMATION

● Operational savings for fluid milk plants, through automation and mechanization, is the major objective of a joint research project of the Dairy and Agricultural Engineering departments. The U.S. Department of Agriculture is cooperating.

In fluid milk plants—the small businesses, especially—employees must move from one working area to another to manually complete various tasks such as closing and opening valves, and starting or stopping equipment.

Many of these manual operations are being eliminated as a result of the Missouri research project. This is possible through development of an electric console and application of timing devices. Mechanical controls turn equipment off and on at a designated time or at a specific point in a series of operations.

Development of an electric console—or control panel—will enable an operator to stand at a single point and, by pushing buttons, operate equipment throughout the plant.

A part of the research project is development of an automatic cleaning operation for fluid milk plants. The end result will be labor savings, decreased operating expenses, greater efficiency, and product uniformity.

A feature of the automatic cleaning system is that facilities used to transport milk from one area to another can be cleaned in place. In addition to automatically cleaning such equipment as milk lines, storage tanks, and other major items, the system will also be used to clean the tanks of bulk milk trucks.

A further benefit from the research is that "cold" rather than "hot" water can be used in cleaning operations.

The usual procedure is to use water heated to about 150 degrees. By using "cold water" detergents, the Missouri researchers expect to be able to get the cleaning job done with 90 degree water. This will reduce water heating and refrigeration costs. The cooler water will not raise temperatures in refrigerated bulk tanks as much during cleaning. This will mean a saving in refrigeration time and expense.

Scientists working on the fluid milk plant research project are aided in their work by the atomic reactor which went into operation last year.

CAN REMOVE WATER CEILING

● Yields of well-fertilized corn are bumping a water ceiling in Missouri, says C. M. Woodruff, Chairman of the University's Soils Department.

Results of investigations conducted for 19 years on the University's experimental field near Columbia show an average yield of 85 bushels of corn per acre. Eleven of the years gave yields averaging 110 bushels. But these 11 were accompanied by eight dry years for which the average yield was only 51 bushels. Yields of 150 bushels per acre are being obtained when the fields are irrigated.

For the past ten years, Missouri's average corn yield has varied around 55 bushels per acre. The total nitrogen now used on corn in Missouri averages approximately 1½ pounds per bushel of grain produced. This is enough to provide much higher state yields. Excellent yields are obtained in some parts of the state every year. But these are offset by very low yields in other locations where rainfall is inadequate.

Woodruff would like to see water removed as a limit to yield. He believes this is possible. A study conducted by the department this year reveals that most areas of the state receive enough rain to supply the water required for the highest possible corn yield. It just needs to be distributed properly.

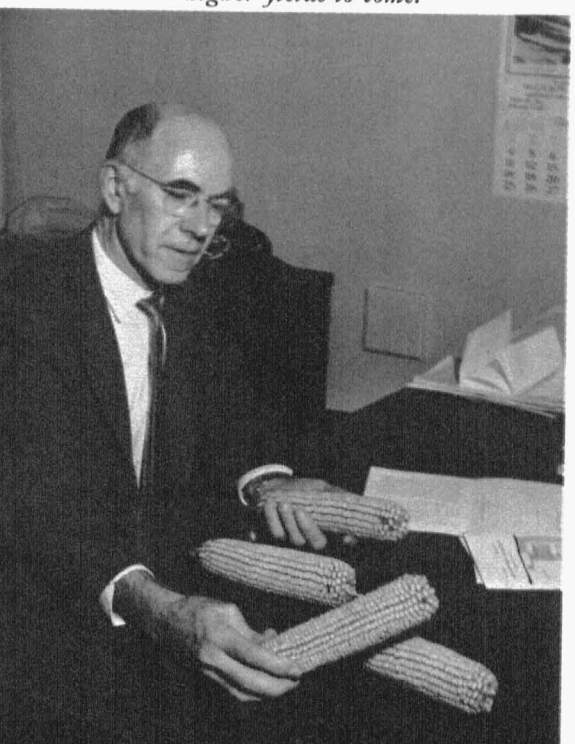
This suggests that the solution lies in storing the water when it falls and irrigating in dry periods. Figures indicate, theoretically at least, that the runoff from a field of corn can be collected in a properly constructed pond and put back on the field, providing all the water that is needed during dry periods.

With all the water and nutrients taken care of, farmers could turn to precise controls MU scientists have up their sleeves. For example, they've worked out a formula for estimating the area of soil and light a given variety of hybrid corn plant will need for maximum yields. This tells how many plants per acre to aim for.

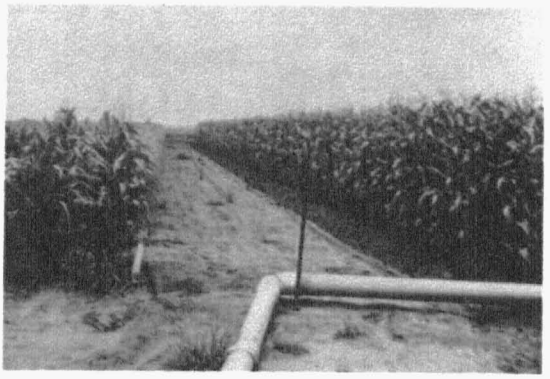
Another factor is ear size in relation to plant size. Small plants can be planted thicker without interfering with each other. The goal is to produce a small plant with a large ear. Another equation gives the size of ear and plant that will produce the greatest weight of grain per acre. One more thing is important—how the plants are spaced. If planted on the square or triangle, equal distances apart, more plants can be planted per acre without increasing their competition with each other for light.

By combining all this information, the MU researchers can tell us just how each hybrid should be planted and spaced to obtain the highest yield it is capable of producing. That's what they are working on, and they are talking of consistent yields approaching the 180 bushel mark as highly probable.

▼ *C. M. Woodruff has vision of much higher yields to come.*

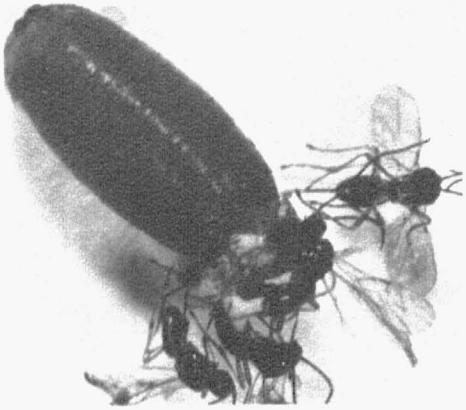


Irrigated plots at Mt. Vernon give 90 to 152 bushel yields (right) vs. 29 to 64 bushels for unirrigated ▼ *plots (left).*



Gus Thomas sifting larvae and pupae from field cages to see how many were attacked by predators.

Small wasp parasites of the face fly lay eggs in fly larvae. Here, young wasps emerge after hatching in fly pupa. ▼



INSECT vs. INSECT

● Whatever happened to all the face flies in north Missouri? A short time ago they were plaguing cattle owners; now they've ceased to be a problem on most farms.

Curtis Wingo, University entomologist in charge of research on animal pests, says such waves of build-up and disappearance of insects is not uncommon. He and a graduate student, Gus Thomas, went to work on the face flies as soon as they began to plague farmers.

The chemicals commonly used on insects didn't seem to affect the face flies much and before new ones could be found natural controls began to take over. Insect predators and parasites began to fluorish on the large supply of face flies and cut back their numbers.

A wasp predator of the face fly was imported from France in an effort to hurry the process along. Tests with it and the native species in Missouri indicate the natives may be better adapted to the duty and don't need help from the foreign troops.

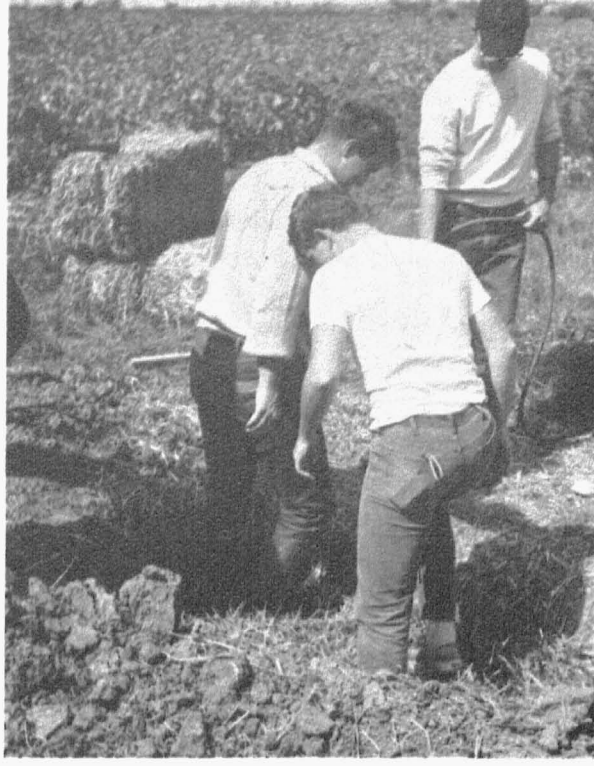
One tiny wasp proved especially effective. A pair of these wasps placed in cages where 100 eggs have been planted in manure samples, the natural egg-laying site of the face fly, will locate and destroy all 100 eggs in 24 hours.

Wingo and Thomas went on to complete a study of face flies and their enemies so Missouri will be prepared in case of another invasion of the pest. Four other species of wasps were found preying on face flies. The wasps lay their eggs in the larvae or young maggots of the fly and when the eggs hatch the larvae are killed.

Several beetles prey on eggs and young larvae of the face fly, giving as high as 50 percent kill in the entomologists' field tests. In all, they found about 20 species of insects preying on face flies.

Though the pressure from the insect is off now, Wingo says it is possible that it can make some adjustments of its own in the future, causing the balance to swing back in the face fly's favor. If it does, the MU entomologists know its life cycle, habits, and enemies now so they can administer controls.

▲ *Learning to level a rice nursery.*



▲ *Packing compost pit.*

TRAIN PEACE CORPS GROUP

● Peace Corps Trainees at the University of Missouri are learning basic agricultural skills in their training for a food production program for West Bengal, India.

Working closely with the departments of Field Crops, Soils, Agricultural Engineering, Entomology, and Extension Education, these trainees are learning agricultural principles and how to apply them in their 21-month tour of duty in India.

Rice production ranks high in interest, along with poultry and small vegetable garden production. Five groups of the trainees have each planted a rice nursery, spinach bed, green manure crop of rye, and a small vegetable garden. They also have made a compost pit. An irrigation system was developed where water is distributed by gravity and centrifugal pumps.

The trainees are also learning how to use demonstrations as teaching tools in working with Indian farmers. One result demonstration showed the value of limestone on spinach. A second demonstration is revealing the results of different kinds of feed for chickens. One group of chickens is being fed a standard American broiler feed; the second group is being fed a high-fiber ration similar to what might be found in an Indian village.

The trainees observed rice production at a rice farm near Palmyra, Mo. An intensive eight-day training period in West Bengal will end their training.

▼ *Patching buns (dikes) of irrigation ditch.*

INDUSTRIES COMPETE FOR YOUTH

▲ *Twenty high school students on "Fly-in" from around St. Joseph.*

● Strong competition has entered the appeal by industries for college-trained youth. An industry must attract top youth if it is to have a future.

Much concern has arisen in agricultural circles over the drain of farm youth into other industries. The need for technically trained youth in agricultural-related industries—supply, transportation, marketing, research, and teaching—has grown tremendously. And, while the number of farms is declining, the larger remaining units are more complex and well educated young men will be in demand to manage them. A rural background gives farm youth a head start in preparing for careers in these fields.

To meet this competition for the services of youth, representatives of Missouri agricultural-related industries have formed the Missouri Agribusiness Committee, in cooperation with the College of Agriculture, to attempt to interest high school students in preparing for careers in agriculture and agribusiness.

This committee began work by trying pilot programs this year in Hermann, St. Joseph, and Springfield. Local committees have been formed in these cities and they have arranged a number of events to inform students, parents, and teachers of career opportunities in agriculture.

Activities have included programs presented to civic clubs, school groups, and Chambers of Commerce; organizing speakers' bureaus; cooperation with high school counselors; and distribution of leaflets.

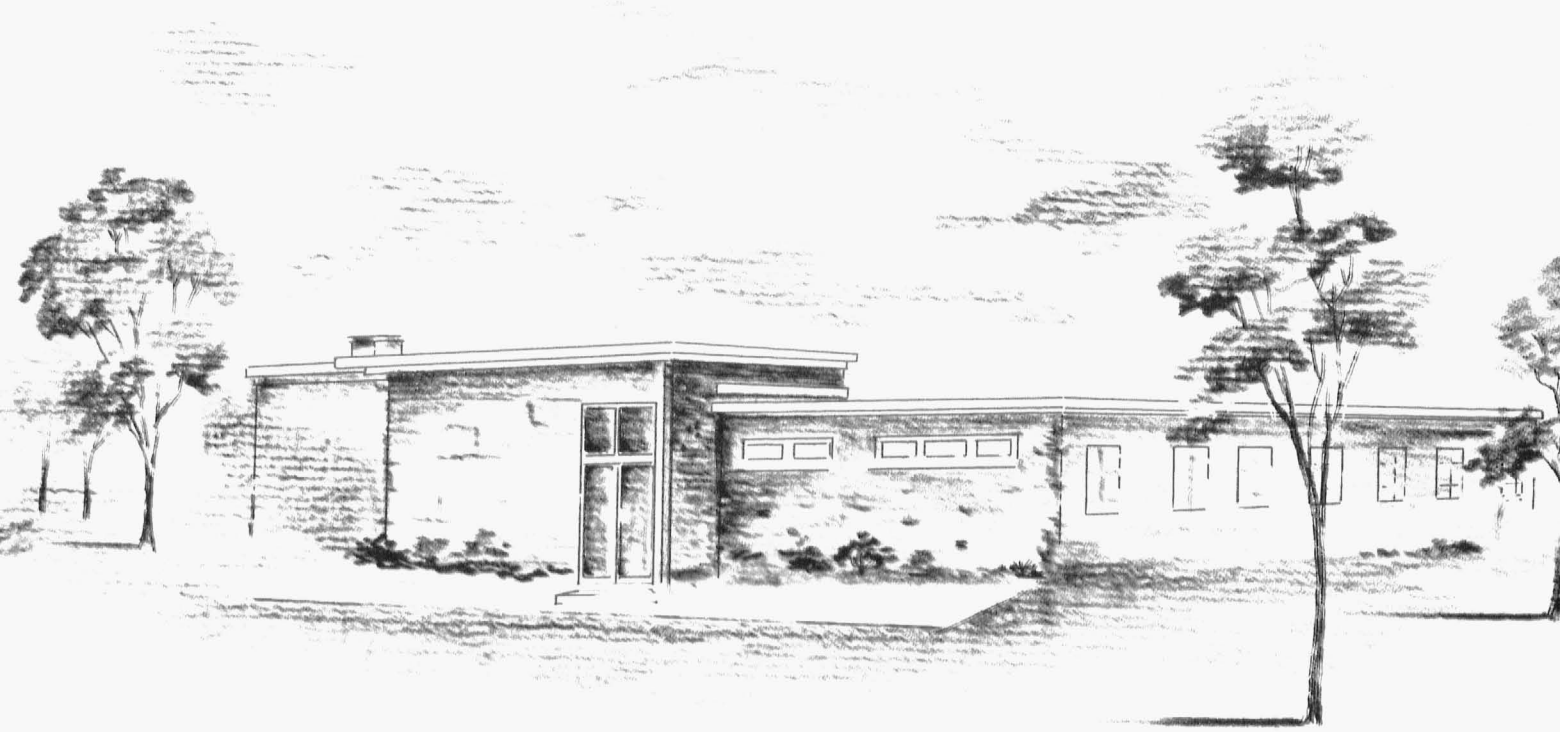
A typical activity was a teachers' meeting at Hermann featuring a program by representatives of the major agricultural companies and the College of Agriculture.

Most spectacular event thus far was the "Fly-In" sponsored by businessmen of St. Joseph. Fifteen representatives of the College and Alumni Office flew to St. Joseph for meetings with high school counselors, businessmen, and representatives of Missouri Western Junior College.

While these groups were meeting, 20 students from high schools in the St. Joseph area were flown to Columbia in the University plane to be guests on the MU campus.

At the second statewide Conference on Opportunities in Agriculture last summer, the suggestion was made that a central information office be established with a full-time director to coordinate efforts and establish a library and visual aid center. The Missouri Agribusiness Committee is presently examining this idea.

College of Agriculture faculty and St. Joseph businessmen and Missouri Western Junior College representatives get together during "Fly-in." ▶



Headquarters, University of Missouri Research Center, Mt. Vernon.

LOOKING AHEAD

● A new office building at the Southwest Missouri Center, Mt. Vernon, is a good example of the progress being made at our outlying centers. The building provides needed facilities for efficient administration of our rapidly growing research program there.

New developments at the Weldon Springs Center were described earlier in this report. We are also making good progress in our research programs at the Delta Center, Portageville, and North Missouri Center, Spickard.

Research results of great value to Missouri agriculture will come from these centers in the years ahead. The centers have been in operation only a few years and much effort up till now has been devoted to getting fields and facilities ready to use. While additional facilities are needed, we have reached the point where we can see more tangible results of our research. Thousands of Missouri farmers visited these centers last year for field day events.

The outlying centers play a key role in the total research program of the College of Agriculture. By coordinating their work closely with that done in the laboratories and on the research fields at Columbia, the College can make use of its total resources in providing research answers for any part of the state.

During the past year, much public discussion turned from the problems of farm surpluses to the question of how to feed the world's growing population. The College of Agriculture, through these research facilities and its teaching and extension programs, will help answer that question.

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