Frontiers
of PLANT SCIENCE

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THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION • NEW HAVEN

DONALD JONES RETIRES

Bruce B. Miner

Donald F. Jones, one of the men who made hybrid corn a reality, retires in June after 45 years on the Station staff. His career here is unique. No other young scientist at this Station, within three years of appointment, is known to have combined theory and practice with such far-reaching results.

Jones did this in 1917 with his double-cross technique of combining desirable characteristics from four inbred strains of corn to produce with almost machine-like precision a synthetic product—hybrid corn seed. He backed up this practical discovery with a theoretical explanation of hybrid vigor, or heterosis, that serves geneticists to this day.

In 1949, after long study, Jones and his former associate Paul C. Mangelsdorf made a second major contribution to the theory and practice of hybrid seed corn production—bred-in pollen sterility that makes costly detasseling unnecessary in the fields where hybrid seed is produced.

On these accomplishments rests the public appreciation of Jones the geneticist. He gave corn breeders two successful techniques. Perhaps no other man did more to promote the revolution that saw the wholesale replacement of open-pollinated corn by the first really new kind of corn in 60 thousand years or more. Hybrid corn has paid off handsomely. A University of Chicago economist conservatively estimates an annual dividend of seven dollars for every dollar invested in hybrid corn research. That is 700 per cent, every year.

Donald F. Jones, who tested in small field plots at Mt. Carmel his theories that explain hybrid vigor.

In retrospect, it is easy to see that Jones arrived at the right place, at the right time, where a scientifically uncomplicated technique was waiting to be discovered. To fall into such happy circumstances it is helpful to be born at the right time. Jones began graduate study when the exciting new science of genetics gave promise of answering questions men had been asking for centuries. Chance, too, was on his side. His early double-cross hybrids were good, much better than other combinations might have been.

How did Jones happen to come to Connecticut? Henry A. Wallace credits the "scientific maturity" of Director E. H. Jenkins of this Station. Jenkins also had a practical point of view. He knew the role of corn in dairy farming and predicted an expanding market for milk as Connecticut grew. And Jenkins attracted men of ability. One senses that it was the climate, not for corn, but for research in the genetics of corn, that lured Jones as it had lured others.

The story begins in Arizona Territory in 1911, where Jones, fresh from Kansas State College, was substituting for bumblebees in pollinating alfalfa with plant breeder G. F. Freeman. Freeman was a bit disappointed in the results of Jones' work. The seed from self-pollinated alfalfa gave plants that were runty, and Jones' hours in the blazing sun seemed to have been largely wasted. Then came a scientific paper by Edward M. East of Harvard and H. K. Hayes of Connecticut in which they pointed out that Freeman and Jones were learning the hard way what East and Hayes already knew. Jones was exonerated, and his already great respect for East increased.

Jones set his sights on advanced study with the eminent biologists in New England. He lacked both money and adequate preparation. To remedy these shortcomings he went to Syracuse University, there to teach and study.

The double-cross method of producing hybrid corn and bred-in pollen sterility are the two best known contributions to practical corn breeding made by Donald F. Jones, who retires on June 30.

Edward M. East, who was on the Station staff from 1905 to 1910, had helped in the selection of H. K. Hayes as his successor when East went to the Bussey Institution of Harvard. When Hayes left for Minnesota in 1914, East recommended Jones to take over the corn and tobacco breeding research here in New Haven.

Jones faced a difficult decision. His prospects at Syracuse seemed good, his summers were his own, and the salary increase offered at New Haven was small. Jones gambled $15 for rail fare and $1 for a hotel room, and visited Dr. Jenkins. On Thanksgiving Day in 1914 he walked up the Huntington Street hill, saw the old Whitney house, and asked himself the common question: What is an Experiment Station doing here, in a fine residential area, with no farmland, no barns, and apparently not much else?

He took the position Jenkins offered, attracted especially by the opportunity to study six months of the year with East at Harvard University to earn an advanced degree. Jenkins told Jones that a full-time appointment awaited him, if both were satisfied, and Jones wrote, "I hope I can handle the work to your satisfaction and my own."

The Bussey Institution marked the third step in Jones' plan of preparation for a career. Step one was to determine what he most wanted to do; step two, to learn who was the leading authority in that field; step three, to go to the authority and learn.

Genetics was the field, East was the

leader Jones selected, and the Institution of that day adjoining the Arnold Arboretum in Jamaica Plain, Massachusetts, was the workshop of a brilliant group of biologists.

In science, particularly, even the man in the foreground does not stand alone. Many able investigators, Darwin, Mendel, Hopkins, Beal, Shull, Hayes, and others had put scientific information on record, there to be used by East and his students.

The process continues. In Jones' time, graduate students from many places have come to New Haven to work with him. Among them are Paul C. Manglesdorf, now of Harvard, Ralph W. Singleton, of the University of Virginia, Lewis F. Roberts, the Rockefeller Foundation, Oliver E. Nelson, Purdue University, Warren H. Gabelman, University of Wisconsin, Herbert L. Everett, Cornell University, Hans Nienstaedt, U.S. Forest Service, and Lawrence C. Curtis, University of Georgia.

Meanwhile the genetic studies of corn and other plants went on at this Station. Jones produced the first of all the hybrid sweet corns, Redgreen, in 1924, and under his direction Station geneticists developed many other widely known varieties. A seedsman in Idaho reports that seven Connecticut sweet corn inbreds were involved in the production of approximately 900,000 pounds of seed in 1957 and an equal amount in 1958. Connecticut field corn inbreds are also still used, although long ago supplemented by many from other corn growing areas. Some of the highest yields in the corn belt in 1959 were made with hybrids containing Connecticut inbreds in their pedigrees.

Scientists and seedsmen, farmers and leaders in government have recognized Jones' work. Jones was elected to the National Academy of Sciences in 1939. He has been honored by the Farm Bureau and the Grange, the American Seed Trade Association, the New England Council and Governors of the New England States, and other societies and organizations.

Some of us who have known both men see a resemblance between Donald Jones and Liberty Hyde Bailey, horticulturist, student, and evangelist of the good earth. Both, at retirement age, could step out with the confident stride of the frontiersman, the proud clan to which they belong. Bailey set aside 25 years of his life to do as he pleased and was able to work productively well into his nineties. Jones' colleagues, and others throughout the world who appreciate his work and counsel, wish for him a comparable future.

Research on Parade AUGUST 10

1960 Field Day to Show How Station Serves You and Your Neighbors

How science asks questions, interprets the answers, and puts these answers to work—that is the common ground upon which scientists and friends of research meet at the Station Field Day.

The date this year is August 10, the place is Lockwood Farm in Mt. Carmel. The program begins at 10 a.m., all are invited.

Since 1910 these Field Days have been planned to show how biological research serves Connecticut. This year, more than ever before, the emphasis will be on research that goes beyond the farm and affects those who earn no part of their income directly from the land.

Agriculture, as the word is generally used, will by no means be overlooked. The professionals—fruit growers, vegetable producers, dairymen, nurserymen, florists, and those who provide them with goods—will have every opportunity to get answers to their perennial question: "What's new and what does it mean to me?" Of this, more later.

For others, the Field Day program covers the fields of interest reflected by the calls for assistance received by the Station staff.

What fertilizer and how much should I use on my lawn? What is this bug? What ails my birch leaves? How can I get rid of poison ivy?

Many of the answers to questions like these are "in the book" of applied science. Field Day is an attempt to show how research writes the book and continually revises the text.

Other questions posed by inquirers are not so easily answered. As one example, suburban living on the old farms and in the woodlands of Connecticut puts people close to the land and its native occupants. Stephen Collins will describe some of the ways to use results of research while homesteading in the suburban forest.

He may point out that while pests in the suburbs come in many sizes and shapes, togetherness need not include undue numbers of caterpillars on the picnic table. Dr. Collins is a forest ecologist, concerned with the relation between organisms and their environment.

Entomologist John C. Schread will deal with practical control methods for pests of flowers and ornamentals.

Blemishes and beauty aids of lawns will be discussed in detail by Paul E. Waggoner, Raymond E. Lukens, and John F. Ahrens. Their discussions and experimental plots will illustrate practical ways to deal with crabgrass and other weeds, lawn care in shaded areas, and seeding mixtures.

Pure foods, food additives, foods honestly described and free from adulterants, these are in the news as never before. In Connecticut, Station research helps to insure that vitamin-fortified milk meets established standards. The Station shares also in the constant effort to keep pesticides out of food. H. J. Fisher and Richard T. Merwin will discuss with Field Day guests the problems and procedures on foods and drugs as they are handled by Station analytical chemists.

Home gardeners will welcome the Field Day opportunity to get information from Frances W. Meyer, Ernest M. Stoddard, John C. Schread, and others who work every day with problems of disease and insect control.

For commercial growers, their suppliers, and visiting scientists concerned with food production, Field Day offers a varied report on progress.

Patrick M. Miller will have new information on control of plant diseases by soil treatment, Lloyd V. Edgington on control of Verticillium through crop rotation. Dale Moss will tell of the work he and Harry T. Stinson, Jr., are doing on close-planted corn (see page 6 for a first-year report). Richard J. Quinton, James B. Kring, and John C. Schread will show field results in control of insect pests on vegetables, alfalfa, fruits, and ornamentals.

Measuring changes in the immediate environment, above, around, and below plants, is the concern of Paul E. Waggoner and others in the Department of Soils and Climatology. Dr. Waggoner and his staff will show the gadgetry and explain the thinking that leads to profitable management of the soil and adjustment of the microclimate in which plants grow. In a few words, they seek ways to make plants do more work by converting into food and fiber more of the solar energy lavished (at times) on the Connecticut countryside.

Barn exhibits tie together many aspects of Station research, from soils to ozone. All field plots are near the

(Continued on page 6)

More Mosquitoes This Summer?

Robert C. Wallis

Robert C. Wallis, medical entomologist, samples water in a woodland pool to estimate prevalence of springtime mosquitoes. Such temporary breeding places for mosquitoes are often overlooked by homeowners.

After two years of unusual prevalence, mosquitoes have bitten their way into first place as pest insects in Connecticut. In 1958 and 1959, melting snow, early springtime rainfall, and regular precipitation throughout the summer set the stage for a build-up of the mosquito population that was felt by almost everyone who ventured out during the warm weather. Mosquitoes, of course, are more than a nuisance. We all recall the 1959 epidemic of eastern encephalitis in New Jersey. With this in mind, many people are concerned about prospects for the current season. As outdoor activities increase, people want to know: Are the mosquitoes getting worse in Connecticut? Will they be abundant this summer? Will there be any eastern encephalitis this year?

The mosquitoes in Connecticut are not a worse pest than they used to be, but more people are aware of the problem than in previous years. Many people who once lived in the protected environment of the city have moved into the suburban forest. In their new home in the woods, they encounter mosquitoes that were previously of little concern to them except when on picnicking or on fishing and camping trips.

Since all mosquitoes develop in water and their numbers are affected by the weather, prediction of the size of the mosquito population early in the season requires a certain amount of speculation. However, there has already been sufficient rainfall and flooding throughout the State this spring to foretell a large early mosquito brood. These early springtime mosquito species are different from those that develop later in the summer. Only three of the thirty-eight species known in the State are bothersome between March and June. Thus, in the areas along the coastline the large "Brown Salt-Marsh Mosquito," *Aedes cantator,* is the major pest in the spring. Farther inland, in fresh water woodland pools, *Aedes abserratus* and *Aedes stimulans* develop in large numbers to bother gardener and fisherman early in the spring. Fortunately, these species have but one generation a year and they soon die off.

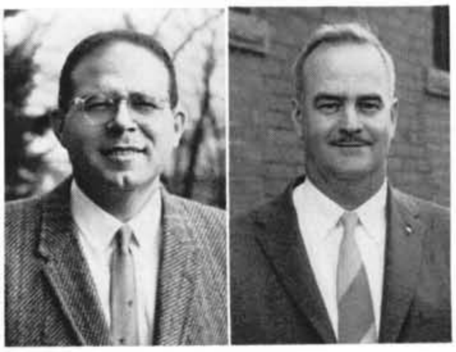
They are replaced by species that develop in the summer. The amount of rainfall during June and July determines the size of the mid- and late-summer mosquito population, when *Aedes canadensis* and *Aedes vexans* develop in fresh water accumulations and *Aedes sollicitans* dominates the salt marshes. If unusually dry weather occurs, the water accumulated in tree-holes and in containers around the home and farmyard disappears, thus eliminating many of the breeding areas for domestic pest mosquitoes such as *Culex pipiens* and *Aedes triseriatus.*

Regardless of the weather, these domestic pest species that are most bothersome in the mid- and late-summer can be greatly reduced by inspection and clean-up in the residential neighborhood. In one fashionable area of a town we found that most of the pest mosquitoes came from an old lily pond in a flower garden. Long out of use and supposedly drained, this lily pond had accumulated several inches of rain water and rotting leaves that provided an excellent breeding place for mosquitoes. There are countless such spots in most towns; mosquito control is literally everybody's business.

While the early season species are important only as pests, some of those prevalent later in the summer are involved in the transmission of eastern encephalitis. Whether or not virus actively occurs this year depends on the weather. An unusually dry summer season would practically dismiss the possibility of serious trouble from eastern encephalitis, even though there may be considerable occurrence of the virus in wild birds. Five of the late summer mosquitoes are suspected of transmission of the virus in Connecticut. Two of these, *Culiseta melanura* and *Culex restuans,* feed predominantly on birds and are probably important in spread of the virus from bird to bird in the natural cycle of the virus. Another suspected mosquito is *Aedes sollicitans,* the "Salt-Marsh Mosquito." As its name implies, this species is found only along the coastal salt-marsh areas. It is not present in the upland areas where many of the horse and pheasant deaths from encephalitis have occurred. *Aedes triseriatus,* the "Tree-hole Mosquito," is sufficiently distributed across the State but does not occur in large numbers except in local areas. In Connecticut, none of these four mosquitoes is known to transmit eastern encephalitis to man.

A fifth species, *Aedes vexans,* fits the outbreak pattern exceptionally well and has become a chief suspect. The encephalitis virus was isolated from naturally infected *Aedes vexans* collected at Farmington in 1959. Additional significance is given this isolation since it is the first time virus has been isolated from this species or from any mosquitoes in Connecticut. *Aedes vexans* is the most common biting pest mosquito during August, September, and October. It is generally distributed throughout the State and bites a variety of hosts including both man and birds. This mosquito breeds in rain pools, swamps, flood water pools, roadside puddles, artificial containers, and a wide variety of other accumulations of water. For this reason people are urged to inspect their own property for standing water that may be used as mosquito breeding places.

If an encephalitis threat develops, the best protective measure that can be taken is to avoid mosquito bites. Screens bar mosquitoes from the home and protective clothing is effective for outdoor activities at times when the mosquitoes are biting. Mosquito repellents are available for application to the skin and to clothing, and residual insecticides properly applied give very effective protection. Information about the mosquitoes in Connecticut is given in Station Bulletin 632, to be available about June 15. Publications on practical control of mosquitoes are distributed on request by the State Department of Health, Hartford.



Plant pathologist Saul Rich, left, is known for his research on the action of fungicides. Gordon S. Taylor, at right, is in charge of the Tobacco Laboratory in Windsor.

Air-Conditioned Tobacco

Saul Rich and Gordon S. Taylor

The day is hot and brassy. The air is still and smoky. Man and his crops droop. Perhaps your eyes smart and your throat tickles. You may remember this day. If you are a tobacco grower, you will certainly rue this day, for tomorrow the tobacco leaves will show white streaks and stippling called "weather fleck." Weather fleck, which damages leaves and downgrades quality, took more than a million dollars from the income of Connecticut tobacco growers last year.

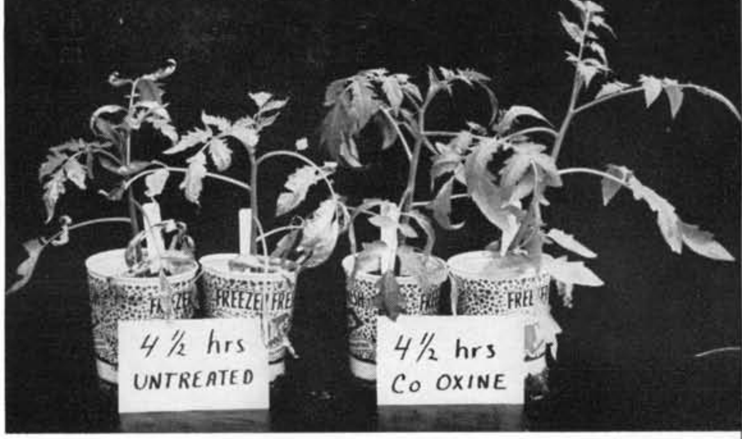
We now know that fleck is caused by too much ozone in the air. The ozone comes from bright sunlight acting upon incompletely burned fumes from automobiles and manufacturing plants. When the air is still, the ozone so produced will accumulate near the ground until the fumes injure such sensitive plants as tobacco, tomatoes, potatoes, and petunias. The longer the ozone remains, the harder the plants are hit.

In 1959, a period of high ozone badly damaged plants at our Lockwood Farm in Mt. Carmel. To our surprise, tomato plants sprayed with certain experimental fungicides were little damaged. These materials, zinc and manganous naphthoquinone-2-oxime, we tested in the ozone chamber at our Windsor laboratory. Sure enough, the fungicides destroyed ozone and were, indeed, antiozonants. Because of the chemical similarity of these compounds to another group of fungicides, the metal chelates of 8-quinolinol, we tested cobaltous 8-quinolinolate and found that it, too, is a good antiozonant.

With weather fleck in mind, we had to consider how best to apply these antiozonants to tobacco. Large tobacco plants crowded together under a cloth shade tent are difficult to cover uniformly with sprays or dusts. Not only must the dense foliage be uniformly covered, but the material must be applied often to protect the rapidly expanding new growth. Once the material is on the plants, it must resist weathering so that the protection will be there when needed. But is it necessary to put antiozonants on shade grown tobacco in order to get protection against ozone? After all, the tobacco is completely enclosed in a cloth tent. The ozone which is made out in the bright sunlight must pass through the cloth to get to the plants. Why not treat the cloth with antiozonant and destroy the ozone as it enters the tent? To test this idea, we treated shade tent cloth with cobaltous 8-quinolinolate, and found that the treated cloth almost completely protected tomato plants in our ozone gassing chamber. Will the treated cloth protect tobacco in the field against weather fleck? If it does, how long are the exposed antizonants active? These are two important questions we will try to answer this summer.

Whether or not we have the best materials for our purpose remains to be seen. Fortunately, there is a great deal known about antiozonants. Ozone not only damages crops, but also cracks rubber, shortening the storage life and wear of tires. Chemists in the rubber industry have long been aware of this problem, and have had vast experience with compounds regularly added to rubber to protect it against ozone. It is to these men and their antiozonants that we will turn first to find the most suitable compounds for our purpose.

Our ideal compound must have certain properties. It must be a powerful antiozonant; it must be applicable to shade tent cloth; it must not be destroyed in the process of destroying ozone; it must be insoluble in water and chemically stable in order to resist weathering; it must be available, cheap, and safe. So the search begins.



Tomato plants on the left were covered with untreated shade tent cloth, those on the right were covered with the same kind of cloth treated with cobalt 8-quinolinolate. All plants were then gassed with 0.8 p.p.m. of ozone for 4½ hours.

Close-Planted Corn Needs Built-in Shade Tolerance

Harry T. Stinson, Jr., and Dale Moss

In their common desire to improve the performance of hybrid corn the farmer, agronomist, and plant breeder sooner or later raise the same question: Why not grow more plants to the acre, and in this way produce corn more efficiently? In recent years investigators have pondered this question with renewed interest. They began by noting the way in which a corn plant responds, in terms of ear development, when grown in thick stands. The results of many experiments show that as planting rates increase the average ear weights decrease. Even though this means that each plant yields somewhat less, so long as the reduction is not too great the grain yield per acre goes up, simply because there are more plants. Eventually, however, the law of diminishing returns begins to operate, and drastic reductions in average ear weight lead to lower overall grain yields. At very high population densities many plants are barren, the ears containing little or no grain, or perhaps absent altogether.

All corn hybrids show this general response, but an important qualification has special appeal to us. The critical population size at which yields begin to decrease sharply is not the same for all hybrids. This differential response of hybrids to increasing planting rates presents an intriguing problem, and we would like to know what there is about the biology of some hybrids that makes them more tolerant of thick stands.

Harry Stinson, at left, a geneticist, works on cytoplasmic inheritance in corn and other plants. Dale Moss, right, is on the staff in Soils and Climatology. Dr. Stinson and Dr. Moss will report in greater detail on close-planted corn at the Field Day, August 10.

It occurred to us that one of the environmental conditions of a thick stand that might limit plant growth is reduced light intensity brought about by the closer spacing of plants. Thinking now of the differential response of hybrids to thick plantings, we might expect hybrids tolerant of thick plantings to perform better in a shade environment than hybrids intolerant of thick plantings. To test this idea we assembled eleven hybrids, six known to be tolerant and five known to be intolerant of high population densities, and grew both groups of hybrids in a tobacco shade tent and in full sunlight. All were grown at the same spacing, and were given the same fertilizer treatment.

The shade-tent corn plants were, as expected, taller than their counterparts in the sun, but the tolerant and intolerant hybrids responded alike in this respect, as they did in stalk diameter (slightly less in the tent) and in stalk breakage (about the same in sun and shade). This picture of similar response changed radically when grain yields were compared. The results in terms of bushels to the acre may be summarized as follows:

Hybrid type	*Full sunlight Bushels/A*	*Reduction in shade Bushels/A*
Tolerant	104	20
Intolerant	102	42
Difference	2	22

The yields of both groups were significantly reduced in the shade. The important point, however, is this: The effect of shade upon the intolerant strains was significantly greater than the effect of shade upon the tolerant hybrids.

Thus, our expectation was realized; hybrids tolerant of thick plantings yield more in a shade environment than do hybrids intolerant of thick plantings. Hybrids tolerant of thick plantings are then also shade tolerant, that is, they make more productive use of the energy available from sunlight. These results probably also mean that where soil moisture and fertility are sufficient, the lower light intensity in thick plantings is primarily responsible for the reduction in the grain yield of individual plants.

The analysis was taken a step further by separating the contributions of the two components of yield, incidence of barren ears and average ear weight. The incidence of barren ears was as follows:

Hybrid type	*Barren ears, sun*	*Barren ears, shade*
Tolerant	none	5.8%
Intolerant	2.5%	24.0%

The proportion of barren ears increased in the shade for both tolerant and intolerant hybrids. Once more, however, the effect of shade was significantly greater upon the intolerant strains. In ear weight, the tolerant hybrids showed a 13.5 per cent reduction and the intolerant hybrids a 24.6 per cent reduction when grown in the shade tent. Clearly, shade caused marked reductions in average ear weight, and the effect was greater upon the intolerant than upon the tolerant hybrids, but in this experiment the effect was not, in a statistical sense, significantly greater.

Thus, both components of yield, ear weight and barren ears, contribute to the overall reduction of yield in the shade. The feature which more clearly distinguishes between the tolerant and intolerant hybrids, however, is the greater tendency for the intolerant group to produce barren ears in the shade environment.

Although our simple experiment shows that corn varieties, like many plants, vary in their tolerance to shade, important questions remain unanswered. Particularly fascinating is the question of the exact manner in which light intensity influences ear development. Having shown that hybrids differ in their capacity to utilize light in the production of grain, we want to probe a little further and ask what mechanism in the plant accounts for this difference. Perhaps in this way a new dimension can be added to corn breeding, and the geneticist will have a specific goal to aim for in his efforts to produce hybrids tolerant of thick plantings.

Research on Parade--

(*Continued from page 3*)

Field Day tent, research men will be on hand to discuss their work and to answer questions. The program begins at 10 a.m. Lockwood Farm is about four miles north of the Hamden Town Hall; signs at Whitney Avenue (Route 10) and Evergreen Avenue mark the way.

A graduate of the University of Maine, Lloyd Keirstead has been on the Station staff in analytical chemistry since 1946. He was formerly at the Maine Station in Orono.

Analytical Chemists Have Key Role in Research and Regulation

Lloyd G. Keirstead

To "stay the ravages of the army worm" in 1880, an Old Saybrook farmer used Paris Green, an arsenical compound, on his corn. That fall he wrote to the Station to learn whether "it will now be safe to feed the cornstalks and husks." No trace of arsenic was found. Pesticide residue determinations have been made ever since to help in the development of better control methods and to detect possibly harmful excesses. The introduction of the new synthetic organic compounds has intensified this work.

During the summer of 1950 Dr. Roger B. Friend, former head of the Department of Entomology at the Station, undertook a study of the distribution of DDT from a mist blower. He used a target consisting of poles with wires strung horizontally and vertically to make a great vertical checkerboard. Microscope slides were suspended in a planned way and runs were made under different conditions. The deposits on the slides were analyzed, using a delicate method.

Sunrae Agostini and Mr. Keirstead handled the exacting process of testing cranberries last fall to make sure they were free from pesticide residue.

In 1952 a similar experiment with DDT was conducted in connection with airplane spraying. A thousand aluminum rectangles were placed on the ground to collect the deposits under various operating conditions.

Each fall Dr. Philip Garman of our staff has sampled apples and peaches from his experimental spray plots for residue analyses, including the phosphorus insecticides and several of the new fungicides.

Dr. Richard J. Quinton studies insect control on forage crops. He has applied different doses and collected samples for analysis at intervals right after spraying and for as long as three weeks. The results enabled him to estimate the proper time to allow between application and harvest.

In addition to the analytical work required during development of application timing and techniques, we are called upon to detect pesticide residues after chemical controls have been used.

Bird lovers concerned about dead birds bring them in to see if the new insecticides are involved. We find that some birds do ingest DDT. Last summer we found one possible explanation. We analyzed earthworms from under elm trees sprayed with DDT and found that the worms had accumulated (without apparent ill effects) amounts of DDT that may sometimes be lethal to worm-eating birds. This confirmed that our Connecticut worms were like their midwestern relatives in this respect.

The passage of the Miller Act in 1954 brought about the establishment of tolerances or allowable amounts of pesticides on foodstuffs. The current stand of the Federal Food and Drug Administration is that no pesticide should be present in market milk. Our State milk control officials have asked us to check samples of milk for DDT. This survey started in 1958 and about five hundred samples a year have been submitted. We have adopted the practice of mixing equal amounts from each of ten samples brought in by each inspector and checking the mix. If the composite appears to be contaminated the individual samples are analyzed.

We also determine residues for the Department of Consumer Protection. The recent cranberry crisis broke on the 10th of November, allowing seventeen days to obtain special equipment, learn a lengthy (ten hours to complete a test) method and check one sample of each of the brands offered for sale in the State. It was our first major encounter with a weed killer.

The techniques used are taken from the literature, including unpublished material kindly supplied by commercial firms. The seventeen people in our department have all contributed, particularly Sherman Squires and Sunrae Agostini who have worked on several of the projects.

We expect to improve our methods both as to accuracy and speed. Richard Botsford, our infrared spectroscopist, has made great progress in adapting the new instrument and accessories which we bought last year for identifying and measuring small amounts of these compounds. This is one of several new approaches which we are exploring.

To Head Research In Genetics

Harry T. Stinson, Jr., has been appointed head of the Department of Genetics by the Board of Control. Dr. Stinson will succeed Donald F. Jones when Dr. Jones retires on June 30.

Dr. Stinson began his career at the Station in 1952. He has conducted studies on cytoplasmic inheritance in maize and Oenothera, cytoplasmic male sterility, and corn breeding. A graduate of the College of William and Mary, where he was assistant professor of biology in 1951-52, Dr. Stinson earned his Ph.D. at Indiana University.

New Publications

The publications listed below are now available to those who apply for single copies to Publications, The Connecticut Agricultural Experiment Station, Box 1106, New Haven 4, Connecticut.

Entomology

- B 631 Laboratory Studies on House Fly Populations. Part III
- C 211 The Black Vine Weevil
- C 212 Insect Pests of Connecticut Lawns

Reports on Inspection

- B 628 Commercial Fertilizers, 1959

Soils and Climatology

- B 626 The Climate of Shade
- B 627 The Storage of Moisture in Connecticut Soils
- C 209 Soils and Urban Development in Hartford County

Tobacco

- B 630 The Pedigree of Connecticut 49 Tobacco

Other Subjects

- C 210 Slate Laboratory Dedication

50 Years at the Station

Laurence S. Nolan of the Department of Biochemistry received a 50-year service pin from the Board of Control on April 19. Dr. Hubert B. Vickery made the presentation and read a letter of appreciation from Governor Abraham Ribicoff. Mr. Nolan and members of his family were guests at a tea given by the Station Council.

FRONTIERS
of Plant Science

Vol. XII — No. 2

FRONTIERS OF PLANT SCIENCE is a report to the people of Connecticut on the research of The Connecticut Agricultural Experiment Station in agriculture, forestry, and gardening. Available upon request.

BRUCE B. MINER, Editor

From the Director

Seeking an understanding of science and scientists, one gains two divergent impressions from the press, TV, and radio. He gains first the impression that science works wonders, that it produces miracles. He marvels at the workings of a TV set—pictures coming into the parlor from the thin air outside. He hears of miracle drugs and miracle fibers.

Melded into this image of science, he sees a white-coated savant who conjures up the miracles with the same ease that the great magician, Thurston, pulled rabbits from his hat. The man in the white coat is a "brain" who will solve any problem by the "scientific method."

For example, the population is exploding and spreading over the land like a bucket of paint spilled on the kitchen linoleum. From whence will come their food after they will have devoured the surpluses? The ready answer I hear is that the scientists will solve this—no trouble at all. As a scientist I am confident that we can surely help, but I am perhaps less confident than my non-scientific friends who have such faith in us.

Supposing scientists do indeed solve this problem, what kind of thinking will they use? Not much different thinking from what everyone uses at least occasionally. Only a scientist does it as a regular business. His cerebration follows the same course as that followed by many people when they suddenly come upon a sign reading "Fresh Paint." The normal first reaction to the sign is "Oh yeah! I doubt that sign. I doubt that that is fresh paint."

To find out, the doubter must do something. He must design an experiment. He uses a gadget—his finger. His experiment comprises the motions of walking over and touching the allegedly fresh paint with his finger.

The experimental design, simple though it be, involves some assumptions: (1) that fresh paint is sticky, (2) that his finger will transmit a touch sensation of stickiness to his brain, (3) that old paint is not sticky, (4) that old paint will not feel like fresh paint.

He makes the experiment, touches the paint. It is sticky. He concludes that his hypothesis was indeed correct, his curiosity is satisfied, his doubt is dispelled, the sign is not a fake, the paint is fresh.

This is the process, the whole process, and nothing but the process of scientific research. Observation (seeing the sign), doubt, further curiosity, and so on. For example, a really curious person might very well wonder "what really does sticky mean?" Experiments to elucidate this question might lead him into the study of glues, cements, mucilage, polymers, synthetic rubber, nylon, and beyond.

The significant point is that science is not something apart from regular affairs of life. A productive scientist trains his powers of observation, encourages his curiosity, works hard at designing the necessary gadgetry, and makes sure that his conclusions stem from his observations and experiments. The kind of investigation we dabble in sporadically when we touch a finger to wet paint becomes to the scientist a regular business of discovery.

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