

The Connecticut Station Today

*Since 1875
a Center for Research
In Plant Sciences
and Related Fields*

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION • NEW HAVEN

A Registered National Historic Landmark



James G. Horsfall

An active imagination not running wild, like a wild ass of the desert, nor confined in a treadmill, but bitted and curbed by "the unsullied temper of a well taught mind" is, it seems to me, an indispensable equipment of a real investigator. A brooding, ruminating, imaginative mind is a great asset. These things are of the spirit.

— E. H. JENKINS

The Spirit of the Station

An institution like ours has a "spirit," an indefinable essence that gives us strength. This spirit illuminates the aphorisms of various directors. S. W. Johnson, a Yale professor who fathered the Station, called first for "men and means for striking out into the path of discovery . . . a station should be near to but not a part of an academy. . . . Research is our business. Discovery is our product."

Jenkins wanted a "comfortable place." Slate said, "Scientists progress faster with their feet on the table than under it. . . . Overorganization begets mediocrity, mediocrity begets overorganization." I can only paraphrase Lord Nelson. "The Station expects every man to do his duty."

How does it work? Yale, our distinguished nearby "academy," keeps us striving. Our smallness encourages *esprit de corps* and discourages overorganizational obfuscation. Full time enables us to do basic research while solving the local biological problems. Our writings have the ring of Johnson's book, "How Crops Grow,"—not "How to Grow Crops." We do the science. The citizens grow the plants.

Director

The Role of the Station

The resolution of the 1875 General Assembly establishing the Station, first in the nation, stated that it should work for the "general benefit and improvement of agriculture and kindred interests of the State of Connecticut."

Great changes have taken place in agriculture and kindred interests of Connecticut citizens. Some things have not changed. One of them is the dependence of people on plants. Plants yield food, and the economy of this State depends mightily upon ample supplies of food. Agricultural research at this Station helps to make this abundance possible.

Plants are also literally in almost every picture of a Connecticut comfortable to live in, pleasant to behold. Agricultural research at this Station helps those who tend and improve the living landscape of Connecticut.

What of the years ahead? More people in Connecticut, more market shelves to fill with better foods from more efficient farms—these we anticipate. Still, because of the research that brings agricultural abundance, much land will not be needed to produce food. So it can be used to give us living room out-of-doors. And we shall need to use it wisely. For we are of the earth and, in our time, responsible for its husbandry.

Whatever lies ahead, the need for research in the plant sciences is apparent. Efficiency in food production, new knowledge of nutrition (from plants to people), and new techniques to enhance the beauty of Connecticut—all of these begin with new knowledge of how plants grow.

We have been called the Station of History, and with good reason. In no small measure, this is because Station scientists have been able to anticipate some of the needs of a changing economy. In that spirit, and as former Director Jenkins said, "not running wild . . . nor confined in a treadmill," the Station of History continues to work for agriculture and kindred interests of Connecticut citizens today and tomorrow.

Dividends From Investment in Research

Regulation of Water Use by Plants

Station scientists have made great advances in knowledge of stomata and water relations of plants. The stomata, microscopic pores in leaves, regulate the ingress and egress of water, oxygen, and carbon dioxide. Understanding of stomatal action and its control is fundamental to discovery of new ways to conserve water and to protect plants from drought injury and freezing.

Insects and Man

Station research on entomology recognizes one clear fact: insects are here to stay; it is prudent for us to learn to live with them. Studies seek understanding of life histories of insects, including knowledge of parasites, predators, and other approaches to control, when needed. Practical use of all this information comes when growers, homeowners, and many others seek help in identifying and controlling insect pests.

Plant Disease Identification and Control

Calls, letters, and personal visits bring a constant flow of requests to the Station for information on identification and control of plant diseases and disorders. Thus research of yesterday and today meets timely needs of individuals and communities.

Chemotherapy, combating disease from inside the plant, has been intensively studied by Station plant pathologists. Dividends from this research have come to florists, strawberry growers, and others.

Genetic Studies

Hybrid corn and hybrid varieties of vegetable crops represent an annual dividend from Connecticut Station research. Present studies are exploring the genetics of the fungi, for in this area may lie clues to disease-resistant plants. Other geneticists are seeking to improve ornamentals as well as crop plants and trees.

Plant Environment

Studies of the climate of shade, of plastic and other mulches, and of plant protectors give new understanding of ways to regulate the microclimate in which plants grow and man lives. Other studies seek new knowledge of energy conversion through photosynthesis, and may lead to greater efficiency in food production. Protection of plants from ozone damage by chemical closure of stomates and by use of anti-ozonants is now possible.

Lawns and Their Management

Amateurs and professionals who grow grass rely on Station research results as a guide to planting, fertilization, weed and pest control. Soil samples from lawns make up a large part of the thousands tested annually in Station laboratories: an example of the practical value flowing from scholarship in soil science.

Contributions to Science

Through papers in technical journals and in other ways, Staff members aid other scientists and thus assist in research elsewhere. Methods and apparatus developed here have proved invaluable as tools of science. These include advances in the biometrical design and analysis of experiments for uncovering real effects in the maze of biological variability.

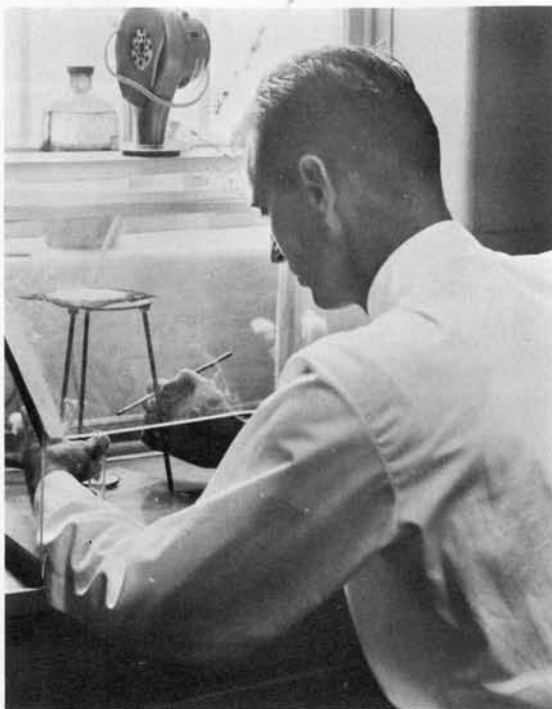
Station Research Serves Connecticut



Agricultural research and related technology undergirds the urban economy of Connecticut with ample supplies of fruits and vegetables, ornamentals, and other products of the land.



The Connecticut Station



Basic scientific research in the laboratory, followed by field experiments to test theories and methods—this is the plan proved in use at the Connecticut Station. The photo below shows Lockwood Farm in Mt. Carmel, a 61-acre research facility purchased and maintained with income from a trust fund.



Because of exceptional value in commemorating and illustrating the history of the United States, the Station was designated a Registered National Landmark in 1964. Below, Connecticut citizens interested in plant science gather at Lockwood Farm annually in mid-August to learn what is new in research.



Lines of Work

Analytical Chemistry

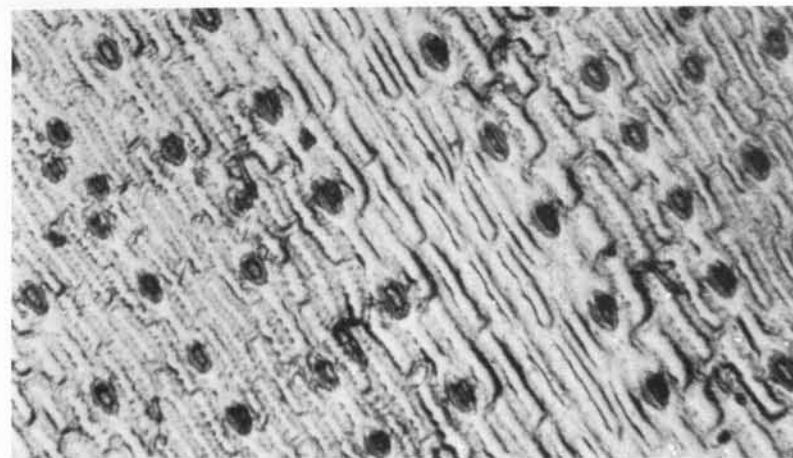
Fertilizer analysis, the cornerstone on which the Station was founded, proved its value immediately. This Connecticut Station idea, that the most effective deterrent to fraud is the publication of analyses made on open-market purchases, has been put to work in many fields.

Since 1895, Station chemists have analyzed food and drug samples and reported on their composition and whether they meet legal requirements.

Feeds and pesticides are similarly analyzed. The Connecticut milk supply is protected by regular bioassays of vitamin D milk and, since 1958, by extensive tests for organic pesticide residues. Systematic testing of field crops by gas chromatography started in 1964.

This laboratory was probably the first to determine drugs in feeds. Several of the methods used in this work originated here.

Gas chromatography is one of the methods used by Station chemists to detect contamination in foods.



The dark areas in this leafprint of corn are stomata. Regulation of water vapor movement through stomata, and other aspects of photosynthesis, are under study by biochemists and other scientists at the Station.

Biochemistry

Biochemists study the mechanisms used by living organisms to make the many substances needed for their growth and reproduction. Proteins are among the most important of these, and the chemistry of proteins has been studied continuously in the Department since it was established in 1888. In the early days, the interest was mainly in plant seed proteins used for human and animal food. Today we are particularly concerned with the proteins which act as the controllers of reactions in the cells of leaves. Such proteins are known as enzymes.

One recent study led to the observation that when the activity of certain leaf enzymes is controlled with inhibitors, the stomata, leaf pores, do not open fully. This significantly reduces the amount of water that normally evaporates from leaves. The technique for controlling stomatal opening offers a possible method of preventing crop losses from drought and of making more runoff water available to fill reservoirs in the future.

Entomology

Our entomologists have studied the abundance and detailed biology of the insect pests of people, houses, farm crops and animals, lawns, flowers, shrubs, and trees. Practical and efficient control measures have been developed for all the annual pests, and for most of the cyclic pests.

The short-range expedient of changing insecticides to control the few species of pests resistant to insecticides is still working. More basic studies of physiology, behavior, and toxicology seem to offer a more permanent solution.

There is progress in developing accurate methods of forecasting outbreaks of cyclic pests so that these may be controlled promptly.

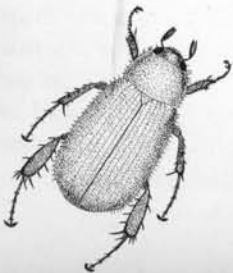
Biological control of pests has always been studied. We are seeking ways to give parasites, predators, and diseases the upper hand over pest insects.

The changing environment of ponds, lakes, reservoirs, and streams has brought new problems with aquatic insects, especially as contaminants of domestic water supplies.

Farmers are still plagued with many insect pests. The myriads of suburban gardeners are growing crops ranging from azaleas to lawns to zinnias, with their pests.

The greatest number of "new" problems comes from suburbanization and recreation. Caterpillars and mosquitoes in uninhabited woods are unnoticed, but when people live and play in these woodlands these annoyers may be intolerable.

Finally, the greatest mystery of all, why some insects are so abundant as to be pests, challenges the thoughts of all our staff.



A new ornamental, product of research in genetics at the Connecticut Station.

Genetics

Plants, like people, are the products of their heredity and environment. The science of genetics deals with heredity, and, in the hands of an artful plant breeder, becomes a potent tool for the improvement of plants.

Built-in resistance to diseases and insects is of immense economic importance. Studies here are directed toward the production of disease- and insect-resistant tobacco varieties, and disease-resistant, early tomato hybrids. In chestnuts, resistance to the blight fungus is being transferred from the oriental species to timber, nut, and ornamental trees.

Disease organisms may themselves undergo genetic changes. It is important to understand these changes and the reasons why they occur so that the potentialities of disease resistance may be exploited to the full. Several plant disease fungi are being studied to obtain a more complete picture of the interaction between crop plant and fungal destroyer.

Traits highly desirable in a useful plant often occur only in its wild relatives, and transfer of these traits is frequently difficult. Means for overcoming these difficulties are under investigation with tobacco, tomatoes, and gloxinias. Studies of the genetic mechanisms which determine crossability between species are in progress.

Plant Pathology and Botany

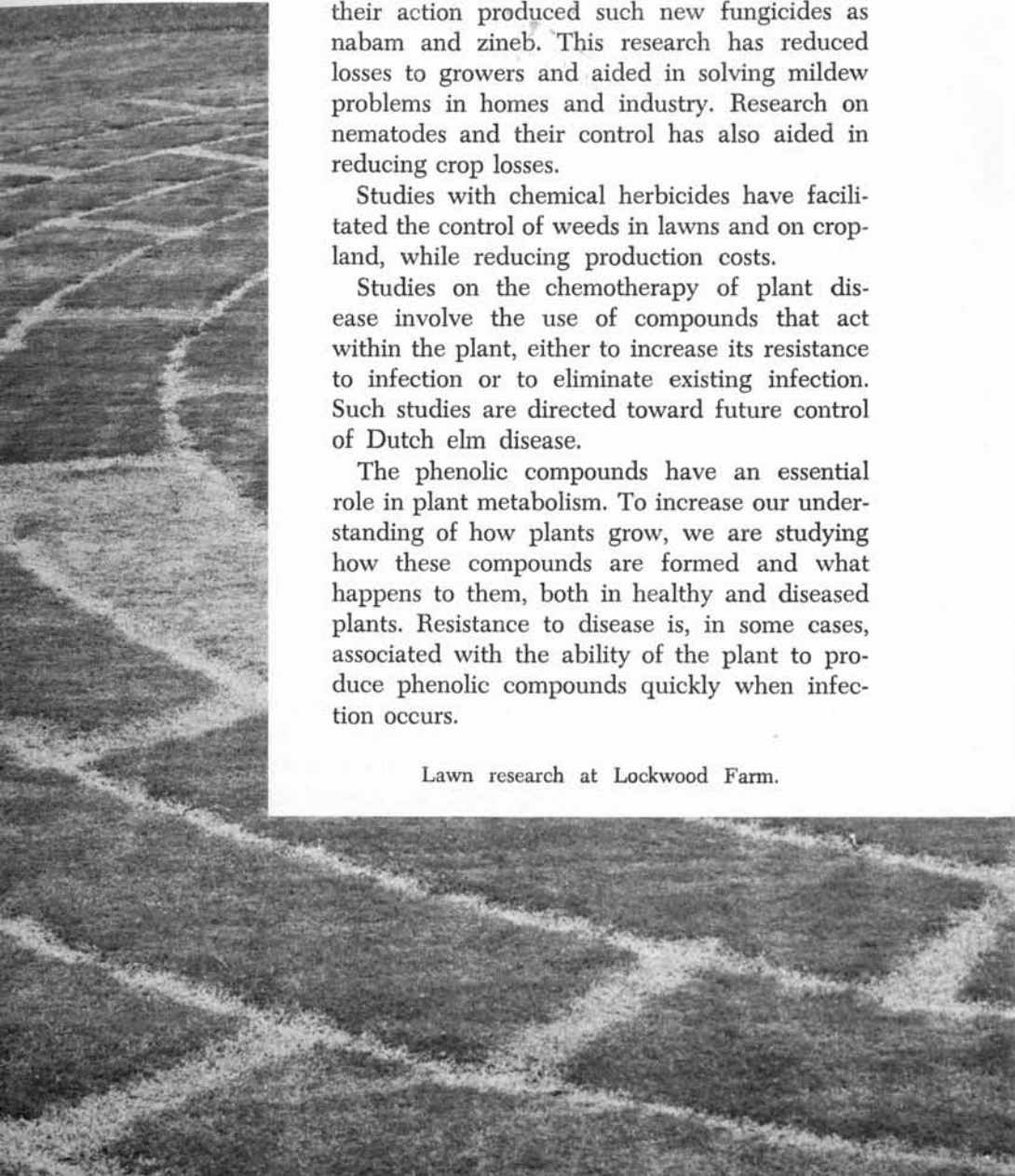
Plant diseases take a \$3 billion annual toll of crops in the U.S. The Plant Pathology Department seeks to reduce this loss by understanding plant diseases and perfecting methods of controlling them. Its research on fungicides and their action produced such new fungicides as nabam and zineb. This research has reduced losses to growers and aided in solving mildew problems in homes and industry. Research on nematodes and their control has also aided in reducing crop losses.

Studies with chemical herbicides have facilitated the control of weeds in lawns and on cropland, while reducing production costs.

Studies on the chemotherapy of plant disease involve the use of compounds that act within the plant, either to increase its resistance to infection or to eliminate existing infection. Such studies are directed toward future control of Dutch elm disease.

The phenolic compounds have an essential role in plant metabolism. To increase our understanding of how plants grow, we are studying how these compounds are formed and what happens to them, both in healthy and diseased plants. Resistance to disease is, in some cases, associated with the ability of the plant to produce phenolic compounds quickly when infection occurs.

Lawn research at Lockwood Farm.



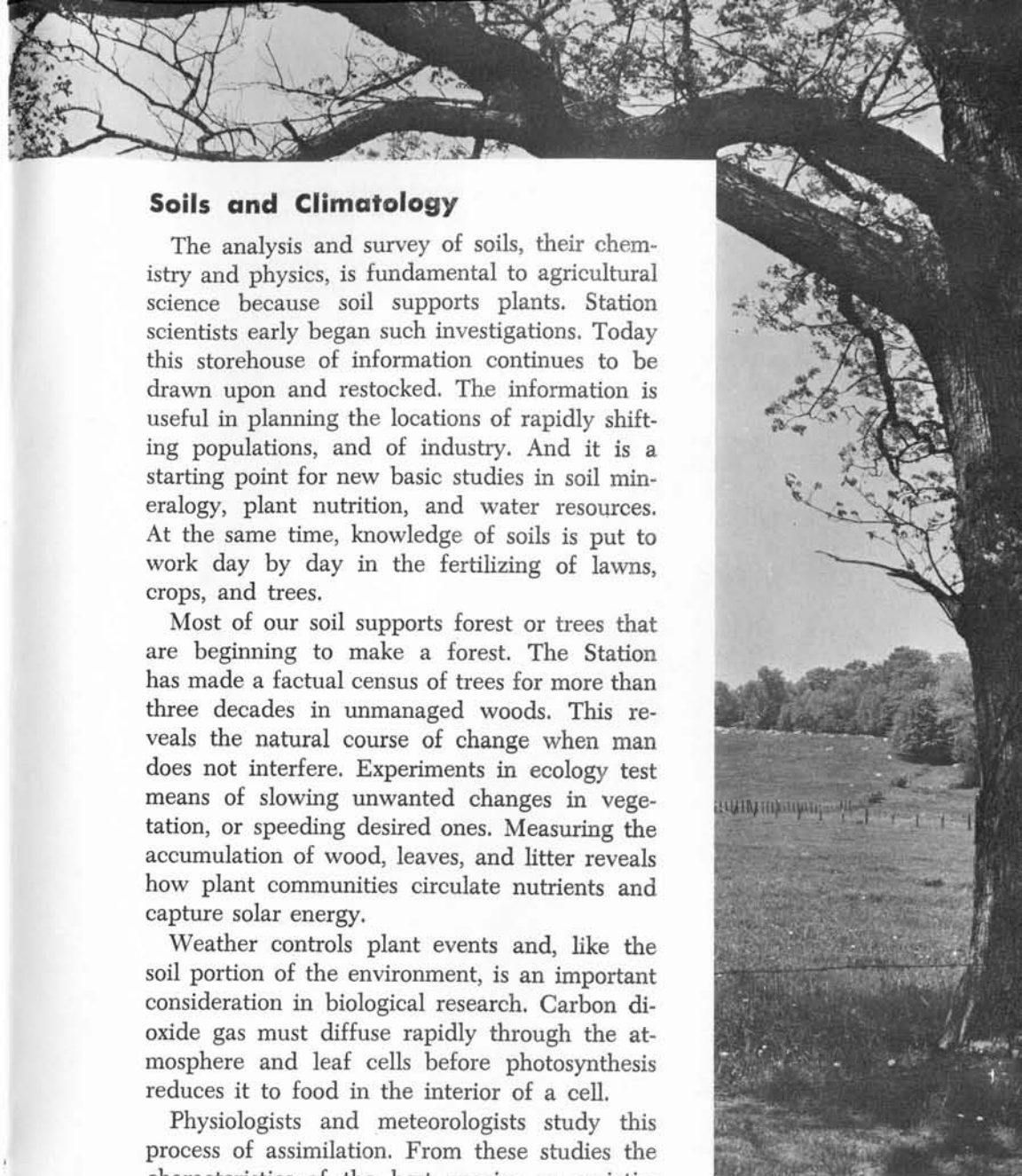
Soils and Climatology

The analysis and survey of soils, their chemistry and physics, is fundamental to agricultural science because soil supports plants. Station scientists early began such investigations. Today this storehouse of information continues to be drawn upon and restocked. The information is useful in planning the locations of rapidly shifting populations, and of industry. And it is a starting point for new basic studies in soil mineralogy, plant nutrition, and water resources. At the same time, knowledge of soils is put to work day by day in the fertilizing of lawns, crops, and trees.

Most of our soil supports forest or trees that are beginning to make a forest. The Station has made a factual census of trees for more than three decades in unmanaged woods. This reveals the natural course of change when man does not interfere. Experiments in ecology test means of slowing unwanted changes in vegetation, or speeding desired ones. Measuring the accumulation of wood, leaves, and litter reveals how plant communities circulate nutrients and capture solar energy.

Weather controls plant events and, like the soil portion of the environment, is an important consideration in biological research. Carbon dioxide gas must diffuse rapidly through the atmosphere and leaf cells before photosynthesis reduces it to food in the interior of a cell.

Physiologists and meteorologists study this process of assimilation. From these studies the characteristics of the best species or varieties for sun or shade, wet or dry sites, are becoming clearer. Some progress is even being made in changing plants chemically to make them tolerate the cold.



Visitors are welcome, although no regular tours are conducted. Advance arrangements should be made for groups of adults and for classes in biology, chemistry, and related sciences. Children in elementary grades generally find little to interest them at this Station.

Science at Work, an annual event at Lockwood Farm in Mt. Carmel, is held in early August. The public is invited.

FRONTIERS OF PLANT SCIENCE, a non-technical report on research in progress at the Station, is mailed regularly to Connecticut residents who request the publication.

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