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ARBORICULTURE AND THE CONNECTICUT EXPERIMENT STATION

by Paul E. Waggoner

A century ago, ten years after Appomatox, 23 years before Teddy Roosevelt rode up San Juan Hill, and 33 years before the counter-attack at Chateau-Thierry, Connecticut established the first agricultural experiment station in the New World. This first Station provided the parents for the International Society of Arboriculture. Thus we have common ancestors, and on this Bicentennial year we have good reason to reminisce together to learn what has been successful, and then explore the future together to learn what is ahead.

What was the situation in the 19th Century when the Station began? Even in relatively wealthy New England, things weren't all milk and honey in this underdeveloped country. Already the best land was occupied, the soil was becoming infertile, and younger sons were heading west in hopes of a better place to live.

Strange as it seems to us only a few generations later, our greatgrandfathers didn't know when manure would work and wouldn't, when lime would work and wouldn't, and how to restore worn-out soil.

Despite our underdeveloped state, however, Connecticut had an able chemist, Benjamin Silliman of Yale. It was in his laboratory in New Haven that they analyzed the oil from history's first oil well in Pennsylvania. It was also Silliman who understood the advances in soil chemistry in Europe about 1840 and sent American students to study there.

Two of these pilgrims from Connecticut were Samuel William Johnson and William Henry Brewer. In 1850 both were students in New Haven, drawn here by John Pitkin Norton, Benjamin Silliman, Jr., and their "School of Applied Chemistry," which had an established position but little other encouragement from Yale College. Later, both Johnson and Brewer studied in Justus Liebig's chemistry laboratory in Munich. By 1865 both Johnson and Brewer were professors in Yale's Scientific School.

Despite their friendship, Johnson and Brewer must have been different sorts. Johnson could see only a few feet without powerful glasses, he wrote constantly and suffered "writer's cramp," he was always the chemist, and he was a retiring scholar.

Brewer must have been more of an extrovert. I have seen a photograph of a geological survey party in California in 1864. There in the center sits bearded, booted Brewer, dominating the group. Sometimes Brewer was a chemist, sometimes a geological explorer, sometimes a botanist, sometimes a professor of agriculture, and sometimes a sanitarian.

The singleminded Johnson campaigned for twenty years for a Landwirtschaftlich Versuchsstation in America as he had seen during his student days in Germany in 1854. He had written the specifications early: near to, but not part of, an academy, so that research could go on full-time in an intellectual community. Steady state support so that serious rather than quick inquiries could be pursued. "Practice and theory ought to go together . . . Agriculture will flourish from that day when practical men shall be philosophical

enough to appreciate the philosopher's thoughts; and the philosophers practical enough to calculate the farmer's profits," said Johnson.

Finally, in 1875 Johnson's specifications were met when the Connecticut legislature established the first American agricultural experiment station.

Friend Brewer was on hand. In 1876 when the Station Director concluded his first report, Brewer was the first to speak in support of the new Station, and the next day Brewer led a committee that recommended liberal support. On the evening back in 1876 when Brewer rose to support the Station, however, he did more. He lectured on "Woods and woodlands."

The Board of Agriculture had met in Middletown, undoubtedly to examine the 3-month old-Experiment Station at the nearby Judd Hall of Wesleyan University. When he lectured on "Woods and Woodlands," Brewer told the audience not to be fussy in distinguishing useful and ornamental trees . . . "for the ornamental are often eminently useful, and the useful as often are conspicuously ornamental. But where trees are grown primarily for their beauty and their shade, or even as screens, we can afford to put more expense upon their planting and rearing, than when their chief value is for timber or wood. For example, how precious are the shade trees held in our cities; many a citizen of New Haven would think a thousand dollars per tree for the magnificent elms before his door, a poor compensation for their loss. Nor is such a value confined to city tastes. When I once mentioned this sum to an old farmer in this state, as the value set by a city friend of mine on his trees, the old man answered quietly, "It would take twice that to buy the elm in front of my door." *Mind you, those were one-thousand 1876 dollars.*

On that December night, Brewer also told the autience that there was an enormous European literature relating to woodlands, but the species that would succeed in any region could only be determinated by actual experiment, and America lacked experiments.

His audience was upset by this proclamation of ignorance, and a committee was proposed to gather practical information on trees and fill the void. Brewer, however, warned them, "The information that you are after does not exist," and it did not. No one on that December night in 1876 mentioned pests, and Brewer even predicted, "The chestnut will some day become more popular than now." The chestnut?

We have seen Brewer's one clear prediction laid low by chestnut blight, but his urging that we experiment and gain knowledge was good sense. Fortunately the Connecticut Station soon did more than analyze fertilizers, acting on the first director's statement: "It has been felt from the first that more abstract scientific investigations would afford not only the proper, but also the most widely and permanently useful labor."

In 1894 the Station hired Dr. W.E. Britton, a horticulturalist, and in those less specialized and less unionized times, Britton made himself into an entomologist in 4 years.

In 1900 the Station received some money that allowed tree investigations to begin, and in 1901 they hired the first forester that any Station had ever employed, Walter Mulford.

The Station Report for 1900 contains 22 pages on "The protection of shade trees." Out of 1143 trees surveyed in New Haven, 36% were mutilated by horses and vehicles, and one photograph shows a tree ruined by gnawing of horses and another tree injured by use as a hitching post. Some troubles do go away. Others have not.

For example, sharp dealing Britton wrote, "In 1890 in southwestern Connecticut traveling 'tree doctors' did a flourishing business by boring holes in the trunks of elm trees and inserting some chemical which they claimed would dissolve in the sap and be carried to the leaves and keep the trees free from the elm leaf beetle. The price was seventy-five cents per tree. It was easy money and many property owners 'fell for it.' Needless to state, no benefit followed, and when the Station staff removed some of the material seven years later, none had dissolved. A chemical examination showed it to be powdered sulphur and some kind of grease, two substances as nearly insoluble in the sap as could easily be found."

Such transient work damaged the business of those men and firms who had established a reputation for intelligence and square dealing, and they applied for legislation to examine and license qualified workers. Thus was formed the Tree Protective Examining Board (TPX) in 1919.

The Station entomologist, pathologist, and forester were on the Board. In 3 years they examined 65 candidates. After 5 years 80 licensees were practicing under this pioneer consumer protection project.

The TPX has not been an expensive burden on taxpayers. In 1922 its budget was $285. With the addition of two appointees by the Governor, the TPX continues its good work today. The budget has doubled to $500, and, lest you think them wasteful, I can tell you that the numbers of annual examinations is six-fold.

In 1922 the Connecticut Tree Protective Association (TPA), a voluntary body interested in the improvement of shade and ornamental trees, was organized, with the Station forester W.O. Filley as secretary-treasurer, an office he held for several years. In the 50's and 60's, Station pathologist Albert Dimond was especially active in the TPA.

In 1924 the first meeting of what was to become the National Shade Tree Conference and later the International Society of Arboriculture was held in Stamford with the redoubtable entomologist Britton as president and the Station forester Filley as secretary-treasurer. Filley continued as secretary-treasurer until 1928 when he was succeeded for one year by the Station pathologist. Thirty-six people attended the 1924 conference. Since that first meeting the organization has become national and then international in scope. The connection between the early interest in trees of the Connecticut Station staff and the formation of the International Conference seems obvious.

You shouldn't think that the Station staff researched, wrote, and founded organizations 24 hours a day. Bulletin 256 of the Station reports that on July 26 and 27, 1923, scientists of the northeastern states met in New Haven. They visited landscaped sites at Yale and examined experiments in spraying and dusting. Here I quote: "Following the luncheon at Hammonasset there was a baseball game (Worthley, umpire); some of the attendees went bathing while other collected insects along the beach. On the second day they visited a greenhouse and 'viewed the gigantic elm tree in Wethersfield.' After supper, guess what! There was a baseball game (Burgess, umpire)."

I have examined the names on the staff of the Station in 1923. Neither Umpire Worthley nor Umpire Burgess were Station men. Clearly the Station could be trusted to examine arborists, but for the really important work of umpiring a ball game the Station could not be trusted.

Returning from baseball, Station scientists have worked on arboriculture for another half century. About 15 years ago the Lockwood Conference on the Suburban Forest sparked a series of investigations on the environmental influences of trees. Director William Slate told me that people had an *un*natural affection for dogs and trees, and we wanted to learn the physical foundation for the affection for trees. (We left dogs for someone else.)

In Connecticut, we learned how the shade of trees changed the energy budget of people. Compared to thickets, parking lots, and even sandy beaches, the shade tree air-conditions wonderfully, and now we know exactly how many calories or BTU's. We have also measured the intake of smog by foliage and the purification of the air you breathe. The muffling of noise by foliage, and the quality of different sorts of trees was carefully measured, and the principles discovered. This year we have examined how the appearance of foliage affects our psyches and our perception of noise. We are also studying the way trees filter out poisonous lead particles from auto exhaust and allergenic pollen from ragweed as they travel on the wind.

But the pests that defoliate and destroy our shade trees are the perennial problem. The three great pests that have come to our suburban forest are the fungus that causes chestnut blight, the fungus that causes Dutch elm disease, and the insect called gypsy moth. Other pests nave nibbled away or even burst forth and declined, but the two great fungal pests have nearly eliminated two valuable trees that we still lament. We are missing the woodwork, poles and nuts of the chestnut and the cathedral shade of the elm. The gypsy moth has likely only ebbed in 1975 as it has before, waiting to break forth again. These three pests were unforeseen when Brewer lectured on woodlands in 1876, and yet they appeared in Connecticut within the next generations, changing the suburban forest more than all

the selections and introductions of species that concerned Brewer that night in Middletown 99 years ago. The three pests have rightly occupied much of the Station's attention, and they occupy arborists.

When the gypsy moth appeared in Connecticut in 1906, Britton was ready. Although he and his colleagues waged war on the gypsy moth for four decades, the moth was still here in 1945, and Britton's successor, Roger Friend, concluded in both defeat and hope, "The gypsy moth in Connecticut has attained the status of a native insect pest with natural factors of control."

Friend's hope of natural control was dashed. Severe outbreaks occurred in 1957 and 1961-1964. Then in 1972 the gypsy moth, aided by the elm spanworm, ate the foliage from a record acreage of our suburban forest.

At the darkest time, however, there was a glimmer. A parasitic wasp eradicated the elm spanworm as if by magic, and the mystery and fear of unknown numbers of oaks dying in the train of the defoliators was recently allayed when Station scientists learned that it takes a borer to give the coup de grace. Learning to grow the gypsy moth in confinement at the Station smoothed the way for studying parasites, and knowledge grows.

Meantime a glimmer has also appeared in the darkness of the two fungal diseases. After decades of faithful labor to prove that chemotherapy of plant disease was at least a possibility, chemotherapy even seems probable now for Dutch elm disease.

This summer a Connecticut arborist loaned a "cherry picker" for Station scientists to observe the movement of a chemotherapeutant to the tops of elms on the Trinity campus in Hartford. Fortunately, the chemical moved further than the grease and sulfur put in elms in 1890 and excoriated in the first report of the TPX.

The best beginning for the Station's new century is, however, a discovery that may make Brewer's 1876 prophecy come true. He said, "The chestnut will some day become more popular than now." Last year Station scientists found that a non-pathogenic strain of the blight fungus could stop the pathogenic fungus. Now cankers in the forests of Hamden, Connecticut are healing because that non-pathogenic fungus has been inserted into the canker.

As the second century of American agricultural experiment stations dawns, so too dawns hope for solving the problems of trees that have perplexed the Station and vexed arborists.

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TASKS ESSENTIAL FOR A TREE SERVICE WORKER

by Paul H. Waddy, Edgar P. Yoder and J. David McCracken

Occupational information is needed to develop and revise vocational and technical education curricula. Teachers and curriculum developers generally determine which skills might be taught in a program based upon teacher expertise, advisory committee input, informal and formal community surveys, and/or task inventories.

The Agricultural Education Department at The Ohio State University has utilized and revised a system for obtaining and using occupational information as an effective aid in planning, improving, and updating occupational education curricula. This report presents the results of a survey of the occupation, tree service worker. The information contained herein may be used by curriculum development specialists, teachers, local and state administrators, and others involved in planning and conducting vocational and technical programs in agriculture.

The major purpose of the occupational survey was to identify the skills which are performed and essential for success as a tree service worker. The specific objectives of this survey were as follows:

1. Develop and validate an initial task inventory for the tree service worker.