

Scientific Investigation: A History of the New York State Agricultural Experiment Station

The Agricultural Experiment Station is a mystery to Genevans and visitors alike. Located away from the lake and downtown, in the northwest corner of the city, it is easy to miss. College-type buildings give few clues about the work. There are surrounding orchards and fields with electric fences and “No Trespassing” signs. What happens at the Experiment Station?

“The Station” was established in 1880 to promote “agriculture in its various branches by scientific investigation and experimentation.” The nature of investigation has changed over 130 years, but scientists still address the same questions of increased production, food safety, and developing healthy food that people want to eat.



The Station has 20 major buildings, 870 acres of orchards and fields, and over 300 faculty, staff, and students who are pursuing masters and doctoral degrees. The staff include many local residents who tend plants, carry out testing, and record data.

Summer Research Scholar Anjali Merchant in the field, 2012. Each year, the Geneva Summer Research Scholars program attracts undergraduates from universities around the United States to work on research projects in NYSAES labs, greenhouses, and fields.



Since 1923, the Experiment Station has been part of Cornell University’s College of Agriculture and Life Science. Currently there are four departments in Geneva: Horticulture, Entomology (insects), Plant Pathology and Plant-Microbe Biology (plant disease), and Food Science.

Other units include:

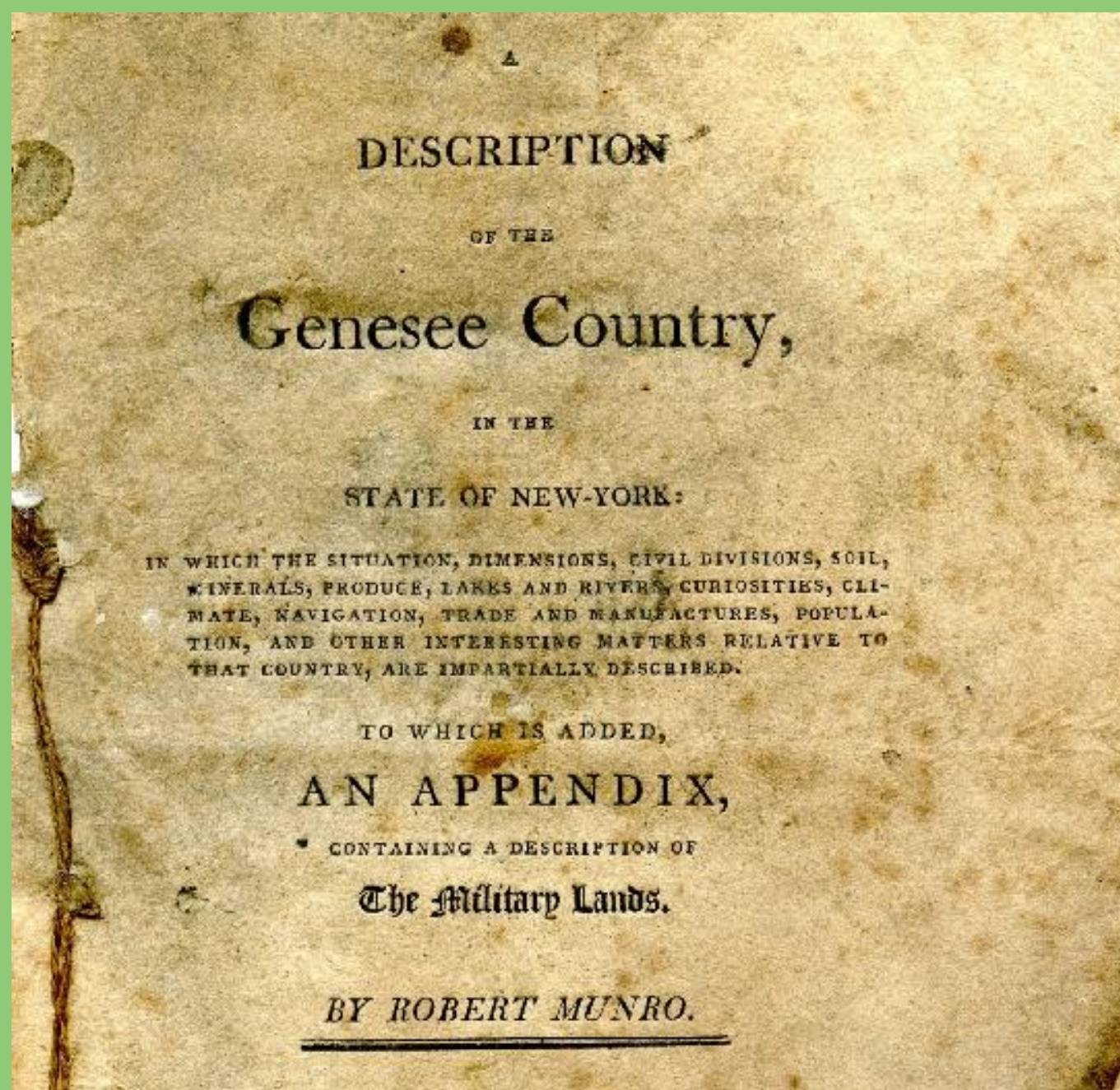
- New York State Integrated Pest Management
- USDA Grape Genetic Research Unit
- USDA Plant Genetic Resources Unit
- New York State Seed Laboratory
- New York Wine Analysis Lab
- Northeast Center for Food Entrepreneurship (NECFE)
- Cornell Ag & Food Tech Park
- Fruit & Vegetable Processing Pilot Plant; and
- Vinification & Brewing Laboratory.

Associate professor of plant pathology and plant-microbe biology Marc Fuchs examines leaves for symptoms of viral infection.



Working the Land: 18th & Early 19th Century Farming in New York State

In 18th and early 19th-century America, farming was unsophisticated. Oxen were used for most tasks, planting and harvesting were done by hand, and the soil was given little attention. Land would be allowed to lay fallow (rest) between crops but manure or other fertilizers were not used to restore the soil. Thomas Jefferson said, “We can buy an acre of new land cheaper than we can manure an old one.” New land was valued primarily for its ability to grow crops with little improvement.



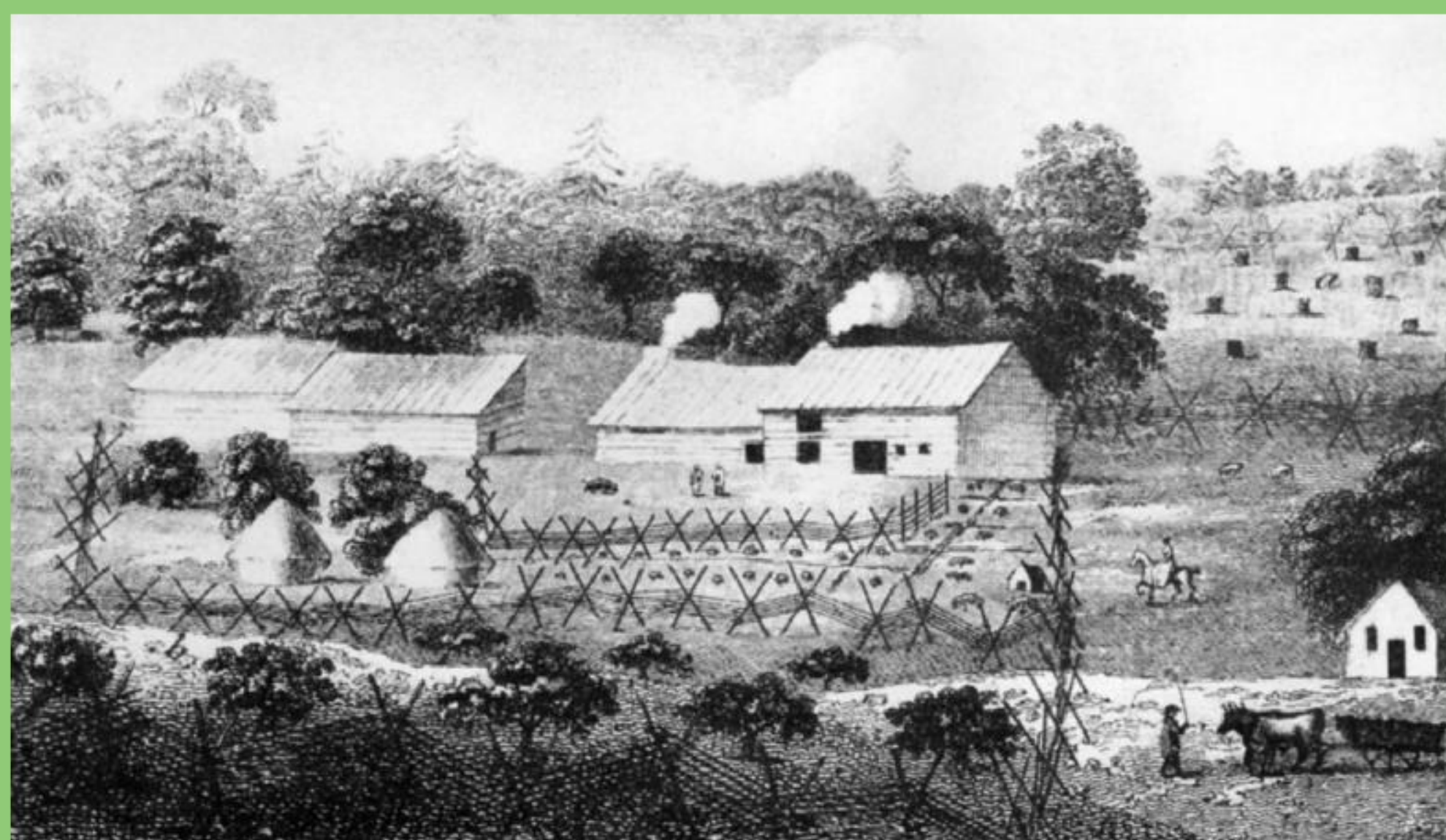
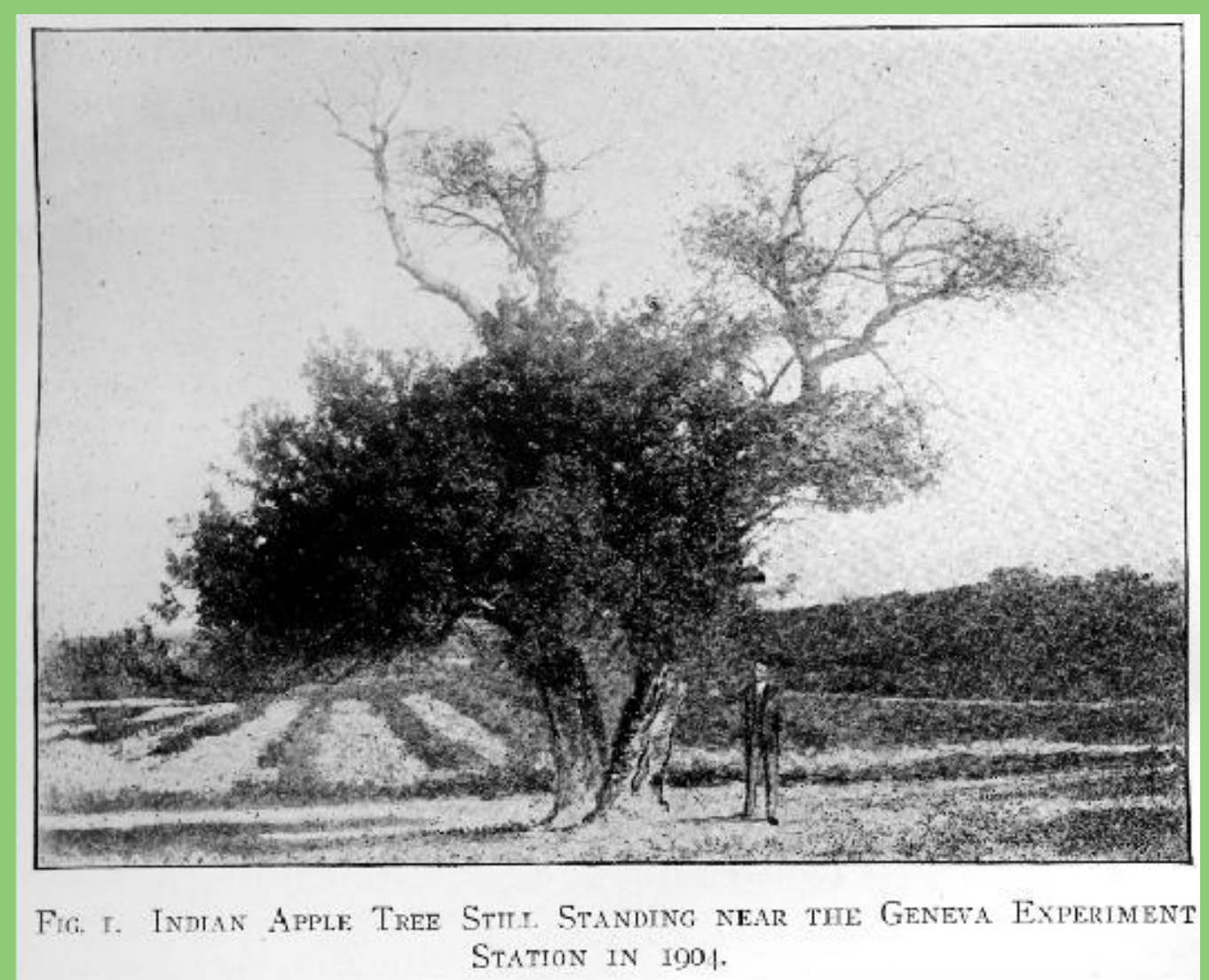
This 1804 pamphlet advertised the rich soil of the Genesee Country, from Seneca Lake westward to the Genesee River. It was written to attract farmers, many from areas with poor soil, to buy land.

“Grain is frequently put into the ground without ploughing, the ground only being broke with a heavy harrow, and often yields, with this cultivation, upwards of twenty bushels of wheat from an acre....[The land] is uncommonly favourable for wheat...from twenty to twenty-five bushels are usually raised on an acre...and the grain is generally large and of a good quality.”

It went on to describe the good harvests of everything from flax to turnips. The author basically promised a better life with less effort.

Apples were brought to America by European settlers. They grew very well in this region; by the early 1700s, Native Americans had large orchards on both sides of Seneca Lake. In 1779, General Sullivan’s troops cut and burned the trees but new growth appeared several years later. The tree shown right was supposedly one of those surviving trees.

Apples were plentiful but wild, and quality varied from tree to tree. Grafting—splicing a bud from a desirable variety onto another tree to control what fruit will grow—was known but not practiced by the early settlers.



In 1821 Scottish immigrant John Johnston purchased a farm on the east side of Seneca Lake. Though his neighbors said the soil was poor, Johnston noticed years of manure in piles and hired a man to spread it on the fields. His first crop of barley failed but the next year’s wheat crop was successful. Johnston then spread bushels of lime (calcium carbonate) on his fields to add minerals to the soil, and his yields increased.

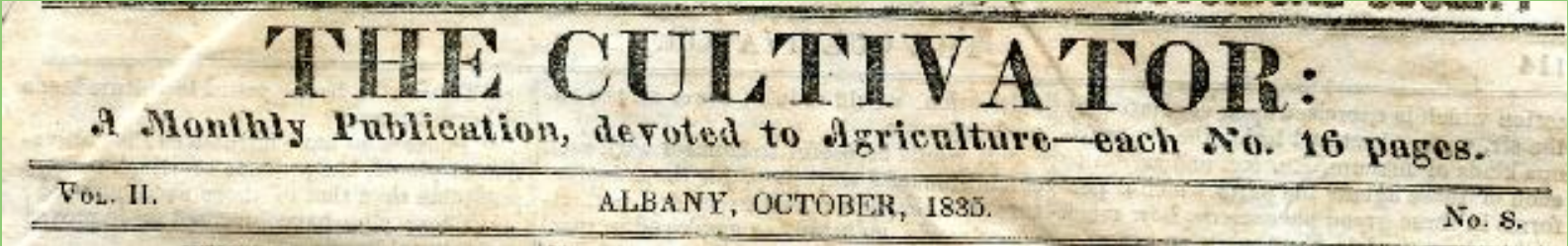
Practical Farming v. Book Farming

Many farmers clung to traditional farming methods for economic reasons. With small profit margins from their crops, trying new ideas could mean financial ruin if the crops failed. Critics called them “practical farmers” who were too lazy to improve themselves.

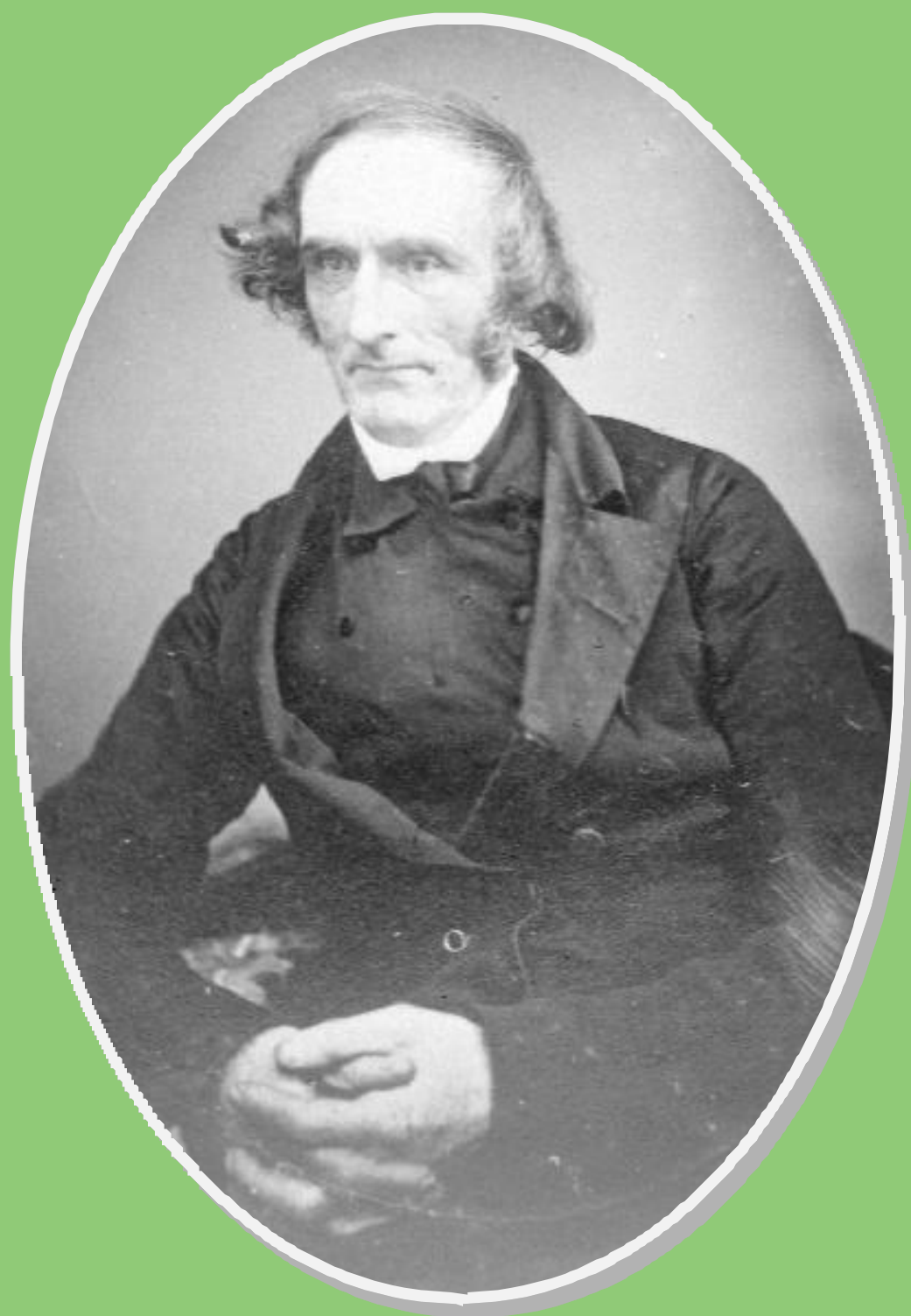
Wealthy gentlemen began experiments on their farms to test and promote new methods. Practical farmers called them “book farmers” as their ideas were untested in the real world, and they did not need to depend on crops for their survival. In the early 1800s, to share results and encourage experimentation, “book farmers” created agricultural societies and began publishing farming newspapers.

Organized in 1791, the Society for the Promotion of Agriculture, Arts and Manufactures was the first farm society in New York. Founding members included a signer to the Declaration of Independence, current and future governors, judges, and wealthy landowners.

In 1832, the New York State Agricultural Society was created and still exists today. The Society began publishing *The Cultivator* in 1834, three years after *The Genesee Farmer* had begun.

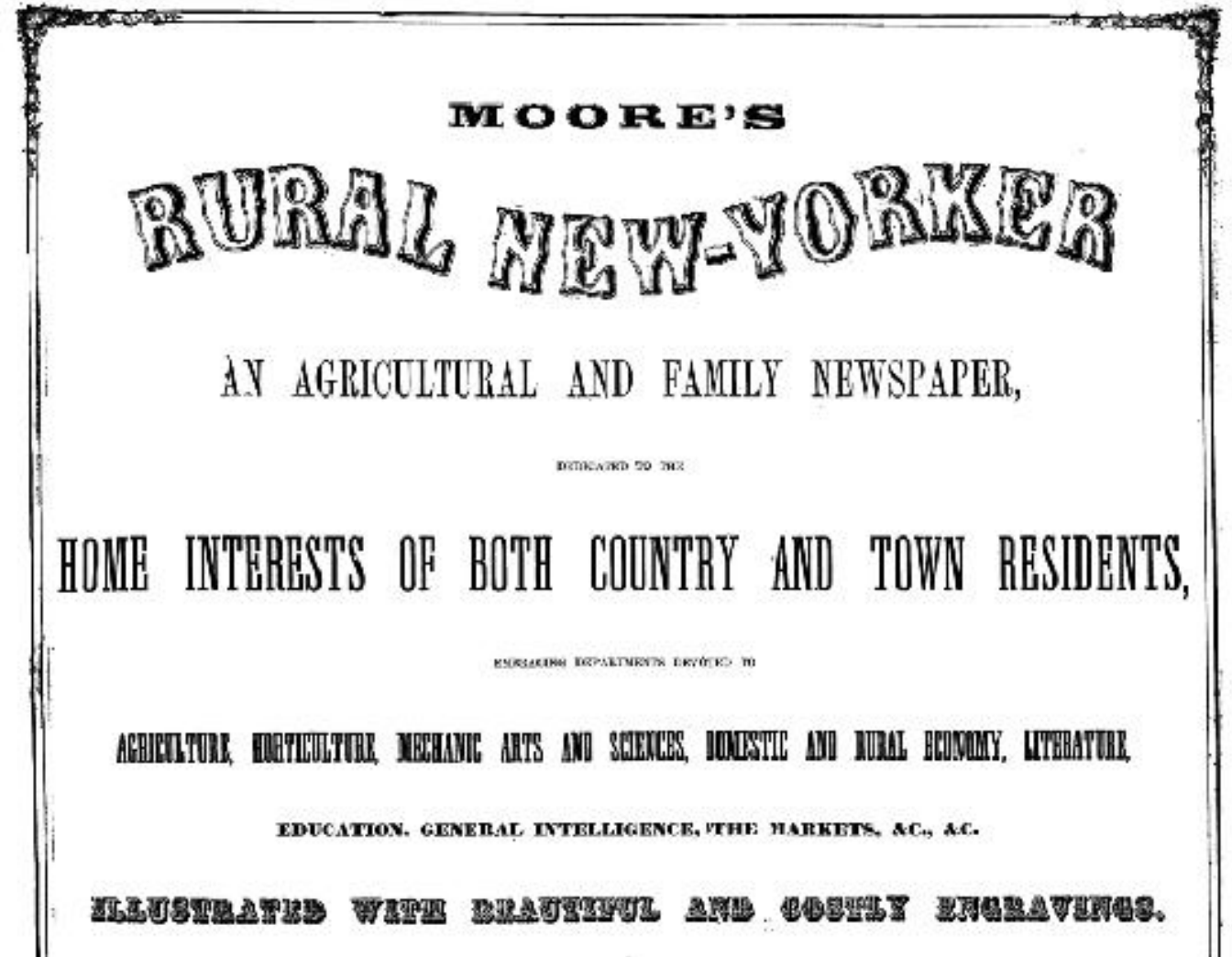
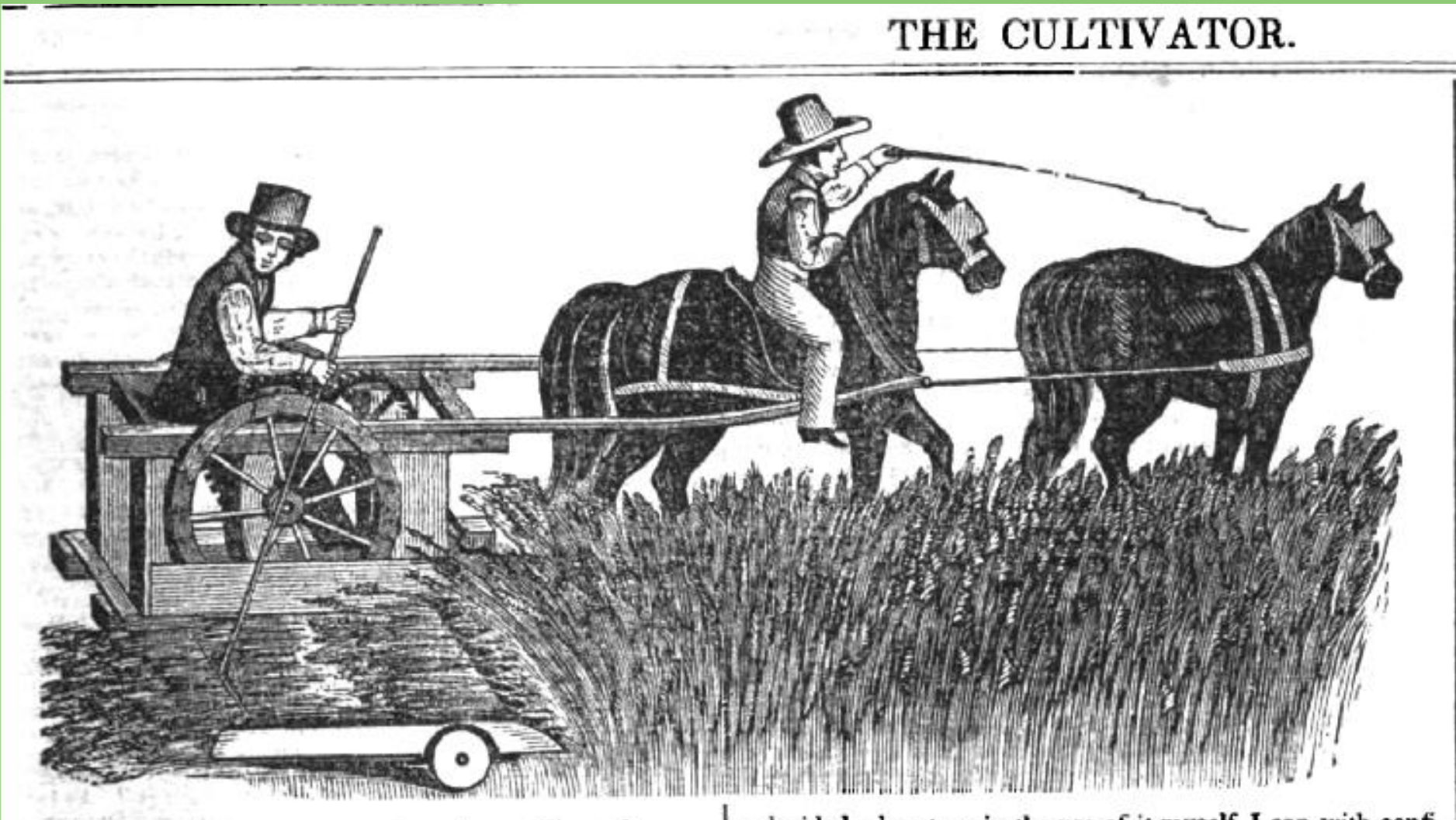


Farmers were skeptical of early agricultural journals as voices of “book farming.” In the 1830s, promoters claimed that any farmer, rich or poor, could plant mulberry trees and raise silk worms (they feed on mulberry leaves). In a few years the United States would be producing and exporting silk. The agricultural journals ran articles, letters, and advertisements for starting a silk worm empire. Raising silk worms was unsuccessful; by the end of the decade, people lost their investment. This was seen as an example of the agricultural press misleading farmers.



John Johnston bridged the gap between practical and book farmers by documenting his experiments and publicizing the results. He was widely mocked for using underground drain tiles to remove water from the heavy clay soil in his fields. Yet, farmers took notice of his increased yields and other advantages, and respected the fact that he was not a gentleman farmer.

By the 1860s, both “practical farmers” and agricultural newspapers were seen as symbols of progress. More farmers used new techniques and equipment, and shared their experiences in the newspapers. “Book farming” was still applied to those who did not work the fields for their living. John Johnston once wrote, “I am aware that both science and theory will scoff at some of these assertions...I must write what I believe I have proved beyond any doubt in my own mind.”



Creation of the Experiment Station: 1880

In 1877 Connecticut became the first state to establish an agricultural experiment station. When similar bills failed to pass the New York legislature, the Department of Agriculture at Cornell University established their own experiment station in 1879. It, however, did not receive funding or recognition from the University.

On June 26, 1880, the New York Agricultural Experiment Station was authorized. Supervised by a Board of Control, a search committee considered three locations: Spencerport, Palmyra, and Geneva. There was speculation that Geneva was chosen because it was near Rose Hill, the home of Robert Swan, who was president of the State Agricultural Society.

Creation of the Experiment Station had broad support from agricultural scientists and societies. The Board of Control was comprised of one representative from each of the following groups: The State Agricultural Society, the State Grange, the American Institute Farmers' Club, the Central New York Farmers Club, the Western New York Farmers' Club, the Elmira Farmers' Club, and the Western New York Horticultural Society.



In 1848, Robert Swan, the son of a wealthy New York City merchant, apprenticed with John Johnston to learn how to farm. When Robert married John's daughter Margaret in 1850, the elder Swans purchased Rose Hill Farm as a wedding present.

Swan followed the practical methods he learned from Johnston—lime, manure, and tile drainage—and was a successful farmer. In 1853, Robert was awarded a silver cup by the New York State Agricultural Society for Best Drainage. He won the Society's Premium for Best Wheat Farm in the State in 1858.

Beyond winning its awards, Swan was active in the New York State Agricultural Society. He was president in 1881 as the Experiment Station was being established.



Residence of Nehemiah Denton

Opened in 1882, the Station was the fourth State Station to be authorized and the sixth to become operational. The Board of Control purchased the Nehemiah Denton farm to the northwest of the village. It had one large Italianate house and 130 acres of land.

Laying the Foundation: The Station's Early Years 1882 – 1900

“The field for agricultural (research) is very extensive. There is room in it for pure science; and there is also abundant room for the science that applies to practical affairs. This Station, however, was organized in the interests of the latter rather than of the former...”

- E. Lewis Sturtevant, first director

Farmers had long pondered the best practices for raising crops and animals, and combatting insects and diseases. The Station's objectives were to apply scientific principles to these issues, verify results, and share the information.

Opened in 1882 on North Street, the Station had one building and five staff members. Early research focused on vegetables and field crops; dairy cows, beef cattle, poultry, and swine; and identifying and combating insects and plant diseases. Fruit research was begun but trees required more time to develop and begin producing. By 1900 there were nine separate divisions of study: Entomology, Bacteriology, Biochemistry, Chemistry, Agronomy, Animal Husbandry (Poultry), Dairying, Botany (Plant Pathology), and Horticulture.



In 1886, the staff, in addition to the director (E. Lewis Sturtevant, seated right), consisted of two chemists, two horticulturists, a botanist, an assistant, a stenographer, and a farmer. Botanist J.C. Arthur (standing left) was an early plant pathologist; he could identify the organisms involved and develop means of controlling them.

The early directors focused on research that would benefit the most farmers in the state. They expanded the staff and facilities. The Chemistry building (below left) was followed by the Biology and Dairy building (later named Sturtevant Hall).

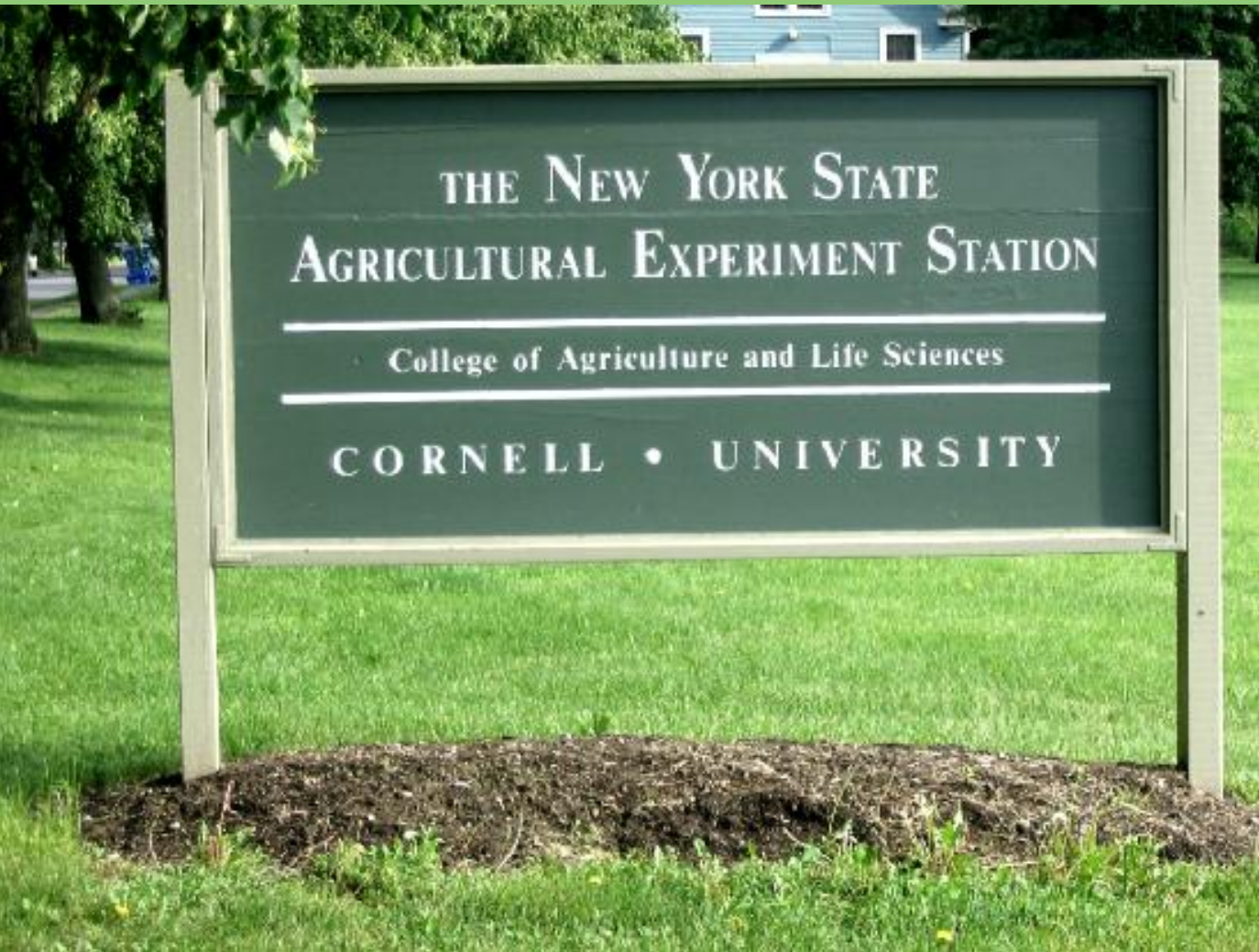
Product testing was an important part of most state stations, to ensure that manufacturers were not making false claims. By 1900, the Geneva Station was testing fertilizer, insecticides, and concentrated animal feed.



The Times They Are A-Changing: The Station During the 20th Century

Station directors faced challenges getting state funds to expand facilities and hire more staff, particularly during the Depression and World War II. In 1923, the Station was placed under the control of Cornell University College of Agriculture Life Sciences. Researchers were granted professor titles in 1941.

World War II created demands for increased food production and improved methods for preserving and storing food. The Station began focusing on food science and consumer needs, in addition to the needs of farmers. The results of this research created new uses and markets for farm crops, helping to grow New York’s agricultural economy.



From the beginning, Cornell University and the State Experiment Station had a prickly relationship. Only 50 miles apart, the Cornell Experiment Station and Geneva competed for allocations of federal and state research money, creating political battles and hard feelings between two similar groups. Relations between the two depended heavily on the Geneva director’s attitude toward Cornell, whether it was cordial or combative.



During World War II, the Station experimented with dehydration to aid in sending food to troops. Robert Thomas is shown putting bricks of carrots - one bushel to a brick - in Marion Davis' purse.

Outgoing director Percival Parrott, left, with Cornell Dean Ladd and incoming director Arthur Heinicke, right, in 1942. Parrott was an entomologist at the Station for 35 years before becoming director. The Denton house was named Parrott Hall in his honor.



Today, we take canned, frozen, and microwaveable food for granted. We expect the food to taste good, have most of the vitamins and nutrients of the fresh product, and to not carry botulism, mold or salmonella. Scientists at the Food Research Laboratory have spent decades making this happen. The departments of Bacteriology and Chemistry were merged to form the new Food Science department in 1945.

The Station has always been committed to “the science that applies to practical affairs.” Manufacturers, particularly small entrepreneurs, can get assistance from faculty and staff. In the processing pilot plant, they can produce small batches of new products, from mustard to jam to wine and beer, before putting them on the market. This ensures food safety as well as helping to expand the state’s economy.



Fruit and Veggie Tales: Fruits and Vegetables Developed at The Station

From the beginning, breeding vegetables and fruits has been central to the Station's mission. The goal is to introduce desirable traits – flavor, color, size, resistance to disease or insects – from two or more parents into a new plant. Common criteria for vegetable breeding is creating plants suitable for New York's climate and soil conditions, while meeting the expectations of canners, freezers, and consumers.

The Experiment Station has created hundreds of varieties of fruits and vegetables. Some, like Empire and Cortland apples, are very well known to us; others, like a virus-resistant bean, may be in our freezer and we never realize it.



Mary Lou Dumbleton with Asian squash and melons grown at the Station in 1955 to test seeds for suitability to this country.



Professor C.B. Sayre, left, shows a new variety of tomato to two agricultural scientists from Yugoslavia.

Karl Brase, pomologist, with a Rhode Island Greening apple tree that was grafted to dwarfing root stock. Smaller trees are more convenient for picking and spraying. Once thought to have no commercial value, today dwarf trees are the norm.



Horticulture professor and apple breeder Susan Brown and research support specialist Kevin Maloney with apple blossoms ready for pollination.



Plant breeding is a combination of all the disciplines found at the Station. Genetics helps determine a new plant's resistance to insects (entomology) and diseases (pathology). Cultivation and growing is determined by horticulture and scientists who specialize in certain fruits and vegetables. Food science is important if a crop is being developed specifically for processing. Finally, producers and consumers are considered. Can farmers efficiently grow and market a new variety, and will consumers buy it?

Over 250 fruit varieties have been bred at the Station. The best-known apples are Cortland, Empire, Jonagold, Jonamac, and Macoun. Other fruits include grapes, berries, cherries, pears, and plums.

Hi-Dri cabbage for sauerkraut, virus-resistant lettuce, virus-resistant beans, and the Red Top tomato are just some of the vegetable varieties developed at the Station.



Associate professor of horticulture Courtney Weber with new raspberries 'Double Gold' and 'Crimson Night'. They were bred to grow in cold climates and be disease-resistant, but their flavor and different colors are selling points at farm stands and markets.

A Plague on Both Your Houses: Battling Diseases and Insects

“The work of the fruit grower and gardener is becoming more and more a warfare with insects and diseases. To discover the cause of these evils and to devise practicable remedies for them is a broad field for the Experimental Horticulturist.”

- Emmett Goff, Station horticulturist, 1882

Late blight, apple scab, and red-banded leafrollers do not capture the average American’s attention. However, these and other diseases and insects cause millions of dollars of damage to potatoes, tomatoes, and apples. J.C. Arthur, the Station’s first botanist in 1884 and one of the first plant pathologists, recognized the importance of controlling pests and diseases, rather than simply identifying them.

Chemical treatments became the common remedy for diseases and insects. *Silent Spring*, Rachel Carson’s 1962 book on the environmental impact of pesticides, ushered in the concept of integrated pest management (IPM). A n IPM Support Group was created in 1980.



Vic Hopkins uses a spray gun, circa 1950.



The Barton Laboratory for Entomology and Plant Pathology was complete in 1968.

Plant pathologists identify diseases or conditions that affect certain plants, then study and interrupt the transmission of the disease. Once a treatment is found, they test to see if the disease develops a resistance to it. Pathologists also work closely with plant breeders to identify varieties of plants that are naturally resistant to certain diseases, and use them to make new varieties.

Station entomologists study insects, how they affect plants (for good as well as ill), and how to treat them. As early as the 1920s, they were researching the most effective times to spray for certain insects with the least residual chemical on the produce. In the 1930s, the Oriental fruit moth was effectively treated by using a parasite that was its natural enemy. The Station was practicing integrated pest management decades before it became an accepted term.



The Station’s IPM research extends far beyond commercial agriculture to schools, nursing homes, hotels (combating recent bedbug infestations), parks and golf courses, and even Christmas tree farms.

Associate professor of plant pathology and plant-microbe biology Christine Smart with seedlings destined for research on improving management strategies for vegetable diseases.

Fruit of the Vine: Grapes and Wine

Even though it was not a department until 1960, viticulture research began at the Station in the early 1900s. Additionally, in 1909 a sub-station was established near Fredonia, NY for grape research. Research into winemaking (enology) began in 1964 and a degree program in enology was established at Cornell in the 1990s. Most of the 56 varieties bred in Geneva have been for the table or juice market. Eleven wine grapes have been developed, from Cayuga White in 1972, to Aromella and Arandell in 2013.



Nelson Shaulis, left, and John Einset, 1951. Nelson Shaulis, active from 1944 to 1979, did important grape research and development. Growers were hampered by low yields and high costs. Shaulis led research which included development of the Geneva “double curtain” trellis and a mechanical grape harvester. Einset, a noted fruit breeder and cytologist (study of cells), collaborated on the Cayuga White wine grape as well as six apples including Empire.



Dr. A.B. Stout (NY Botanical Gardens), Professor Richard Wellington, and Dr. Arthur Heinicke, Station Director, inspect unnamed seedless grapes bred at the Station.



Senior extension associate Tim Martinson examines unripe berries in a research vineyard at the Station.

Plant breeding takes years to produce fruit and see if it will be commercially successful. Wine grapes have the extra step of testing with winemakers. The fruit seems good, but will it make good wine? New varieties are given to winemakers who experiment with different techniques and share their results. This information helps determine if a grape will be released and how it will be marketed.

The Grape Genetic Research Unit researches to improve crop yields and protect against loss from insects and disease. Like Food Science, the research unit utilizes scientists from multiple disciplines.

The NYS Wine Analytical Laboratory operates within the Food Science department and provides analytical services to all winemakers, from the home vintner to bonded wineries. Funding from the New York Wine and Grape Foundation allows New Yorkers to received these services at a discount.



A new facility in Portland, NY replaced the Fredonia substation; its primary focus is on juice grapes with some work on wine grapes.

The Station Today

Over the last 130 years, the importance of agriculture to New York’s economy has only increased. More production is demanded of fewer farmers and less land. Commercial farming is only part of the equation, as the Station now serves the needs of the home gardener, wineries, craft brewers, cheese makers, and agricultural innovators. E. Lewis Sturtevant, the Station’s first director in 1882, would not recognize much of today’s equipment but would approve of the investigations that are still applying science to practical affairs.



With about 25% of New York State land used for farming, agriculture generates over \$4 billion a year in income. The Station’s research on diseases and insects that threaten crops are critical to the state’s economy and the national food supply. Nationally, New York’s production ranks very high in categories from apples, grapes, and cabbage (left, #2 in the nation) to cauliflower and maple syrup.

The “Ag Tech Park” was created in 2005 as a research and development space for new enterprises. Tenants, and their work, include:

- Top Quality Hay Processors developed a patented method of drying hay in less than four hours, preserving nutrients that are lost in field-drying.
- Stony Brook WholeHearted Foods produces five oils made from varietal squash seeds, formerly considered waste product by farmers who grew and processed the squash.
- Cherrypharm, Inc. makes and bottles cheribundi™, a tart cherry juice rich in nutrients and antioxidants.



Staff load apples into a processing machine at the Fruit & Vegetable Processing Pilot Plant.



Betsy Bihn, a senior extension associate in food science, speaks about food safety on the farm. Preventing transmission of bacteria such as *e. coli* begins with good agricultural practices.