

# Roots of Research: Raphael Zon and the Origins of Forest Experiment Stations

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**Abstract**—The 1908 founding of the first American forest experiment station in Fort Valley, Arizona was an event of considerable historical significance. The Fort Valley station was the linchpin of forester Raphael Zon's bold plan to create the first program of organized research in U.S. Forest Service history. It also represented the beginning of a fruitful marriage between German and American methods of forestry. This project traces the history of government-run experiment stations from its roots in Vienna, Austria, in the 1870s, through the work of German-American forester Bernhard Fernow and finally to Zon, Fernow's student. The process through which Zon successfully promoted forest experiment stations within the U.S. Forest Service, culminating in the creation of the Fort Valley station, is also discussed.

## Introduction

Nearly six thousand miles of land and sea separate Vienna, Austria, and Fort Valley, Arizona, yet the two locales jointly played a leading role in the development and implementation of an important concept in forest research and management. The idea of forest experiment stations—government-run facilities charged with scientifically improving tree planting and growing procedures—was spawned in Vienna just after the American Civil War. Imported to the United States through the ideas of German-American forest scientist Bernhard Fernow, experiment stations became the centerpiece of outspoken forester Raphael Zon's bold plan to institutionalize scientific investigation in the U.S. Forest Service—a quest that achieved its unlikely fruition in the northern Arizona wilderness.

## European Origins

In 1868, a group of German foresters and soil scientists at a Vienna convention, concerned with their country's lack of any comprehensive plan of forest research, appointed a five-member committee of experts to explore the best methods for enacting such an organized system (Heske 1938). The result was a network of government-operated forest experiment stations, associated with schools of forestry and staffed by professors. The first two stations were established in 1870 in Baden and Saxony; within two years, six more outposts were in operation throughout Germany, and a Union of German

Forest Experiment Stations was set up to standardize and codify experiments conducted at the various locations. This German Union created so much useful data that in 1892 an international forest research association was formed in Eberswalde, Germany, along similar lines. Both organizations were still operating in 1938 and may have continued to do so after World War II.

When German forester Bernhard Fernow immigrated to the United States in 1876, he brought with him a fervent belief in the forestry practices of his homeland, including the efficacy of experiment stations (Miller 2007, Rodgers 1951). Fernow's 1886 appointment to head the U.S. Division of Forestry put him in a position to act on these views. Under Fernow, the Division created temporary planting stations in Minnesota and Pennsylvania and worked closely with the leaders of state-run experiment stations in nine states, the first of which were chartered in California in 1887 at the urging of state forest commissioner Abbot Kinney (Rodgers 1951). These state-run experiment stations were productive, but their scope was limited by their inability to study phenomena across state lines. To rectify this problem, Fernow began initiating federally funded research projects, most notably the "Bruner plantation" in Holt County, Nebraska. Suggested to Fernow in 1891 by University of Nebraska forestry professor Charles Edwin Bessey, whose students would later include Fort Valley Experiment Station director G. A. Pearson, the "Bruner plantation" was essentially a prototype federal experiment station, with a multi-year program of tree planting organized and managed by Division of Forestry directive. The "Bruner plantation" differed from the German and later American forest experiment stations, however, in the fact that ownership of the facility was retained and day-to-day labor performed by Hudson Bruner, a private

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citizen, instead of by the government. Similar collaborative efforts would continue in later years, but they would largely be eclipsed in importance by the federal system of experiment stations.

Before he was able to make any further progress in encouraging scientific research, Fernow left the Division of Forestry in 1898 to direct the new degree-granting forestry school at Cornell University. The forestry curriculum he established was based on “the most advanced German ideas in forestry education” (Miller 2007). Fernow and his fellow German-born forestry instructor, Filibert Roth, “emphasized economics and the long-term profitability of forestry over silviculture,” but they also taught their students that more scientific data was needed in order to achieve these goals (Lewis 2000). One of their first students at Cornell was Raphael Zon, who would soon become the most vocal advocate of scientific forestry in America. A cantankerous Russian immigrant who had come to the United States to avoid a ten-year prison sentence for labor organizing, Zon quickly gravitated toward forestry as an outlet for his prodigious creative talents (Miller 2007, Schmalz 1980), and at Cornell he devoured and then mastered the curriculum with a will (Lewis 2000).

## Zon’s Crusade

After securing employment in 1901 under new Forester Gifford Pinchot, Zon became convinced that the German methods of forest science advocated by Fernow were being improperly utilized by the Bureau of Forestry. Zon’s blunt and argumentative manner—even his friends admitted that “his ability to criticize searchingly” was “sometimes a bit overwhelming”—led him to act forcefully on this concern (Richards 1926). In a 1904 memorandum to Pinchot he painted a dire picture of the state of forest research. “The need for silvical data upon which one can rely in making his practical recommendations,” he wrote with characteristic zeal, “is felt by every member of the Bureau. . . .” The solution, Zon believed, was a Section of Silvics with wide administrative independence that would serve as “the source of information for all field men regarding the silvical data on hand.” A silviculture department was in fact created in 1906, with Zon placed in charge the following year, but the restless forester was already thinking along new lines. It was not enough simply to organize whatever data the Forest Service (as the Bureau was renamed in 1905) happened to produce, wrote Zon and Treadwell Cleveland, Jr., in a 1906 memorandum; the “desultory scientific efforts of the Forest Service” were unlikely to produce much useful research anyway. Nor were state-run or locally-administered experiment stations, such as the Bruner plantation or Kinney’s projects in California, adequate for solving forestry problems of a national scope, though Zon later wrote that “there should always...be the closest possible cooperation” between the Forest Service and these groups (Zon 1920). Instead, he urged, the money being spent on haphazard studies



**Figure 1.** Raphael Zon, seen here in 1926, was the most important advocate of scientific forestry in the early Forest Service. Photograph courtesy of the Forest History Society, Durham, NC.

should be “diverted into one channel and spent for carrying on a series of systematic, well-thought-out investigations under one head” (Zon and Cleveland 1906).

Zon’s knowledge of German forestry suggested a proven method for conducting this research: forest experiment stations. Though he would not observe a German experiment station until the end of 1908 (Rodgers 1951), Zon saw at once how to modify the European system for American use. While the Germans, working within a smaller land area, had placed stations in nearly every state, the Forest Service need build only one for each administrative region, selecting a “typical reserve where the desired experiments may be carried on, and the results applied to the whole region” (Zon and Cleveland 1906). And where German stations were staffed by forestry professors, a troublesome proposition in the largely remote American forest reserves, the United States could make do with “the best m[e]n the Forest Service can afford to get within its ranks. . . .”

Zon’s reasoning was convincing to Gifford Pinchot, who scrawled his assent on his copy of the Zon-Cleveland memorandum: “I have read this with great interest – Pls let me see the detailed plan.” In May 1908, Zon produced this proposal, titled “Plan for Forest Experiment Stations.” “The purpose of such stations,” wrote Zon, “is to carry on... experiments and studies leading to a full and exact knowledge of American



**Figure 2.** German experimental plots, like this one at Colditz, were the inspiration for Zon’s program of American forest experiment stations. This photo, taken in 1935, shows an American delegation of foresters that includes Aldo Leopold (center, with binoculars). Photograph courtesy of the Forest History Society, Durham, NC.

silviculture, to the most economic utilization of the products of the forest, and to a fuller appreciation of the indirect benefits of the forest.” These stations, like their German counterparts, would be essentially permanent, allowing “for experiments requiring a number of years, and for the maintenance of model forests typical of the silvicultural region.” Zon also envisioned a broad public role for the experiment stations, which would “furnish the most valuable, instructive and convincing object lessons for the public in general” as well as much-needed technical data. Pinchot was delighted with the document: “I am for this, with some changes,” he wrote on the plan’s cover. In fact, he authorized the experiment stations so quickly that Zon was able to establish the first only three months later.

## The Prototype: Fort Valley

Zon and Pinchot decided to locate the inaugural Forest Service experiment station in the Southwest. Zon’s assistant, Samuel Trask Dana, canvassed the Arizona-New Mexico area in early 1908 to look for a suitable location (Olberding 2000). By May of that year, Zon had narrowed the choice to either the Coconino National Forest near Flagstaff or the



**Figure 3.** Bernhard Fernow, the first professional forester employed by the U.S. Government, was a mentor and teacher for Zon during his years at the Cornell School of Forestry. Photograph courtesy of the Forest History Society, Durham, NC.

Black Mesa Forest in eastern Arizona, with the final decision to be made “more on the question of accessibility than on any other point” (Zon 1908). At the time, Flagstaff was easily the more accessible of the two areas; the bustling lumber town was located on a major railroad and was home to what forester A. B. Recknagel recalled was “a wonderful group of bachelor [forester]s...” (Mauder 1958). The Flagstaff area was also recommended to Zon and Pinchot by Flagstaff lumbermen Timothy and Michael Riordan or by Coconino National Forest Supervisor Frank C. Pooler (Olberding 2000, Riordan 1903, Rodgers 1951).

The Coconino Experiment Station—renamed in 1911 the Fort Valley Experiment Station after the valley outside Flagstaff in which it was located—was the first of many. By 1915, when a separate Branch of Research was created in the Forest Service, Zon’s experiment station network had blossomed to include seven locations, and more were added in ensuing years. Yet Zon clearly viewed Fort Valley as the linchpin of his program of scientific forest investigation. He selected the exact location of the site himself in August 1908, announcing to two of his fellow foresters that he was “plant[ing] the tree of research” (Pearson 1936); later, he



**Figure 4.** A view of the Fort Valley Experimental Forest headquarters. USFS photo 449254 by G. A. Pearson in 1916.



**Figure 5.** Gustav Adolph "Gus" Pearson was the founding director of the Fort Valley Experiment Station and served there from 1908 until his retirement in 1944. USFS photo 223964 taken in 1927.

helped "shingle the roof and build the road in from the main route to the station" (Schmaltz 1980). In addition, according to a 1916 Forest Service inspection chart, Zon personally performed annual inspections of the Fort Valley station in seven of the following eight years, more often than at any other station; in 1915, he spent two entire weeks at Fort Valley, the longest amount of time he had spent at any of the stations.

## Experiment Stations Today

"Our goal," wrote Zon in 1917, "is to develop our knowledge of American silviculture so as to enable us to safeguard and perpetuate our forests for all the needs of our country." For Zon, as for the foresters in Vienna forty years earlier, forest experiment stations were not simply a research tool; they were a symbol of the importance of scientific inquiry in forest

administration. The same principle animates much of Forest Service work today. When experts at the Forest Service's Rocky Mountain Research Station in Flagstaff investigate how best to clear, thin, and care for the national forests, for instance, they invoke the same spirit of scientific management championed by Zon a hundred years in the past. Through the work of these professionals and many others, the "tree of research" that Zon planted a century ago has bloomed, and Flagstaff and Fort Valley continue to play a central role in protecting our forests for future generations.

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