

*As the early conservation movement was forming, the discipline of forest pathology in the United States was in its embryonic stage. Led by Hermann Von Schrenk the field aided the rational management of resources advocated by Pinchot. But Pinchot was too obsessed with the fear of industry-sponsored research and hampered forest pathology efforts that could serve the goals of conservation. One hundred years ago, Von Schrenk was hired as a Special Agent for USDA, and was destined to contribute significant research in wood preservation that would help the nation conserve its forest resources throughout the 20th century.*

# HERMAN VON SCHRENK:

## *THE BEGINNINGS OF FOREST PATHOLOGY IN THE U.S.*

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**A**t the turn of the twentieth century, forest pathology first appeared as a new specialty of plant pathology in the United States. It emerged primarily from the confluence of two sources: taxonomic mycology and the conservation movement. The rise of this specialty was personified by one

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individual, botanist and mycologist Hermann Von Schrenk. He virtually created forest pathology in the United States through his research on forest tree diseases and timber preservation for the U.S. Department of Agriculture (USDA).

Forest pathology began in Germany during the nineteenth century, primarily through the efforts of the Hartig family. In 1833, Theodore Hartig, forester and educator, published a report on the effects of mycelium in wood. Affected by the era's dominant biological theory of spontaneous generation, T. Hartig deduced that the fungi were the result rather than the cause of rotting wood. Nevertheless, the report served to illustrate the destructive nature of fungi. In the 1870s, Robert Hartig, son of Theodore, did foundational research on the etiology of tree diseases caused by fungi. Hartig established the basis of forest pathology through his textbooks and teaching.

In the United States, forest pathology developed more slowly than other aspects of plant pathology. This was due largely to

the fact that there was less interest in the health of trees than in the health of food and fiber crops. The great exceptions were orchard fruit trees which, unlike forest and ornamental trees, did attract a great deal of attention from the earliest days of plant disease studies because they were plagued by many destructive diseases such as fire blight and peach yellows. During the nineteenth century, the most notable American work on forest tree diseases came from William Farlow, the gifted Harvard mycologist, who had studied with Anton DeBary in Germany in the early 1870s and was likely aware of Hartig's work. After Farlow returned to the United States in 1879, he wrote "Diseases of Forest Trees." This paper was his single contribution to the field until 1891 when he wrote "Diseases of Trees Likely to Follow Mechanical Injuries." Farlow's work did not represent the full extent of American interests in tree diseases, but it did reflect the most scientifically advanced. It also showed an attachment to classical mycology at a time when the science of plant pathology was

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**BY PAUL D. PETERSON AND CLAY S. GRIFFITH**



Through his research on forest trees diseases and timber preservation for the United States Department of Agriculture, Hermann von Schrenk was instrumental in establishing forest pathology in the United States during the late nineteenth and early twentieth centuries.

already shifting in a more applied direction, particularly at the state agricultural experiment stations and the USDA.

The publication of "Diseases of Shade and Ornamental Trees" by Beverly T. Galloway and Albert F. Woods in the USDA *Yearbook* for 1896 marked the first serious foray into forest pathology by America's foremost institution of agricultural research. The *Yearbook* paper by Galloway, chief of the Division of Vegetable Physiology and Pathology, and Woods, his top deputy, highlighted ongoing attempts by the USDA to collect data on tree diseases. It was a brief introduction to the young field of forest pathology and provided some cultural control information. The paper aroused a noticeable interest in tree diseases as indicated by the large numbers of requests for information and specimens.

For the next several years the USDA nurtured an interest in tree diseases. By 1900, the demand for concerted attention to tree diseases came conspicuously "from owners of forest and shade trees" as well as "superintendents of parks and streets." The Secretary of Agriculture declared that "the rapidly growing interest in forestry problems has created a widespread demand for information as to diseases affecting trees, and in recognition of this fact the work has been pushed forward as rapidly as possible."<sup>1</sup>

The growth of forest pathology can be seen as a part of the overall growth of the Department's attention to forestry, in part sparked by the rise of national interest in conservation. A highlight of this movement was the appointment of the legendary Gifford Pinchot as chief of the Division of Forestry in 1898. More than any other American, Pinchot shaped the early conservation movement. His primary desire was not to keep natural areas pristine, but to understand and monitor natural resources so they could be used in a wise and well-regulated way. As a quintessential Progressive Era style expert, Pinchot believed that the federal government was the best institution to act as a rational steward of national resources.

Although understanding the diseases of forest trees was an inherent part of the Progressive concept of conservation, it was not high on Pinchot's priority list. Indicative of the relatively low status that the nation's chief conservationist gave to forest pathology, tree diseases merited only one brief mention

1. Galloway, B.T. 1900. Report of the Chief of the Division of Vegetable Physiology and Pathology. Pages 49–58 in: Annual Reports of the Department of Agriculture, 1900. GPO, Washington, DC.

in his autobiography, *Breaking New Ground*. That one mention, however, made note that "field studies of some of the more destructive diseases were already being made" by Dr. Hermann von Schrenk.

Hermann Von Schrenk was born in College Point, Long Island, New York in 1873. He was encouraged to pursue an early interest in plants by his father, who was an instructor of botany, physics, chemistry, and physiology. In 1893, Von Schrenk earned a B.S. from Cornell with a thesis entitled, "Parasitism of *Epiphegus Virginia*" or broom-rape. This was followed by a year at Harvard earning a botanical M.A. under William Farlow and the notable plant physiologist George L. Goodale. Perhaps his studies with Farlow stirred Von Schrenk's interest in forest pathology as he became aware of the work of Robert Hartig.

In 1897, Von Schrenk became an instructor in botany at the Shaw School in St. Louis, a premier institution for botanical studies in the United States. From that point, he rapidly became more involved in research on tree diseases. His early focus was on cypress, cedar, and pine trees and his approach was descriptive rather than experimental. In 1898, he presented a paper on "Notes on Some Diseases of Southern Pines" at the annual meeting of the American Association for the Advancement of Science. The next year, he published on "A Sclerotoid Disease of Beech Roots" in the *Missouri Botanical Garden Tenth Annual Report*, the same year in which he earned his Ph.D. from Washington University in St. Louis. His dissertation was on a heart rot problem and was entitled "A Disease of *Taxodium distichum* known as peckiness, also a similar disease of *Libocedrus decurrens* known as pin-rot."

It was also in 1899 that Von Schrenk became associated with the USDA thanks, in part, to the intercession of L. H. Pammel, a fellow Washington University Ph.D. and professor of botany at Iowa State Agricultural College. Pammel was a specialist in plant disease research and had been working as a special agent of the USDA since 1889. Pammel recommended to Beverly



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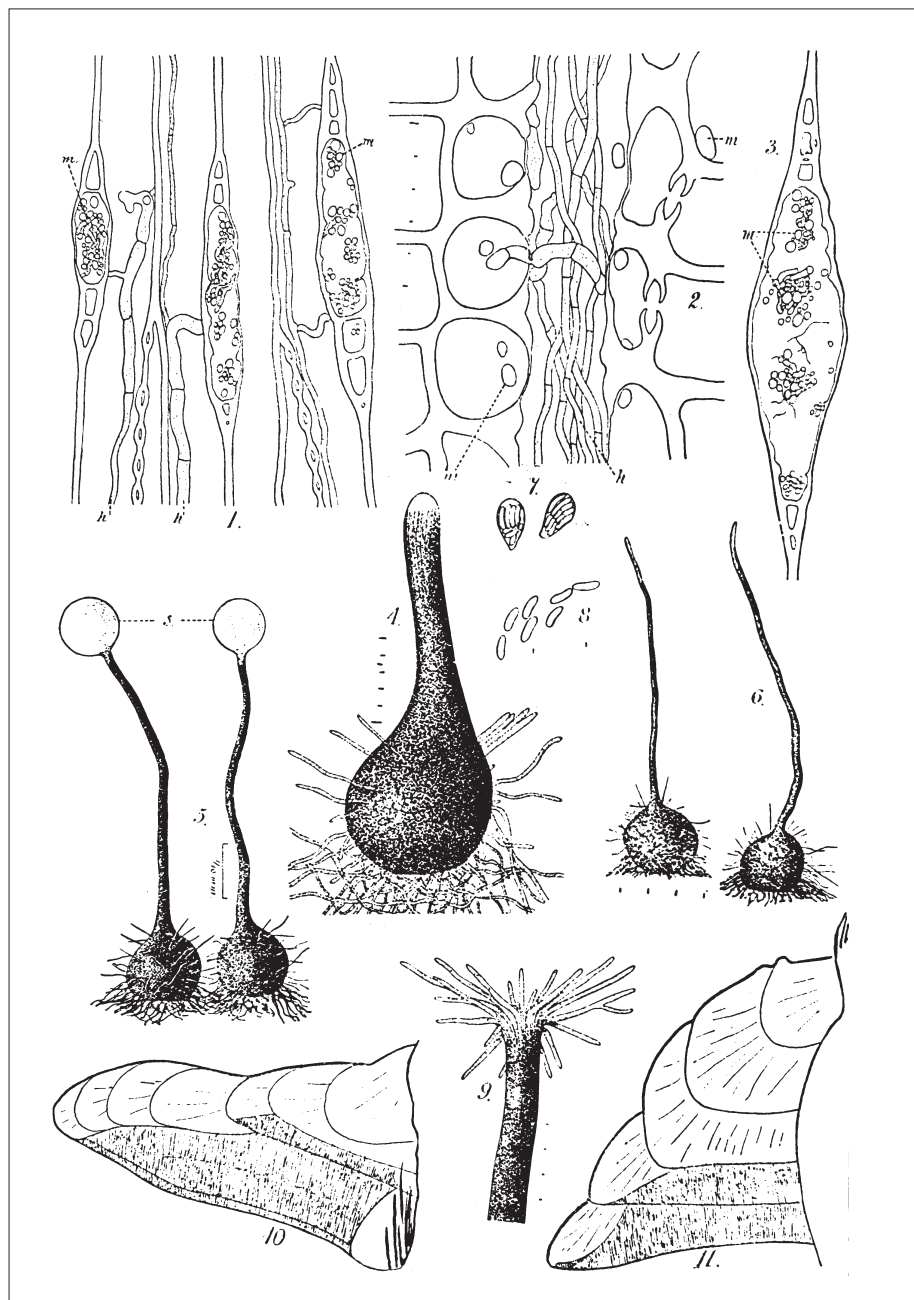
As an administrator and scientist, Beverly Galloway was arguably the most influential figure in the early growth and development of plant pathology and the plant sciences generally in the United States Department of Agriculture.

Galloway that an arrangement be devised for Von Schrenk to study tree diseases with government support. On July 1, 1899, Von Schrenk was appointed as a USDA special agent to conduct investigations relating to diseases of forest and shade trees while he maintained his position as instructor in botany at the Shaw School.

For the first several years of his assignment, Von Schrenk served as a USDA special agent for the Division of Plant Physiology and Pathology and, to an increasing degree, for the Division of Forestry. The USDA special agent system was an institution passed down from the earliest days of federal plant pathology. In 1885, botanist Frank Lamson Scribner became the first federal employee assigned specifically to study and treat plant diseases, but he had limited personnel, laboratory space, greenhouses, and field sites. To overcome these limitations, he turned to the very agriculturists he was charged with serving and solicited their labor and land for use in experiments. These grower “special agents” helped make breakthroughs in plant disease control, particularly in the testing of fungicidal sprays. Under Beverly Galloway, Scribner’s successor, the complexity of plant pathology expanded beyond the grasp of volunteer growers. However, Galloway had budgets and institutional support far greater than Scribner’s, so he scoured American colleges and state agricultural experiment stations for the best talent in the expanding discipline of plant pathology. If he could not afford to hire them permanently, he offered them temporary contracts as special agents to study specific disease problems. He expanded the number of special agents by developing cooperative research programs with other institutions. In this way, Galloway created a widespread corps of special agents around the country, directly or indirectly controlled from Washington, dedicated to researching an ever growing variety of plant disease subjects.

As a USDA special agent, Von Schrenk’s research centered on forest fungi and decays in timber trees, reflecting ongoing work in Europe, and he took reconnaissance trips into major timber regions. Soon after his appointment, two pioneering USDA bulletins appeared: *Two diseases of red cedar, caused by Polyporus juniperinus n. sp. and Polyporus carneus Nees* and *Some diseases of New England conifers*. They were followed by a summary paper published in the *USDA Yearbook* for 1901 entitled *Fungous diseases of forest trees*. All three publications emphasized the largely uncatalogued destruction of forest trees by fungi that rendered them “unfit for lumber” and highlighted the paucity of forest pathology research in America.

The primary goal of the USDA was to apply scientific research



Illustrations of mycelium and fruiting bodies of the “blue” and “red-rot” fungi from Von Schrenk’s research on diseases of western yellow pine in the Black Hills Forest Reserve of South Dakota. From H. Von Schrenk, 1903, *The “Bluing” and the “Red Rot” of the Western Yellow Pine, with Special Reference to the Black Hills Forest Reserve*. USDA, Bureau of Plant Industry, Bulletin No. 36, Washington, GPO, Plate VII.

to the benefit of agriculture. This goal appeared to fit well with how Von Schrenk viewed his mission as a special agent. He told an audience in February 1901 that “to see that the work of the laboratory is of direct practical application is often a source of pleasure to the scientific man.”<sup>2</sup> In USDA Bulletin 25, he called for a shift from existing mycological studies in the United States that mostly considered “fruiting structures” of forest-tree fungi to a focus on the “effects which they bring about.” If these effects

2. Cronin, J.E. 1959. Hermann Von Schrenk: The Man Who Was Timber. Kuehn Publisher, Chicago, IL, p. 60.

were understood, he held, then a rational approach to forest management, such as Pinchot advocated, could be implemented. Focusing on a number of *Polyporus* spp., for example, Von Schrenk described some of “the characteristic changes which their mycelia induce in the wood of trees in which they grow,” and he offered practical solutions to counter these effects. Above all, he warned lumbermen to be aware of diseased and dead trees and not to be hesitant about culling large tracts for the good of the whole plantation. He also advised growers to harvest trees before old age to avoid destruction due to insects and fungi that commonly attacked older stands.

Secretary of Agriculture James “Tama Jim” Wilson was impressed with Von Schrenk’s initial work and in 1901 he authorized the creation of the Mississippi Valley Laboratory in St. Louis for research not only on forest trees but also on fruit trees and ornamentals. The Mississippi Valley Lab was a joint venture of the USDA and the Shaw School of Botany in cooperation with the Missouri Botanical Garden. Von Schrenk was placed in charge. He continued to work for Galloway and the newly created Bureau of Plant Industry, but he also served as Timber Agent for the Division of Forest Products in the Bureau of Forestry.

When the USDA sent Von Schrenk to Europe in early 1902 to study methods for controlling forest tree diseases and treating construction timber, two scientists, George Hedgcock and Perley Spaulding were added to the new laboratory. Hedgcock, a native of Illinois, had earned his bachelor’s degree at the University of Nebraska under the eminent American botanist Charles Bessey. Spaulding had studied plant pathology at the University of Vermont with L. R. Jones, who was soon to be

world-renowned for a variety of ground-breaking plant disease studies. Both men would receive their Ph.D degrees in 1906 from Washington University in St. Louis.

Research at the Mississippi Valley Laboratory was conducted along two main lines after 1902. The first area involved the study of fruit tree diseases such as crown gall and bitter rot of apples. The second and more unique area of research focused on fungal pathogens of live forest trees and structural timber. Von Schrenk remained the principal investigator on forest fungi and decay in timber, although both Hedgcock and Spaulding contributed important early work. Von Schrenk pioneered research on diseases of the catalpa, white ash, pine, redwood, and red gum. One particularly significant area of timber investigation involved explorations by Von Schrenk and Hedgcock into the understanding and control of the staining of sapwood and lumber by fungi. Von Schrenk did some of the earliest work on the “blue stain” of the western yellow pine. Responding to reports that nearly 600,000 board feet of timber were affected in the Black Hills Forest Reserve of South Dakota, he found that the fungus *Ceratostomella pilifera* followed the attacks of beetles and resulted in a blue coloration of the wood. Later, Hedgcock performed important cultural studies of wood-staining fungi and experimented on their control through chemical dips. Perley Spaulding also made significant strides in the culture of wood-decaying fungi and initiated major studies on damping-off of conifer seedlings that would lead to the first successful use of inorganic acids for disease control.

With time, Von Schrenk increasingly became interested in the chemical preservation of wood from an engineering and commercial perspective. In the late 1890s he had been exposed



Illustrations such as this one showing logs totally absent of sap-rot fungi five months after creosote treatment were powerful endorsements of chemical preservation of timber. From H. Von Schrenk, 1907, *Sap-Rot and Other Diseases of the Red Gum*, USDA, Bureau of Plant Industry, Bulletin No. 114, Washington, GPO, Plate V, fig. 2.

to wood preservation technology through his acquaintance with John Johnson, professor of civil engineering, and Gelent Alleman, instructor of chemistry, in St. Louis. He also gathered advanced information on the impregnation of timber with chemical preservatives during his European trip. In 1902, he wrote Bureau of Plant Industry Bulletin 14, "The Decay of Timber and Methods of Preventing It," highlighting the "annual destruction by decay of forest timber and timber used for construction purposes . . ." as "one of the greatest drains on the timber resources of the country." Two years later, at the 1904 World's Fair, his advocacy of creosote for the preservation of railroad cross ties was heralded as a major event.

Naturally, relevant business interests saw the value of this research. Railroad managers, in need of vast quantities of cross ties to keep up with the rapidly expanding track mileage in the West, were particularly impressed. By 1903, timber-using companies such as the railroads had begun to underwrite the federal research on timber decay.

Von Schrenk's shift in focus from mycology and plant pathology to engineering and business had consequences for his career and influenced the direction of events for forest pathology in the USDA. Research priorities became a major issue of contention between Von Schrenk and his superiors in Washington as his strong ties to industry troubled both Pinchot and Galloway. Pinchot's vigorous beliefs about the government's role in protecting the nation's natural resources from short-sighted industrial concerns were well known and he took pride that his Bureau was in the forefront of conservation. He later wrote in his book, *The Fight for Conservation*, that "it is the honorable distinction of the Forest Service that it has been more constantly, more violently and more bitterly attacked by the representatives of the special interests in recent years than any other Government Bureau." Von Schrenk's close ties to industry, particularly the railroads, led Pinchot to desire him dismissed.

Galloway stepped in, fearful of an embarrassing public row between government bureaus. He offered to placate Pinchot by removing the controversial pathologist from the rolls of the Division of Forestry and leave Von Schrenk totally under the Bureau of Plant Industry. Galloway, however, had also become increasingly disturbed by the ties of federal plant pathology to private industry, confiding to his assistant A. F. Woods that "I do not see how we can accept money from the railroads without laying ourselves open to criticism in a number of directions."<sup>3</sup> The conflict between Von Schrenk and the two administrative colossi raged for two years. Pinchot did not want Von Schrenk to be involved in any federal research on timber, particularly timber preservation. Galloway rejected this extreme solution, but he did demand that Von Schrenk refuse all research funding from railroads in an attempt to prevent his pathologist from further antagonizing the powerful Pinchot.

In 1907 the situation came to a critical juncture over an issue more significant than possible conflicts of interest and the stakes elevated to a question of who would control forest pathology itself. Pinchot made public his wishes that the Forest

Service assume all forest pathology research. This galvanized Galloway, normally a master of graceful political accommodation, to act with great dispatch. He wrote to Von Schrenk that the Bureau of Plant Industry did not intend to lose forest pathology. "The Forest Service," Galloway said pointedly, "was very frank in stating that the difficulty, so far as they were concerned, lay in their ability personally to cooperate with you."<sup>4</sup> Therefore, the Mississippi Valley Lab was to be closed and its operations brought to Washington.

Rather than leave St. Louis, his home of many years, Von Schrenk chose to leave federal service. On March 11, 1907, he wrote to his friend and colleague R.A. Harper of the University of Wisconsin that:

I beg to say that I have almost definitely decided to sever my connection with the Bureau of Plant Industry, and am making efforts at the present time towards establishing myself here in a consulting position. There have been many developments . . . which made remaining in the Government service almost an impossible matter for anyone anxious to do independent scientific work. I am very glad to have come to this conclusion, because I expect to have a pretty good time from now on.<sup>5</sup>

Von Schrenk was, thus, left behind as federal forest pathology shifted to Washington. His career was by no means over, however. He was recruited by Harper to join the staff at the University of Wisconsin, but he chose to stay in St. Louis as the pathologist for the Missouri Botanical Garden. His abandonment of federal service also freed Von Schrenk to continue in private industry the work on which he had been concentrating: the care and preservation of timber. He no longer had to concern himself with placating the competing interests of Washington. He quickly joined numerous railroads like the Rock Island, the Santa Fe, and the Frisco System as a timber consultant at a salary far above his government stipend. He traveled the nation for the railroads and continued to lecture on timber issues at prestigious venues like Yale and the Biltmore School.

Von Schrenk's career spotlighted several trends in the development of plant pathology around the turn of the century. The first was disciplinary expansion and the development of subspecialties. From its roots in taxonomic mycology and the resource management concepts inherent in the early conservation movement, forest pathology arose to explore the destructive diseases of forest trees, their understanding and control. By so doing, this subdiscipline offered to aid in the rational management of timber resources. This, however, led to another trend of early twentieth century plant pathology that was seen in Von Schrenk's work, the growth of agri-business and the controversies over the ability to perform objective research on funding from interested, industrial parties. Or, more precisely, the issue was that of cooperation between government, with its assumption of conducting research for a higher goal of the public good,

3. Galloway, B.T. to Woods, A.F. February 17, 1905. National Archives. RG54. Entry 157. Records of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Record Group 54. National Archives, Washington, DC.

4. Cronin, J.E. 1959. Hermann Von Schrenk: The Man Who Was Timber. Kuehn Publisher, Chicago, IL, p. 123.

5. Von Schrenk, H., to Harper, R.A. March 11, 1907. Hermann Von Schrenk Papers. Missouri Botanical Garden Archives, St. Louis.

and industrial concerns linked to research with a profit motive. This dichotomy was particularly strong in terms of forest trees, which were often located on public lands, but were being utilized by private concerns. In Von Schrenk's case, the situation was settled by his moving, through forcible relocation, into private industry. And this highlights yet a third trend in plant pathology in the twentieth century, the funding of large-scale, private research by industry.

On July 1, 1907, the Laboratory of Forest Pathology was established in Washington, DC. Hedgcock and Spaulding were brought from Missouri and Haven Metcalf, state botanist of South Carolina and professor of botany and bacteriology at Clemson Agricultural College, was named Pathologist-in-Charge. Metcalf and his staff of federal forest pathologists would soon be involved in monumental work that would cement the place of their specialty, particularly in a government context, in the larger scientific discipline of plant pathology. Prior to 1920, the United States experienced epidemics of massive proportions involving several tree diseases, notably chestnut blight and white pine blister rust. These diseases ingrained themselves in the public consciousness by forever altering the appearance of the North American landscape. As much as any other single event, these epidemics would force forest pathologists into a place of prominence that no one could have anticipated during the difficult years just after the turn of the century when forest pathology rested almost solely in the hands of Hermann Von Schrenk. n

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*Hermann Von Schrenk in later life. Conflicts with Pinchot over industry-sponsored research led Von Schrenk to leave the USDA and consult directly with railroads.*

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