



Dr. Gotthold Steiner in Gainesville, Florida (circa 1959)

(Photo: Dr. George Weber)

DR. GOTTHOLD STEINER (1886–1961): VERSATILE NEMATOLOGIST

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ABSTRACT

Swiss-born Dr. Gotthold Steiner was a pioneer in formulating the discipline of nematology. He worked with the American nematologist NA Cobb and together they were responsible for acceptance of the concept of nematode phytoparasites. Steiner had special expertise in anatomy, morphology, phytonematology, marine nematodes, nutrition, mermithids, and selected invertebrate taxa. He authored 191 scientific papers, established the ubiquitous phytoparasitic genus *Helicotylenchus*, described the pinewood nematode, and did significant work with three important economic pests, *Ditylenchus dipsaci*, *Heterodera rostochiensis*, and *H. schachtii*. He was responsible for introducing training programs in nematology in USDA laboratories.

Introduction

When I met Dr. Steiner in the late 1950s, I was occupied with many projects involving a variety of nematodes. In our conversations, I was astounded by the fact that each project and nematode under discussion was familiar to Dr. Steiner; he had been engaged in research sometime previously on almost everything under discussion. Other than my mentor Dr. BG Chitwood, I have never to this day encountered a person with such versatility in investigating different aspects of the science of nematology. This appearance of versatility was fully confirmed when I reviewed his scientific accomplishments.

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Foundations

Dr. Steiner was born in Signau, Switzerland, on April 8, 1886. As a boy he was interested in zoology, but his parents, having other plans, enrolled him in a military school. He joined the Swiss army and entered the Infantry Division Officers School, where he was top of his class. He might have pursued a military career, but he developed ear trouble from close contact with big gun explosions and found it provident to start a new career (4).

Educational Development

Steiner received his PhD in 1910 from the University of Berne. Following graduation, he was employed at zoological stations in Naples, Italy, Cette, France, and Helgoland, Germany. He described marine nematodes collected on the German South Polar Expedition in 1901–1913. Dr. JR Christie (2) considered Steiner's two-part monograph of nematodes collected during the polar expedition to be his greatest contribution to science. In 1918, he worked on the advanced degree "Privat-Dozent," which he attained in 1921. He taught class at this time, but received no salary. Students in his classes paid their fees directly to him. By 1921 he had authored 25 papers, most dealing with marine nematodes. His scientific work came to the attention of NA Cobb, the eminent American nematologist, who invited him to come to the United States. Cobb arranged a position as Sessel Research Fellow for Dr. Steiner at Yale University in New Haven, Connecticut, in 1921 (5).

Steiner joined Cobb's staff in Washington, D.C. in 1922, and became engaged in considerable work with mermithids, a group of nematodes that parasitize insects. He also described a number of free-living and marine taxons. His first paper on phytoparasitic nematodes appeared in 1924, at a time when most biological scientists scoffed at the concept of nematodes damaging plants. Both NA Cobb and Steiner fought this tide of disbelief for many years before the concept of nematode phytoparasites was universally accepted.

Administrator: Scientist

Following Cobb's death in 1932, Steiner was appointed Nematologist-in-charge of the USDA Division of Nematology. Two innovative major new projects were undertaken by Steiner. He placed Washington staff members at research stations in selected locations where plant problems caused by phytoparasitic nematode existed or were anticipated, thus expanding the horizons of phytonematology in the United States (3). In 1934, AL Taylor and in 1935, CW McBeth were assigned to Tifton, Georgia; HW Reynolds went to Sacaton, Arizona, in 1947; JR Christie was assigned to Sanford, Florida, in 1948; and BG Chitwood was sent to Babylon, New York, in 1951 (3).

Significant pioneering work with phytoparasitic nematode control and biology was to result from this innovative distribution of staff. When Steiner took

charge there was a severe lack of facilities in the United States where one could be educated as a nematologist. Another of Steiner's significant contributions as a leader was the training of undergraduate and graduate students in the USDA laboratories (1). Students involved in the training who went on to successful careers in nematology included MW Allen, EJ Cairns, VH Dropkin, J Feldmesser, AM Golden, GD Griffen, EC Jorgensen, LGE Lordello, BF Lownsberry, BA Oteifa, VG Perry, JN Sasser, AC Tarjan, and AL Taylor. Many of these students, in turn, initiated the careers of a large number of nematologists. One could say Steiner was instrumental in generating a network of scientists essential to the foundation of the science of phytonematology in the United States. BA Oteifa returned to Egypt, and LGE Lordello to Brazil, becoming the fathers of nematology in their respective countries. Steiner also encouraged employees to attend university courses, with the agreement that time away from work would be made up. The Washington staff met with Steiner each Friday in a nematology discussion group. In 1940, the 30-member staff moved to Falls Church, Virginia, as part of a unified war effort.

Publications: Research

The versatile Steiner was highly skilled in many areas of nematology. He was basically a taxonomist, with special expertise in anatomy, morphology, phytonematology, marine nematodes, nutrition, mermithids, and selected invertebrate taxa. He authored 191 scientific papers, his first published in 1911 and his last 49 years later in 1960. He published 74 papers on phytoparasitic nematodes, 26 on free-living nematodes, 24 on mermithids, 18 on marine nematodes, and 49 papers on a variety of subjects. He established the ubiquitous phytoparasitic genus *Helicotylenchus*, described the pinewood nematode, and did significant work with three important economic pests, *Ditylenchus dipsaci*, *Heterodera rostochiensis*, and *H. schachtii*.

Awards and Honors

Dr. Steiner received the USDA Superior Service Award in 1948 and the Distinguished Service Medal of the USDA in 1955 (2). He was President of the Helminthological Society of Washington in 1925 and Trustee of the Braylon H. Ramson Memorial Trust Fund from 1936–1956 (1). He belonged to 16 scientific societies. He was singularly honored when the nematode genus of the most important nematode biological control agent of insects, *Steinernema*, was named in his honor.

The Man

Steiner was short and rotund, with a grandfatherly face. Possessed with an amiable personality, he was always the perfect gentleman. When he first arrived to work in Washington, he wore a stiff white collar and a long white gown over

his suit. The suit and tie were ever present; one could not imagine a sport shirt or walking shorts in his wardrobe. He used an arc lamp to illuminate nematodes viewed using the microscope. An unfounded rumor was that Steiner and Gerald Thorne, who also used the arc lamp, burned off their hair, creating the bald condition in both. He drove an old car that periodically developed problems. Dr. Steiner and his wife Emma had two sons, one who operated a farm in Maryland and one who taught zoology at the University of Michigan (4).

Retirement and Beyond

After his retirement in 1956 until his death in 1961, Dr. Steiner resided in Puerto Rico where he established a phytoparasitic nematology laboratory at Rio Piedras. He made a trip to Brazil during this period and identified the nematodes multiplying in the vats of a tomato paste factory as *Panagrellus redivivus*. He also was an instructor at a six-week school held at Raleigh, North Carolina, in 1959.

In retrospect, one must consider Steiner's greatest achievements to be his creation of the phytonematology student training program in USDA laboratories, which resulted in a continental network of distinguished scientists in nematology; his persistent struggle to establish phytonematology as a science based on proof of nematode depredations; and his establishment of regional USDA research stations in phytonematology. JR Christie stated in 1962 (2) that "It was Dr. Steiner's good fortune to see his most extravagant claims vindicated."

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