

PIONEER LEADERS IN PLANT PATHOLOGY: GERALD THORNE

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K. R. Barker

Plant Pathology Department, North Carolina State University, Raleigh, North Carolina 27650

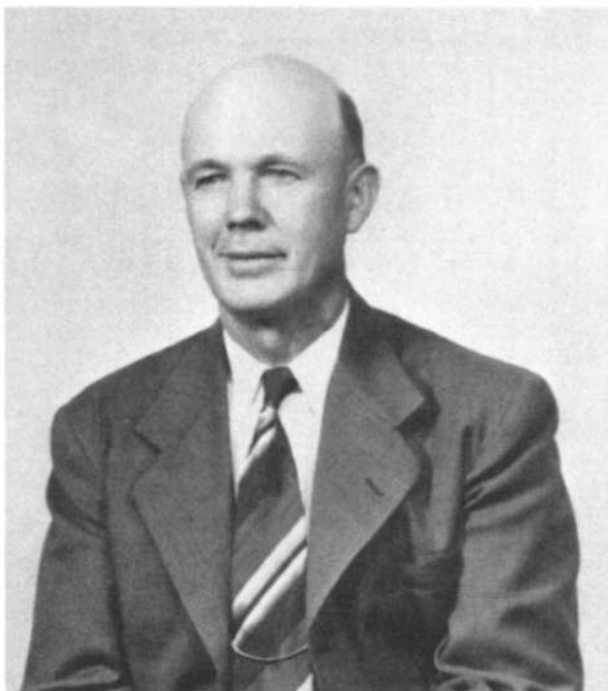
E. Mae Noffsinger

Division of Nematology, University of California, Davis, California 95616

G. D. Griffin

USDA/SEA Crops Research Laboratory, UMC 63, Utah State University, Logan, Utah 84321

Gerald Thorne in 1915 rode a saddle horse down a mountain trail in Utah to further his education and enhance his proficiency in teaching school, an activity in which he had been involved since 1911 after leaving his home ranch near Vernal, Utah (3). Rather than continue his teaching career in isolated one-room public schools in Utah and Wyoming, Gerald Thorne followed the advice of a boyhood friend and enrolled in Utah Agricultural College at Logan. There he came in contact with Dr. E. G. Titus, Head of the Department of Entomology and Zoology. In 1917, Dr. Titus took Thorne to his first sugar beet field and pointed out plants that were dying or severely stunted and showed him cysts of the sugar beet nematode that apparently were responsible for this problem. Dr. Titus indicated to Thorne that no one in the entire country was working on this problem. He further suggested that Thorne should get busy on it! When Dr. Titus transferred to the USDA in 1917, he initiated plans for a scientific assistant who was to begin investigations on the sugar beet cyst nematode. Upon graduation in 1918, Gerald Thorne filled this position, thereby beginning a long and distinguished career in nematological research.



Gerald Thorne

UNUSUAL STRENGTHS

Gerald Thorne's enthusiasm for life, his humor, unending energy, and powers of observation were such that he would have succeeded in any era. Although a man of modest desires, he was extremely productive in the day of the saddle horse, the model "T", and the airplane as well as the space age. His enthusiasm for nematology, admittedly, sometimes became overzealous. For example, in 1968, he predicted that our first space ship to return with soil samples would have some of our well-known species of nematodes; further he envied the nematologists who would have the opportunity of identifying these pests (6). Also, throughout his career he continually searched for a plant-parasitic nematode feeding on redwoods that would match these giant trees in size. Nevertheless, this magnetic zeal for his profession enabled Gerald Thorne to make contributions that are unmatched in American nematological research.

In addition to writing one of the most widely used textbooks on nematology (2), and a number of monographs (1, 7-9), Thorne published

more than 84 technical papers over a 54-year period (a complete list was published in the Newsletter of the Society of Nematologists). He described hundreds of nematode species and built large permanent collections of these organisms at Salt Lake City, Utah; Madison, Wisconsin; and Brookings, South Dakota.

Professor Thorne was an amateur human nutritionist, an advocate of physical fitness, and a naturalist. These characteristics plus his inherent strengths of patience, ability to interest and stimulate others, sense of humor, unselfishness, enthusiasm, extraordinary energy, and comprehensive knowledge of his discipline made him a great international leader in nematology.

HIS PHILOSOPHY

Gerald Thorne was a man dedicated to his profession. Nevertheless, his long hours of daily work were those of excitement, curiosity, and satisfaction. Even when busy describing or sketching a new nematode species, Thorne was always delighted to assist graduate students or consult with other faculty. He was a proponent of neatness and orderliness in the classroom and the laboratory. For example, after discovering that his initial collection of some 2000 nematode specimens had captured him rather than his managing them, he devised a numerical-alphabetical system for indexing them so a given specimen could be found in a matter of seconds (5).

Thorne was an early practitioner of carrying new information to growers. Although encouraged by his supervisors in Washington DC to concentrate on basic research, he was successful in developing new information and transmitting it to the individual grower as well as to related industries. In 1928, he accompanied an agricultural train which included half of one railroad car devoted to an exhibit of large color transparencies illustrating infested fields and the value of rotating crops and the various forms of the sugar beet cyst nematode. He explained all illustrations by lectures to small groups of growers as they walked through the cars. This massive educational or extension effort, which lasted for almost a month, demonstrated to some 18,000 people the dangers of this pest to the sugar beet crop.

Even with an unending zeal for this work, Thorne found time for family life. Early in his career he married Mabel Albaugh who grew up in Ohio. They had a son, Marion F., who is an engineer and resides in Pacific Palisades, California. Many years later, he and Zelda Norman from Maryland were married. They had one son, Gerald B., who is a specialist in computers and lives in Colorado Springs, Colorado. Mrs. Zelda Thorne is now 90 years old and lives in Alexandria, Virginia.

Thorne did not seek titles or wealth. He was happy with living in a small,

well-kept home, driving a Rambler, and giving most of his time to nematology. Nevertheless, many honors came to him. He was presented a distinguished Service Award by Utah State University in 1956. The Society of Sugar Beet Technologists and the Helminthological Society of Washington DC, respectively, presented him with forty-year and fifty-year service awards. He was given a special award with the engraving "Gerald Thorne honoring 50 years of outstanding service to Nematology from the Society of Nematologists 1967." In 1965, he was elected Fellow in the American Phytopathological Society.

TYPICAL DAILY EXPERIENCES IN THORNE'S LABORATORY

Gerald Thorne usually walked to work with a springy, rapid step, a twinkle in his eye, and a friendly smile for all around him. Whether extracting nematodes from "gooey" soils, studying individual nematode specimens, or lecturing in the classroom, each day was a most interesting and exciting adventure for this man and for all students around him. When he observed an unusual nematode specimen, he not only called the nematology students to see the unique animal, but would also ask general plant pathology students to participate in such learning experiences. His expertise and counsel were constantly in demand during his varied career. He actually served in 48 of the 50 states, and in Puerto Rico. In addition to completing a 38-year career with the USDA, he was on the active faculty at the University of Wisconsin for 5 years, and was professor emeritus for 14 years. Much of his research during his years after retirement from the University of Wisconsin was conducted in the Department of Plant Pathology, South Dakota State University where he worked as a visiting professor. During all of these varied activities, Gerry Thorne never lost his extraordinary energy and enthusiasm for research and patience to teach and assist others.

NEMATODE TAXONOMY

Some of his most significant contributions undoubtedly were in his favorite research area, nematode taxonomy. In addition to assembling a collection of more than 36,000 specimens and describing some 467 species of nematodes, he initiated or established 70 genera, 23 subfamilies, 20 families, 8 superfamilies, and an order. In preparing these contributions for publication, he made approximately 3000 drawings which illustrated diagnostic characters of the species involved. It is to his credit that he not only described the plant-parasitic species of great importance in areas in which he investigated indigenous nematodes, but he also published extensive de-

scriptions of new species of microbivorous nematodes in the Cephalobidae and in the widely varying forms of the Dorylaimoidea. One of his latest monographs, entitled "Nematodes of the Northern Great Plains," [the first part published in 1968 (8) and the second part in 1974 (7)] contains hundreds of his drawings, all exhibiting the typical, simple, and artistically beautiful characteristics of his sketches. Even at the age of 84, he was still describing and illustrating numerous new species of nematodes. Throughout his life, he was not hesitant in offering counsel or advice to aspiring taxonomists (5, 6).

DEMONSTRATION OF CROP DAMAGE CAUSED BY NEMATODES

Gerald Thorne's early contributions in delineating damage caused by plant-parasitic nematodes were concerned primarily with the sugar beet cyst nematode *Heterodera schachtii*. He gave Dr. E. G. Titus credit for having discovered this nematode in Utah in 1907 and having immediately realized its potential as a threat to the sugar beet industry. Thorne's major early project was to survey sugar beet fields in the western states for this nematode. He pointed out that it was the time before automobile transportation, and the usual day began by riding an early train out to a certain point and then walking through many fields, making maps of planted beet fields and recording nematode infestations, and returning to town on the evening train. Even in his early research, Thorne realized the importance of observations made by growers in cooperation with others. In the 1920s, the options for nematode control were extremely limited. He gave growers, who have never heard of nematodes, credit for having learned that a crop rotation of 4 to 5 years would produce one good crop of beets, but not two in succession (3). From data collected in such grower-planned rotations, he soon was able to prepare a bulletin and make recommendations for rotations with other crops, such as alfalfa, small grains, potatoes, tomatoes, corn, and vegetables. Since high fertility was essential, recommendations included the application of barnyard manure and plowing under cover crops. To Thorne, the most gratifying aspect of his early projects was that the crop rotations and the soil fumigation methods that he had developed and recommended were still being followed in the 1960s (4). He indicated that by utilizing these practices, it was possible to grow beets valued at many millions of dollars in fields that were generally infested with sugar beet nematodes.

The origin of the sugar beet cyst nematode in the United States was always something that perplexed Thorne and others. He suggested that it probably had been introduced in bits of soil carried with beet seeds imported from infested fields in Europe, or it could have been indigenous to areas in which it was found. He discovered that it had been introduced into unin-

fested fields in "dump dirt" by farmers hauling it from sugar beet dumps as they returned from deliveries made at the factory.

Gerald Thorne was a man ahead of his time. He not only described nematodes as causal agents of plant disease, but he was concerned about the total problem including the diffusion patterns of soil fumigants and their effects on insects as well as free living nematodes. He found certain nematodes to be associated with decline of small fruits such as raspberries, and dieback of orchards. He and one of his former students described *Xiphinema index*, a species which was later shown to be an important vector of grape-fanleaf virus.

A nematode of particular interest was *Ditylenchus destructor*, a new species described by Thorne in 1945. The outbreak of the potato rot disease caused by this pest in Wisconsin was largely responsible for Thorne's moving to the University of Wisconsin in 1956. This problem, through the efforts of Thorne and associates, was essentially eliminated by delineating its occurrence through surveys and repeated soil fumigation and other practices.

EXTENSION

As indicated earlier Gerald Thorne felt even as a young man that it was absolutely essential that information gained through observation and research must be carried to the growers as well as to industry. One of Thorne's rare indignations concerned the command by his supervisors that he be concerned largely with doing fundamental research instead of extension work (3, 4). Actually, he liked to balance research with extension. He surveyed for plant-parasitic nematodes, studied rotation systems, and other management practices, and examined soil samples for predatory nematodes and other possible agents of natural control. In addition, he spent many of his evenings on his own time in Farm Bureau meetings and similar group meetings educating growers on nematode control.

One of the first practical nematode assay programs was conducted by Thorne in the 1920s and 1930s (4). For many years, a considerable portion of his survey work was done in fields for which the grower did not know the past history prior to planting sugar beets. He used the cyst flotation technique which consisted of dropping small amounts of dry soil into a glass of water, stirring thoroughly and observing to see if any cysts of *H. schachtii* floated around the edge of the water. With a farmer or fieldman to carry a jug of water, it was possible to zigzag back and forth across the field and cover several hundred acres in a day. If cysts were found, the infested areas

of given fields were identified by further sampling. If the infestations were general throughout a field and beets had been produced in the past three years, additional years of rotation were recommended. Often, it was possible to delineate an infested portion of the field, thus enabling the grower to plant the remainder. This survey covered thousands of acres, and his educational program proved to be so successful that in the early 1930s it became difficult to find fields that showed severe damage.

GRADUATE EDUCATION

Gerald Thorne's greatest satisfaction came from graduate education and the accomplishments of his students. In 1968, he estimated that of the 125 full-time nematologists working in all of the diverse phases of nematology about half were his students or individuals educated by his students, even to the fourth generation. Thorne was one of the key scientists largely responsible for the rapid growth of nematology in the 1950s and 1960s. He pointed out that in his early days nematodes were regarded with skepticism and even contempt, but was extremely pleased in later years that nematology became accepted as an essential component of education in agriculture. He maintained that well trained young scientists were the principle need in nematology. Furthermore, he insisted that young scientists should not be handicapped by an inadequate education when going into research. He felt that students should not only be able to extract nematodes properly and prepare permanent mounts of specimens, but that they should know soils, crop production, and all associated aspects of agriculture. His many excellent photographs gave an added dimension to his teaching. Thorne though an extremely prolific writer was dedicated to concise but definitive writing with minimal verbosity. He followed N. A. Cobb's suggestion "write your paper, then reduce it to 25% of the original contents" (6). While acknowledging the merits of basic research, Thorne emphasized to students that one should keep one foot in the soil to know what is taking place in the field. He strongly urged that one always be responsible to the agencies supporting research and never discount the thousands of growers who are willing to cooperate in field tests. He further suggested that at the end of each year one should review his research and estimate how well the funds from the sponsoring taxpayer had been expended.

Thorne, at age 83, at the Second International Congress of Plant Pathology in St. Paul, Minnesota in 1973, still had that sparkle in his eye and enthusiasm for visiting with students of nematology. More importantly, he had great personal pride and satisfaction in the productivity of the many former graduate students whom he had taught.

HIS LEGACY TO NEMATOLOGY AND PLANT PATHOLOGY

The rocky trail that Gerald Thorne followed down that mountain in 1915 is now a broad, paved highway over which thousands of visitors enjoy the scenic beauties in a region where he once saw fewer than 20 people in an entire summer (6). Similar growth has occurred in his discipline nematology. In 1968, he stated that "perhaps no other science has enjoyed the enthusiastic reception as that accorded nematology during the last 20 years" (6). We in plant pathology were fortunate to have had a man with the insights, strengths, and abilities of Gerald Thorne to pursue basic and applied problems in this important area over a 58-year period. Still, he indicated that the most rewarding part of his rare opportunity was the privilege of knowing and working with people to whom he was always most grateful for their cooperation and friendship (6). The works and memories of Gerald Thorne still serve as a stimulus for greater efforts and excellence in research today. Gerald Thorne, the man who traveled by horseback, by train, by foot, and who enjoyed much of the early space age, visiting and working in 48 of our 50 states, in some 12 of our state universities, and several foreign countries, was truly a pioneer leader in plant pathology. His concern for applied and basic research, extension, and graduate education, combined with his enthusiasm for nematology, undoubtedly will continue to yield dividends in agriculture and food production for many years to come.

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