

John A. Mulrennan, Sr.: An Entomology Pioneer of Florida

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John A. Mulrennan, Sr.: an entomology pioneer of Florida

*John A. Mulrennan, Jr.**

My dad, John Mulrennan, Sr., was born into a Florida pioneer family on a 160-acre homestead in Bloomingdale, Hillsborough County, Florida, in 1906 (Fig. 1). He was the second oldest of four children and was four years old when his father died of an unknown illness on January 6, 1910, at the age of 31.

After becoming an entomologist and learning about mosquito-borne diseases, dad speculated that his father may have died from east-

ern equine encephalitis. This possibility was based on my grandfather's symptoms and stories related to my father by his mother. My grandfather was a fox hunter, having a special horse and two well-trained hound dogs for that purpose. This avocation frequently exposed him to potential vectors of the virus that causes eastern equine encephalitis, because his many hunting forays took place in and around freshwater swamps in the area. However, he died in January, when the vector



Fig. 1. Mulrennan homestead close to Tampa in Bloomingdale, Florida, where Dr. John Mulrennan, Sr. was raised (about 1905). Dominick Mulrennan is sitting and Joseph Mulrennan is standing on the porch. In the yard are John Mulrennan's mother, May, sister Margaret, and half-brother Martin "Bud" Mulrennan.

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mosquitoes are least active, casting doubt on the speculation that the cause of death was eastern equine encephalitis. It nevertheless made a good entomological story for my dad to tell about our family.

At the time of my grandfather's death, he and his father, my great grandfather, Dominic, an Irish immigrant, had a thriving citrus, vegetable, cattle, and hog farming business. My grandfather's death left our family without enough help to operate the business, so one of dad's uncles, Joseph Mulrennan, left his job in Tampa as a cigar maker and came to help. Uncle Joseph married my grandmother in 1912, and they had four more children. Although he was my dad's stepfather, my dad always called him Uncle Joe. Dad loved to tell stories about his boyhood and the many trips he took with Uncle Joe to Judy's Lot on 7th Avenue and 23rd Street in Ybor City to sell their produce. It was a 16-mile trip one way over a clay road on a wagon pulled by a team of mules. Dad was proud to be involved in the beginning of the farm market system in Florida.

My dad began his education in a one-teacher school in Bloomingdale, after which he attended school in Brandon as a teenager. The teachers in Brandon were not impressed with the education my dad and his siblings had received, so the boys were assigned several grades back to catch up with the other students. During high school at Brandon, my dad saw my mother for the first time on a school bus and winked at her. My mother related later that she thought he was a flirt but very good looking. This was the start of a romance that lasted over 50 years. When dad finally graduated from high school in 1928, he was 22 years old. It is no wonder he was an outstanding athlete while at Brandon—he was a man among boys!

After graduating from Brandon High School, dad enrolled in the College of Agriculture at the University of Florida in the fall of 1928. His intention was to earn a degree in agriculture and return home to take over the family farming business. He got a part-time job at the State Plant Board in Gainesville when he was a freshman and worked there all through his time at the university. At the State Plant Board he developed an interest in entomology through his association with George Merrill, a mentor and friend. He recognized the possibilities of doing something different than farming and decided to major in entomology. He also received encouragement from his soon-to-be wife—mother did not want to go back to the farm! Consequently, in 1931 my dad and mother were married before he finished his senior year at the University of Florida. He graduated in 1932 with a Bachelor of Science degree in Agriculture with a major in Entomology.

Historically, 1932 was not the best of times for finding employment because it was in the middle of the "Great Depression." Dad had a wife, a child on the way, and no job. He finally heard about a job as a citrus grove foreman working for Latt Maxcy, Inc., a short distance from Gainesville in Island Grove. It paid \$1.00 per day, six days a week and included use of the company truck. While in Island Grove the first summer or early fall of 1932, my mother contracted malaria. She was pregnant with my older sister, so there was concern about possible trans-placental transmission to the baby. Fortunately, such transmission did not occur and my mother gave birth to a healthy baby girl on November 19, 1932, before herself being cured of malaria with quinine. This first-hand experience with malaria had a profound effect on dad. He saw how debilitating it could be and was aware of how common malaria was in Florida at the time. He also was aware that Florida was not a healthy place to live, remembering that his father died from a disease at 31 years old, just one year shorter than the life expectancy of a man in Florida in 1910. With this background for motivation, dad's true destiny was soon to begin.

After a year in Island Grove, dad was contacted by Dr. John T. Creighton, chairman of the University of Florida Entomology and Nematology Department (Pioneer Lecture, Florida Entomologist 87: 94–99, 2004)

about a position in entomology in Tallahassee, Florida. Dr. Mark Boyd, a world-renowned malariologist with the Rockefeller Foundation, was seeking an entomologist to conduct malaria research and establish an insectary to rear *Anopheles quadrimaculatus* Say (Diptera: Culicidae) (Dr. Mark F. Boyd, University of Miami, <http://merrick.library.miami.edu/specialCollections/asm0037/>). Dad accepted the position and thus began a long and distinguished career in public health and medical entomology. He successfully established the "quad" colony and a colony of *Anopheles punctipennis* Say (Diptera: Culicidae) to determine their ability to vector the parasite that causes malaria. The "punks" were not very efficient vectors, unlike the "quads," so the latter colony was discontinued. One of dad's responsibilities was to place the "quads" in small cages and, accompanied by Dr. Boyd, take them to the local hospital to feed on malaria patients and become infected with the parasite. The mosquitoes were held for two weeks and then taken to the State Mental Hospital in Chattahoochee. There, Dr. Boyd fed the mosquitoes on mentally ill patients who had in their brains the spirochete that causes syphilis. The patients contracted malaria, causing a high fever that often killed the syphilis spirochete and cured them of their mental illness. This treatment was developed by Dr. Julius Wagner Jauregg, a Viennese neurologist, before antibiotics became available to effectively treat patients with syphilis. He received the Nobel Prize for his achievement in 1927 (http://www.nobelprize.org/nobel_prizes/medicine/laureates/1927/wagner-jauregg-bio.html).

Dad remained in Tallahassee with Dr. Boyd until 1935 when he was offered a position as assistant state entomologist/malariologist with the Texas State Board of Health. He accepted the position and we made the trip by train from Tallahassee to Austin, Texas. I had been born on March 2, 1934. Dad's primary responsibility was to help establish a malaria control program for the state of Texas. A year later he became head of the program and successfully led its establishment.

In late 1937, the Rockefeller Foundation embarked on a "Malaria Control Demonstration Project" located in Pensacola, Florida. The foundation needed an entomologist with malaria control experience and the obvious choice was John Mulrennan, Sr. Dad was ready to leave Texas, as there was too much Florida sand in his shoes for him to stay. We returned from Austin to Pensacola in a new 1937 Chevrolet with another child, my brother, added to the family. We arrived and unfortunately moved into an apartment on Palafox Street that was infested with bedbugs. Dad got rid of the bedbugs by fumigating the apartment with sulfur candles. We later moved into a house on NW 7th Avenue, and my older sister and I attended Annie McMillan Elementary School.

On February 1, 1938, dad started his public health career in Florida as the first entomologist/malariologist in the Malaria Control Demonstration Project headed by Dr. J. E. Elmendorf, Jr., M.D. (Florida Entomologist 28: 1–7, 1945). The project concentrated on Escambia County and other areas of the Florida Panhandle considered the malaria belt. It incorporated the expertise necessary to be successful, primarily entomologists, engineers, and physicians. The entomologists conducted surveillance for vectors, identified and treated vector breeding areas, and installed screens on windows and doors of homes in endemic areas. The engineers were involved in source reduction by eliminating mosquito breeding sites, often by draining them with ditches hand-dug by Works Progress Administration workers. The physicians detected malaria-infected carriers by taking blood smears from children and adults for laboratory analysis and by examining young children for enlarged spleens. When I was in first grade, health officials came to Annie McMillan Elementary School and pricked the student's fingers for blood samples and felt our midsections to see if we had enlarged spleens. The physicians also prescribed treatment for people who were infected, but source reduction and window screens proved to be the most effective means of disease control.

Wilson T. Sowder, M.D., the Florida State Board of Health state health officer for many years, was in Pensacola at the same time as my dad (http://www.doh.state.fl.us/disease_ctrl/epi/topics/fphmmpictures.pdf). Dr. Sowder often told a humorous story about my dad, describing an event that occurred when both of them worked in Pensacola. Dad was conducting “resting station” surveillance for vectors, and some of the resting sites were under old houses that were built off the ground with easily accessible crawl spaces. One day dad was met by the police as he exited from under one of these houses. Apparently, he had been collecting mosquitoes under a house of ill repute, and the madam called the police complaining that he was a “peeping Tom.” Dad quickly showed the police his collecting equipment and captured mosquitoes to convince them that he was not a threat to the ladies. Needless to say, he did not use that mosquito resting station again.

The success of the Malaria Control Demonstration Project conducted in the Florida Panhandle prompted the State Board of Health to appropriate the funding necessary to make it a statewide program. In the summer of 1941, the Bureau of Malaria Control was created at the State Board of Health headquarters in Jacksonville to manage the expansion. Dad’s position was with the bureau, so we moved to Jacksonville with another addition, my youngest sister, who was born in 1939. Dr. Elmendorf also relocated to Jacksonville and served as the program leader for a brief period until the beginning of World War II. Subsequently, dad was made chief of the Bureau of Malaria Control.

The start of World War II on December 7, 1941, changed everything. The State of Florida’s malaria control program was renamed “Malaria Control in War Areas” and dad was still in charge, but with an entirely new emphasis. Military installations were being built throughout Florida, many in endemic malaria areas, and protecting soldiers and sailors from malaria was a high priority. It quickly became apparent that the military had very little expertise in malaria control, so this critical effort became the responsibility of Malaria Control in War Areas personnel. Florida was the only place in the U.S. with personnel experienced in controlling malaria. Dad began hiring the knowledgeable people he needed in 1942, including Dr. Maurice Provost (Pioneer Lecture, Florida Entomologist 87: 412–416, 2004) and Dr. A. J. “Jack” Rogers. Years later, Dr. Rogers related how he was selected to be an inspector. Dad assembled several candidates in a cow shed and asked them to identify resting mosquitoes. He asked if anyone could show him the lone “quad” female among all the other mosquitoes. Dr. Rogers was the only candidate who was able to identify the *A. quadrimaculatus*; consequently, dad hired him on the spot. Drs. Provost and Rogers remained dad’s friends and professional associates for the rest of their lives.

A great many Army and Navy entomologists, engineers, and physicians were stationed in Florida to be trained in malaria control before being deployed to Europe or the South Pacific. John Mulrennan, Sr. trained them all! On my first day of college at Tulane University, my zoology professor told me he was trained by dad during World War II, and later, when I joined the Navy in 1959, I met a number of senior officer entomologists who also had been trained by my dad. Dad did not know at the time that he was making such a major contribution to the war effort by producing competent military entomologists, engineers, and physicians. Nevertheless, he indirectly helped prevent a massive number of casualties due to malaria.

Malaria Control in War Areas was terminated as an official program at the end of the war, but malaria control efforts continued in Florida with residual spraying of houses with DDT until the last endemic case of malaria occurred in Collier County in 1948. Also at the end of the war, there was a shift in emphasis from governmental disease control to private-sector pest control directed at mosquitoes. Soon, “fly by night” pest control operators began to bilk Florida citizens out of mil-

lions of dollars by doing faulty pest control work or just perpetrating scams. As chief entomologist and director of the Bureau of Entomology, State Board of Health, in 1947 dad responded by cooperating with members of the Florida pest control industry (Fig. 2), such as Dempsey Sapp, Sr. (Pioneer Lecture, Florida Entomologist 95: 803–808, 2012) to pass the “Structural Pest Control Act” Chapter 482 F. S. This act regulated the pest control industry by requiring licensing of pest control operators and companies, as well as enforcement of rules pertaining to certain pest control practices.

In 1949, dad was instrumental in getting the “Mosquito Control Act” Chapter 388 F. S. introduced and passed in the Florida Legislature. This act provided funding out of general revenue to aid counties or special taxing districts in their efforts to control pest mosquitoes. The funding, called “State One Funds,” enabled personnel to be hired and the purchase of chemicals and application equipment. In the beginning, the state bought all of the chemicals, mostly DDT in those days, stored them in a warehouse in Jacksonville, and distributed them to the counties and districts as requested. With this funding support for mosquito control available in the state, my dad and members of his staff made a major effort to visit counties that lacked mosquito control, meeting with county commissioners and citizen groups to encourage them to establish a program. Many counties held referendums and created special taxing districts to tax themselves specifically for mosquito control. Most coastal counties created programs that received state aid, as did some inland counties, such as Polk, Orange, Lake, and Leon.

To monitor the effectiveness of the county mosquito control programs, my dad established a statewide network of light traps. These traps were operated by cooperators who were paid by the state Bureau of Entomology, and collections were sent to the bureau’s laboratory in Jacksonville so the species of mosquitoes could be identified and counted. Dad used the data from the light trap collections to create a graph that demonstrated significant declines in many species of pest mosquitoes, specifically the two salt marsh species, *Aedes taeniorhynchus* (Wiedemann) and *Aedes sollicitans* (Walker) (Diptera: Culicidae). Dad used this information often to justify continuing mosquito control programs when he was competing with other interests for state and county funding.

Initially, the effectiveness of DDT in reducing mosquito populations was truly amazing, so it was sprayed all over coastal areas where salt marsh mosquitoes were prevalent. However, this panacea for controlling mosquitoes did not last long, because the mosquitoes were becoming resistant to the insecticide by the early 1950s. Consequently, my dad established a novel and ultimately crucial policy for using insecticides to control mosquitoes in Florida. The policy prohibited the use of chemically similar compounds as larvicides and adulticides, thus limiting the development of insecticide resistance in mosquitoes and maintaining the effectiveness of adulticides. Unfortunately, this policy was not adopted by other states, such as California, that now have widespread resistance in their mosquito populations.

Having been involved in malaria research during his early years, dad understood the necessity of studying the biology of pest mosquitoes. He believed that a more scientific and long-term approach was needed to make mosquito control more effective and efficient. Fortunately, this goal could be achieved by Dr. Provost, who had the requisite expertise and already was employed by the Bureau of Entomology. Dr. Provost established the research program in Orlando during 1947 and eventually added Dr. E. T. Nielsen, James Hager, and William Bidlingmayer to his staff. One of their first major research projects was conducted in the summer of 1952 on Sanibel Island in Lee County to determine the flight range of *A. taeniorhynchus*. Thousands of mosquitoes were reared in large swales, collected as larvae, exposed to the



Fig. 2. Dr. John A. Mulrennan, Sr. in 1947 at the first meeting of the Florida Pest Control Association on the University of Florida campus. John Mulrennan is holding his hat in the center of the photograph. Dr. John Creighton is on his left and Dr. Jack Rogers is to the left of Dr. Creighton.

radioactive isotope P-32 in the laboratory, and released in the field. To determine how far the mosquitoes traveled after they emerged and dispersed, light, truck, and animal traps were located at increasing distances from the release point. It was not unusual for one collection to at least fill a 5-gallon can.

After I graduated from high school in 1952, my dad hired a friend and me to work in the Jacksonville laboratory assisting Nina Branch and Lucille Logan with the salt marsh mosquito project. The mosquitoes trapped on Sanibel Island were sent to the laboratory for identification and screening for radioactivity, an indicator of the distance flown. My friend and I were responsible for opening the shipping containers and subdividing the collections into samples for estimating the number of mosquitoes and identifying the species. Nina and Lucille used a Geiger counter to scan the collections for radioactive mosquitoes and recorded the locations where they were collected. It was determined that *A. taeniorhynchus* females can fly several miles and travel much farther if blown by wind. This research project was my first exposure to “hands-on” entomology, an exciting experience that led to three more summers at the laboratory where I became proficient in identifying mosquitoes. During my last summer, Miss Logan taught me how to identify malaria parasites in blood smears that she had accumulated during the years she worked with Dr. Mark Boyd. This four-year experi-

ence in an entomological laboratory caused me to change my major in college from pre-medicine to entomology.

In 1953, dad was instrumental in obtaining \$1,250,000 from the Florida Legislature for permanent mosquito control based on source reduction. These funds, distributed on a matching basis, were appropriated through State Aid legislation and referred to as State II funds in Chapter 388 F. S. There was an additional \$250,000 surplus that year, and representatives of many state agencies were appearing before legislative budget committees in an effort to secure the funds. My dad appeared before one of the committees and said, “You have a big watermelon to cut. I know that many state agencies with worthwhile needs and projects will be asking for pieces of this melon. All we are asking is one seed. If we get it, we will plant it and I guarantee it will produce a rich harvest of greenbacks for the people of our state.” As a result of dad’s efforts, the \$250,000 was provided for constructing and equipping a laboratory, now the University of Florida’s Florida Medical Entomology Laboratory (FMEL) at Vero Beach. On another occasion, dad went before the Florida Governor and Cabinet seeking money for something important. He was almost the last one to appear, and the others before him had not been successful in obtaining funds. Governor Fuller Warren asked my dad, “Mr. Mulrennan, you have seen how unsuccessful others before you have been. What do you think of your

chances?" My dad replied, "Governor, I feel like I'm up to bat and have a two-strike count and the next pitch is going to be a screwball, but I'm going to swing at it with all I have and hope I hit it." This answer got a big laugh from members of the cabinet and they voted unanimously to give dad the money he requested, overruling Governor Warren.

Construction of the FMEL was completed in 1956, and Dr. Provost became the first director and head of the Ecology Section. The FMEL had both a basic and operational research component. Dr. Rogers left the University of Florida in 1956 to join Dr. Provost and lead the operational research component with B. W. Clements and Carlisle Rathburn as staff members. In August 1964, the operational research was moved to Panama City after dad obtained funding to build the West Florida Arthropod Research Laboratory (WFARL). The initial laboratory was located in the cafeteria of an old U.S. Navy base, but the staff moved into a newly constructed laboratory in March 1966. The mission of the WFARL was to develop techniques for controlling arthropods of medical importance. One of the significant research accomplishments of WFARL was an effective means of controlling the dog fly or stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae). It was determined that aerial insecticide spraying should be synchronized with weather fronts that bring the flies south from farms where they breed to the beaches. The insecticide was applied using a Stearman aircraft loaned to the state by Jackie Salmela of Brevard County. After a military surplus DC-3 airplane was acquired from Texas, the Stearman was returned. Dad then created a separate state program, called "Dog Fly Control," to spray the beaches from Apalachicola to Pensacola.

In the late 1960s, the Florida Legislature abolished the State Board of Health and created the largest state agency in the U.S., the Florida Department of Health and Rehabilitative Services (HRS). The Bureau of Entomology became the Office of Entomology in the HRS Division of Health. Many administrative layers were added, whereas in the past the "chain of command" was from dad to Dr. Sowder (Fig. 3) and ultimately to the governor. During 1986 while in HRS, the WFARL was renamed the John A. Mulrennan, Sr. Arthropod Research Laboratory. HRS was reorganized in 1992 and the Mulrennan Laboratory was transferred to Florida A&M University (FAMU). Sadly, in 2012, due to budget reductions, mismanagement by FAMU administrators, and a veto by the governor, the John A. Mulrennan, Sr. Laboratory was closed.



Fig. 3. Dr. John A. Mulrennan, Sr. (right) with Dr. Wilson T. Sowder, who served as state health officer from 1945 to 1974.

In 1979, the Florida Legislature transferred FMEL from HRS to the University of Florida. At the time, Dr. Rogers served as director of the Office of Entomology in HRS, following dad's retirement in June of 1976. Dr. Rogers was the director from June 1976 to June 1979 prior to my appointment in July 1979. Dad never took sides in the debate regarding the transfer of FMEL to the University of Florida because his good friends, Drs. Provost and Rogers, were not in agreement about the move (The Mosquito Wars. A History of Mosquito Control in Florida, Florida Entomologist 87: 417–418, 2004). Later, dad told me it was the best thing that could have happened. He thought HRS would never be supportive of FMEL or other entomology programs because there were too many competing factions. Decisions were made by social workers and not physicians and scientists. In his opinion, the social workers did not understand the importance of public health, particularly control of vector-borne diseases. He was absolutely right! I witnessed it firsthand during my 17 years as director and later bureau chief of the Office of Entomology under HRS. The Office of Entomology was moved to the Florida Department of Agriculture and Consumer Services in 1992 and renamed the Bureau of Entomology and Pest Control. Regardless of the administrative placement and names for programs that prevent disease or control pestiferous insects, it always has been difficult to gain support for them from the Florida Legislature, public administrators, and the general public. This was true even in the Navy when I was a medical entomologist. Dad's vision for FMEL was right on target. The FMEL has prospered under the management provided by dad's alma mater, the University of Florida. It remains one of the world's leading laboratories for investigating mosquitoes, mosquito control, and mosquito-borne diseases.

John A. Mulrennan, Sr. was the right man, at the right place, at the right time. He had a deep sense of responsibility to the people of Florida and always considered himself a public servant. Fortunately, his boss, Dr. Sowder, gave him the freedom to lobby the Florida Legislature and successfully secure legislation to support his programs. Dad dedicated his life to improving the health and economic well-being of the citizens of his beloved state, and the public health programs he established have been extremely successful. Florida has no endemic malaria or other mosquito-borne diseases, and pestiferous mosquitoes normally are maintained at acceptably low levels. Thankfully, most people in Florida have no idea what it was like to live in coastal areas of the state or be threatened by vector-borne diseases. Even occasional outbreaks of St. Louis encephalitis, West Nile virus, or dengue fever are quickly quelled and therefore generate little attention. Without the accomplishments of public health and mosquito control pioneers like my dad, Florida would not be a year-round tourist destination, the economy would be weaker, and the health of the citizens would be compromised. Nevertheless, he would not be able to accomplish this important work today because, as evident in recent legislative cuts to Florida mosquito control, the current bureaucracy would not allow it or likely would add roadblocks to achieving success.

The honors John A. Mulrennan, Sr. received during and after his illustrious career are a testament to his extraordinary success and the esteem in which he was held by his peers. A mosquito and a sand fly species bear his name in international scientific nomenclature. He served as president of the American Mosquito Control Association, State Public Health Vector Control Association, Florida Anti-Mosquito Association, Florida Entomological Society, and Florida Public Health Association, and was the first chairman of the United States and Territorial Vector Control Conference. He received the Meritorious Service Award from the Florida Public Health Association and was installed in their "Hall of Memory." He also was awarded "Florida's Man of the Year

in Entomology” in 1974 by the Florida Entomological Society (Florida Entomologist 58: 121–123, 1975). However, the tribute he cherished most was the Honorary Doctor of Science degree bestowed by his alma mater, the University of Florida, in 1972 (Fig. 4). He loved the “Gators” and was a diehard fan for many years before his passing. In his Presidential Address to the Florida Public Health Association in 1955, Dr. Mulrennan, Sr. (Fig. 5) made the following statement that summarizes his philosophy of life: “If you have faith in the mission to which you have dedicated yourself for suffering humanity—then, with your technical knowledge you will be able to open wide the eyes, minds, and hearts of all mankind to the fact that public health is the preservation of the human body. Our responsibility is one of supreme importance when we realize that the human body is the most sacred of all temples—for therein dwells a soul which on that final day must give its accounting for its stewardship on this earth.”



Fig. 4. Dr. John A. Mulrennan, Sr. being awarded the Honorary Doctor of Science degree from the University of Florida in 1972.



Fig. 5. Portrait of Dr. John A. Mulrennan, Sr. (1983).

Acknowledgments

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