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UNCLE SAM'S ACE INSECT HUNTER: SENEKERIM DOHANIAN[1]

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It was an inauspicious beginning to what would ultimately be a fruitful, 44-year career with the USDA. Although he never moved up the bureaucratic ladder, Senekerim Dohanian played an important role in the early days of biological control of insect pests, creating a lasting impact on science and society.

Dohanian was born in 1889 to Armenian parents in Malatya, a town in eastern Turkey. In 1895, when Dohanian was 6 years old, Turkish officials began a campaign to exterminate the ethnic Christian Armenians who historically occupied eastern Turkey. Dohanian's father and grandfather were among the approximately 200,000 Armenians killed during a 2-year period (Armen 1987). Out of tragedy, however, sometimes comes triumph, and Dohanian's case helps prove that point. Had the massacres not occurred, his life might have followed a very different course—one that might not have included his many accomplishments.

Through grit and determination, Dohanian and his mother, grandmother, uncle, and 2 brothers escaped Malatya in 1903, traveled by boat to America, and settled in Somerville, Massachusetts. Dohanian entered public grammar school at the age of 14 to learn to read and write English alongside 6-year-olds. He finished grammar school in 1905 and then went on to Somerville High School, graduating in 1909.

Following graduation, Dohanian enrolled in the Massachusetts College of Agriculture in western Massachusetts, but, always a penny pincher, transferred to Tufts University so he could save money by living at home. He received a B.S. degree in Forestry in 1913 and continued his studies at Harvard University School of Forestry, where he received a master's degree in 1915 (Fig. 1).

Fig. 1. Senekerim Dohanian as a young man.

It is unknown as to why he decided to pursue an education, as no other family members went to college. This is even more remarkable given that, at the time, only 3% of Americans had college degrees (Caplow et al. 2001). Dohanian was soon employed by the U.S. Department of Agriculture as an entomologist with the Gypsy Moth Lab in Melrose Highlands, Massachusetts, until he enlisted in the U.S Army in 1917 (Dohanian 1958).

KELLY FIELD, TEXAS, 1917-1919

Dohanian was stationed at Kelly Field Aviation Camp just outside of San Antonio, Texas. It was the first training camp for the nascent air division of the Army (soon to become the Air Force), with 250,000 soldiers trained there in a 2-year period (Callender 2001).

Dohanian served as camp entomologist, a critical position because disease-carrying insects could have posed a significant danger to soldiers in the camp. The camp was hastily built on former cotton fields and had poor drainage. The resulting pools of standing water provided *Anopheles* mosquitoes, which carried malaria, with ideal habitat in which to lay their eggs. Dohanian directed a biological control project, using a technique known as "source reduction," which is done by removing habitat, in this case the mosquitoes' breeding grounds. When Colonel Lewis, Sanitary Officer of the Medical Department for the Air Service, inspected the camp in 1918, he stated, "There are very few flies in the camp and no mosquitoes" (Dohanian 1920).

[1]Pioneer Lecture delivered at the 2010 annual meeting of the Florida Entomological Society.

Government researchers discovered that Dohanian had completely eliminated yellow fever mosquitoes in Kelly Field, thus protecting the camp's soldiers from possibly fatal diseases (Dohanian 1920).

Gypsy Moth, 1915-1926

Dohanian then returned to the USDA Gypsy Moth Lab and was sent to Europe in 1924 as part of the USDA's first "super-project" in biological control. The goal was to collect parasites of the gypsy moth, which had been accidentally released into Massachusetts in 1869 and was wreaking havoc across the eastern United States by destroying thousands of acres of forests (Burgess & Crossman 1929).

With the help of the Spanish government, Dohanian set up a laboratory in Madrid to study parasites of the gypsy moth. The work done in the lab was considered so important that the king and queen of Spain, personal friends with Spain's chief of the bureau of entomology, visited it several times. According to Lyons (1935), 'The Armenian refugee of 1895 lent his microscope to a king in 1925. That is the adventure of American education.'

One of the parasitoids Dohanian found while he was in Spain was an ichneumonid wasp, *Apanteles melanoscelus* (Ratzeburg). Dohanian reared this parasitoid and shipped nearly 100,000 of them to North America where they could be released into infested areas.

During his work, however, Dohanian discovered that *A. melanoscelus* was itself being attacked by parasitoids. This is a phenomenon known as hyperparasitism, which he described in detail (Muesebeck & Dohanian 1927). This paper, cited by researchers worldwide from the time it was written until the present, was possibly the most important outcome of his work on the gypsy moth. Researchers are still looking for an effective parasitoid that will survive in New England.

Dohanian was forced to quit studying the gypsy moth after the barbed, poisonous hairs of the caterpillar got inside his throat and lungs. This caused lifelong asthma, which he nicknamed "the fuzz." However, this did not end Dohanian's career. He continued his fight against other insect pests.

From 1926 to 1927, Dohanian worked for American Cyanamid and traveled in Europe. He published on the application of Cyanogas in vineyards (Dohanian 1927), but interestingly, he did not include this brief period of service on his resume. It is unknown whether it was because he did not agree with the use of chemicals on plants, if the time was too brief, or if the nature of his work was out of context with the job search for which he prepared his resumé.

European Corn Borer, 1927-1934

In the 1930s, more than one-eighth of Long Island, New York, was cultivated, with its chief crops being potatoes and corn. In 1923, the European corn borer was discovered infesting corn in Long Island, creating a significant economic problem of concern to the USDA (Dohanian 1934). In 1927, Dohanian began his work with the USDA on combating this problem. He supervised the rearing of the European corn borer's natural enemies, which were sent to his laboratory in Arlington, Mass., from Europe and the Far East.

In 1933 he released almost 70,000 of these parasites in Long Island and expressed hope that at least 2 of the 16 species of the released parasitoids would be effective against this pest (1934). One of them was a tachinid fly, *Lydella stabulans grisescens*. Seventeen years later, an article in *TIME Magazine* (1951) stated, "The USDA announced that one of the worst crop-eating insects, the European corn borer, has neared the end of its reign of terror in US cornfields. Its conqueror was a fly named *L. stabulans grisescens"* (Robineau-Desvoidy, now called *Lydella thompsoni* Herting). The USDA may have been overly optimistic. *Lydella thompsoni* was not effective against the pest in all locations, nor were many other parasitoids. Even so, Dohanian's work still appears to have had an impact on corn production in the U.S. (Capinera 2010).

Tropical Pests, 1935-1936

In 1935, the USDA sent Dohanian to the Caribbean and South America to search for natural enemies of insects that harm sugar cane, cocoa, bananas, and coconuts. His 9-month search took him to the island of Trinidad as well as to British Guiana and Peru. The work required the cooperation of a number of government entities, in order to allow for the capture, rearing, and exportation of the parasites to the U.S. and Puerto Rico. By the mid-1930s, air service in the tropics was sufficiently established to help facilitate shipment of specimens.

In all, Dohanian shipped over 21,000 parasitoids and predators, which included 11 species, to Puerto Rico, Florida, and California. Most of the specimens perished on the trip to California, and those that survived were not established. However, there was a little more success in Florida and Puerto Rico. Today, nearly 75 years later, 3 of the coccinellids are established. In Puerto Rico, *Pentilia castanea* Mulsant is doing well on the west side of the island, where it is controlling scale insects; *Pseudoazya trinitatis* (Marshall) is effectively controlling coconut scale and whitefly. In Florida and Puerto Rico, *Cryptognatha nodiceps* Marshall is established and appears to be keeping coconut scale in check (Frank 2009; Segarra 2009).

Dohanian published 4 papers (Dohanian 1937a,b,c,d) in English on his work in the tropics. He also contributed specimens to the Florida State Collection of Arthropods, which are still a part of the collection today (Woodruff & Sailer 1977).

Filbert Worms, 1937-1947

Near the end of the Great Depression and throughout World War II, food production was more important to the United States than ever. The USDA sent Dohanian to Eugene, Oregon to establish a laboratory to help fight the insects that were destroying Oregon's filbert (hazelnut) crops, which account for 99% of the United States' total production.

Filberts were a relatively new crop, providing welcome habitat for the indigenous filbert worm (*Melissopus latiferreanus* (Walsingham) (Lepidoptera: Tortricidae, also known as the Catalina cherry moth), whose major prior host was acorns and oak trees.

Infestations in filbert orchards were a significant economic problem, costing farmers lost revenue from rejected crops. Before Dohanian came along, filbert orchards were sprayed with lead to control pests. But with the onset of World War II, lead could no longer be sprayed, as it was needed for other uses, besides the fact that it was dangerous and ineffective. Dohanian was brought in to establish a better method of pest management. He devised a biological and cultural control program that changed the filbert industry to this day.

Dohanian spent years studying the life cycle and biology of filbert worms, and he discovered that the filbert worm larvae over-winter in prematurely dropped nuts (Dohanian 1942a,b). He found that removing the infested nuts from the ground before the harvest results in a much lower infestation rate. Dohanian determined that using laborers, pigs, or mechanical means, such as flailing, would effectively remove infested nuts (Dohanian 1944). His discovery had a large impact on the filbert industry.

Dr. Vaughn Walton, an assistant professor at Oregon State University, estimates that 90% of filbert growers in Oregon still use methods of control that Dohanian developed. Through flailing, they are able to achieve infestation rates lower than 1%—the threshold over which processing plants will reject crop shipments (Walton 2009).

According to researcher AliNiazee (1998), "Hazelnuts are on the verge of becoming one of the first crops in grown in the United States that could possibly be produced commercially without the use of any broad-spectrum organic insecticides."

Dohanian left a lasting legacy in Oregon. In fact, filberts annually are currently a $50-million industry (Savonen 2009), which might not have come to be had it not been for his work.

Later Years, 1948-1972

From 1948 to 1959, Dohanian worked for the Agricultural Research Service, Plant Quarantine Division, in New York City, inspecting baggage coming into the port on planes and ships, searching for foreign insect pests and disease, and confiscating offending items. After this period of dedicated service, he retired.

However, Dohanian continued to be fascinated by insects even in retirement. Although he lived in New Hampshire, he spent winters in Arizona and California for his asthma. He collected aphids in Arizona, one of the only collections of its kind, which was later documented and published by Leonard (1974b) after Dohanian's death (Leonard 1974a).

Dohanian's work has had an impact on biological control today. With public opinion veering away from the use of chemicals, interest in some of his groundbreaking work—discovering and implementing alternatives to chemicals—has returned (Flint 2009; Webber 2009). His work, largely documented in his published papers, has been cited by researchers from as far away as Poland and Japan and as recently as 2008.

Dohanian completely devoted his life to his work, perhaps even, as some family members have speculated, to the exclusion of a personal life. He never married or had children, but was a devoted uncle, brother, and son throughout his life. His humble beginnings led to a drive for education and a solid career—hallmarks of a man who was committed to hard work and a sense of duty. Although he was fairly reticent about his work, he would be happy to know that it was being recognized, and he'd probably eke out a smile and crack a wry joke were he with us today. For more information on Dohanian, including copies of his papers, go to www.unclesennie.com.

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