John E. Halver

1922–2012

BIOGRAPHICAL *Memoirs*

A Biographical Memoir by
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and Ronald W. Hardy

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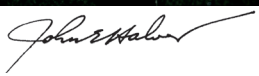
NATIONAL ACADEMY OF SCIENCES

JOHN EMIL **HALVER** III

April 21, 1922–October 24, 2012

Elected to the NAS, 1978



By Robert J. Cousins and Ronald W. Hardy

John Halver was a true son of the State of Washington. It is where he was born, educated, employed, and where he produced major accomplishments in research and service and lived a long and successful life.

Halver was born on April 21, 1922 in Woodinville, Washington, about thirty miles northeast of Seattle. His parents, John E. Halver and Helen Hansen Halver, were first-generation descendants of Finnish and Danish-Norwegian immigrants. Growing up during the Great Depression, Halver worked on the family farm, where he sold milk and raised veal calves to help support his early education, which his mother encouraged. That education gave him the didactic background, particularly in chemistry, to win an agricultural innovation scholarship to attend Washington State University. His successful project demonstrated how paper-like material could be produced from wheat straw. Halver majored in chemistry at Washington State and received his bachelor of science degree in 1944 (awarded in absentia).

Military service in World War II

Halver's education was interrupted by World War II. He served as a US Army Ranger in the European Theatre and rose from platoon leader to captain. His military service was near the end of the war, being called to active duty just after D-Day. He was involved in many campaigns in France and Germany, including the Battle of the Bulge. Halver received numerous citations for his military service, including the Presidential Unit Citation and the Croix d' Valeur, two Bronze Stars, and the Purple Heart. He also served in the Army of Occupation after the surrender.

Graduate education

After the war, Halver pursued graduate studies, earning a master of science degree in organic chemistry from Washington State in 1948. He enrolled in graduate studies briefly at Purdue University, in 1948 and 1949, before transferring to the University of

Washington. After a year as a teaching fellow in 1949, he became an employee of the US Fish and Wildlife Service (USFWS) concomitantly with his graduate studies in Seattle. He completed his PhD in the field of medical biochemistry in 1953.

Father of fish nutrition

Halver frequently emphasized that the name, H440, was to signify his success in developing the test only on the 440th attempt.

Halver's career led to his recognition as "The Father of Fish Nutrition" by the Fisheries Hall of Fame, a designation that crystalized when he was appointed founding director of the USFWS Western Fish Nutrition Laboratory in 1950. He held that position at the Cook, Washington, site until 1975. Duties for this position reflected his interest in the nutrition of fish and provided the topic of his doctoral dissertation, which focused on developing a diet for Chinook salmon composed of vitamin-free casein, gelatin, dextrin, minerals, select vitamins and oils. This formula facilitated selective addition and deletion of vitamins, which enabled him to establish nutrient requirements in this commercially important species. In later years it was the basis for the standard vitamin test salmonid diet (H440) used for experimental nutrition projects with other species of fish on a worldwide basis. Halver frequently emphasized that the name, H440, was to signify his success in developing the test only on the 440th attempt.

The Chinook salmon remained the most important animal model for his research. He was particularly interested in the water-soluble vitamins. He documented deficiency syndromes for thiamine, riboflavin, pyridoxine, pantothenic acid, biotin, niacin, folate, choline, vitamin C, vitamin B12, and various fat-soluble vitamins. Each vitamin deficiency required development of a specific test diet, based around the H440 formulation, and each deficiency required extensive physical measurements and biochemical assays.

Halver's research led in 1972 to publication of the textbook *Fish Nutrition*, a multi-authored book that he edited. A second edition, also published by Academic Press but with different chapter authors, appeared in 1989. A third edition, published by Elsevier, came out in 2002 and was co-edited with Ronald W. Hardy, Halver's longtime associate and co-author of this memoir. These texts have been a valuable reference source for the aquaculture industry worldwide.

Life as an academic

When the Western Fish Nutrition Laboratory closed in 1975, Halver entered a new career phase as professor in nutrition at the University of Washington in the College of Fisheries while retiring from the USFWS as a senior scientist. He taught fish nutrition, supervised graduated students, and organized short courses for an international cadre of professionals working in the fisheries industry until 1992, when he retired with status as professor emeritus. He went on to form the Halver Corporation, capitalizing on his vast experience in the science of fish nutrition in a global setting.

John Halver

Halver's career is replete with notable achievements and discoveries. He discovered that vitamin B12 was the anti-anemic factor in salmon, identified indispensable amino acids for fish, identified ascorbate-2-sulfate (vitamin C2) as the storage form of vitamin C in fish and the enzyme L-ascorbyl-2-sulfohydrolase as a regulating factor for circulating levels of vitamin C in blood, and he discovered the protective role of selenium during stress. He also established which isoforms of vitamin C were the most stable in animal feeds when exposed to heat and light.

In a career that covered many decades, Halver's paramount accomplishment is arguably his coupling of aflatoxin produced by *Aspergillis* fungi consumption with hepatocarcinoma in rainbow trout. He clearly demonstrated the sensitivity of rainbow trout to mycotoxin consumption (contamination). It should be noted that the aflatoxin research was carried out primarily at Hagerman, Idaho, where the USFWS, under Halver's direction, established a fish nutrition laboratory that is currently the University of Idaho Fish Culture Experiment Station.

Professional service

Halver was proud of his national service in fish nutrition and fishery research. He developed a didactic program on fish nutrition for the Marine Sciences Laboratory in Port Aransas, Texas. He served on the National Research Council Committee on Animal Nutrition and the Board on Agriculture and Renewable Resources, and he supervised a USDA Northern Research Station study of agricultural effects on fish and wildlife habitat. He also served on numerous editorial boards including those for the *Journal of Nutrition, Marine Ecology, Journal of Applied Ichthyology, Aquaculture and Fisheries Management,* and *Aquaculture Research.*

International travel, lecturing, and consulting were activities that Halver enjoyed. Over the years these activities took him to more than forty countries including Italy, Germany, Laos, Thailand, Bangladesh, India, the USSR, Australia, Yugoslavia, Scotland, Japan, Egypt, Vietnam, France, Tunisia, Germany, Malaysia, Spain, Portugal, Korea, Chile, the Netherlands, the Bahamas, Israel, the Czech Republic, Turkey, Switzerland, and Mexico. These trips consisted of both governmental and industrial consultancies. Many were sponsored by the Food and Agricultural Organization of the United Nations, the United Nations' Development Program, the World Bank, USAID, and the International Executive Service Corps.

A plethora of honors

Election to the National Academy of Sciences (NAS) in 1978 was based, in part, on Halver's unique contributions to nutrition of fish and research on the connection between aflatoxin and liver cancer in fish, as well as methods to prevent that outcome. Halver was a particularly vigorous promoter of the Academy. Induction into the National Fish Culture Hall of Fame (American Fisheries Society) in 2000 was also a source of great pride for him, since virtually his entire professional career was devoted to scientific discovery related to fish. His international honors included membership in the Hungarian Academy of Sciences, the Makila d' Honneur (Basque), and recognition as a Citoyen d' Honneur (France). He received an alumni award from Washington State University, was a founding member of the Washington State Academy of Science in 2008, and an honorary life member, bestowed in 2008, of the World Aquaculture Society.

Personal life

John married Jane Loren on July 21, 1944, just prior to being called to active duty and sent to Europe with the US Army. The Halvers have five children: John Emil IV, Nancylee, Janet, Peter, and Deborah. They also have twelve grandchildren and four great-grandchildren. Halver was a religious person and frequently presented lectures on the interrelationships of science and theology. A favorite quote of his is, "God is the author of truth, and science is the search for truth. They are not in opposition. Eventually the two paths must converge." Halver passed away on October 24, 2012, at the age of ninety in Seattle, not far from where he was born.

Upon Halver's passing, Dr. André Punt, Director of the School of Aquatic and Fishery Sciences at the University of Washington, noted, "Although retired for about twenty years, John continued to be very active, and passionately continued to publish papers in top journals…John will be remembered by all for his dedication to the school and to science in general."

Ron Hardy and Gary Wedemeyer reflected in a 2013 memorial note, "John Halver set the bar for fish nutrition research, bringing solid nutritional biochemistry to the subject and building the foundation for today's global aquaculture industry by quantifying the nutritional requirements of fish. All fish feed production around the world is based on his pioneering research."

ACKNOWLEDGEMENTS

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