Chemical Research in Toxicology

Editorial

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Virtual Issue on the Work of John Casida

With the death of John E. Casida, the scientific community lost an extraordinary scientist and toxicologist. This Virtual Issue on the works of John Casida in *Chemical Research in Toxicology* commemorates his long-standing career in pesticide toxicology and showcases the depth and breadth of his career in understanding the toxicological, biochemical, and metabolic mechanisms of pesticides and environmental chemicals.

John was a preeminent pesticide biochemist and toxicologist at the University of California at Berkeley. He made seminal discoveries in the fields of pesticide biochemistry and toxicology. John was best known for investigating how pesticides worked, particularly as it related to how pesticides had selective toxic effects on the pest species over mammals. He also studied how these pesticides also caused harm to humans and the environment. His research on natural and synthetic pesticides in his laboratory laid the groundwork for the development of more selective and safer compounds.

His research accomplishments spanned nearly 70 years. John was a scientist whose research transcended disciplines to reveal solutions to scientific problems that often gave birth to new areas of research. His interests as a teenager in collecting insects and field biology shifted to pesticide effects with the advent of DDT and other synthetic agrochemicals that became available in the 1940s. He became interested in the molecular and metabolic mechanisms of how pesticides worked. He made critical contributions to the chemistry, metabolism, and toxicology of many key classes of pesticides still in use today, including organophosphate, carbamate, pyrethroid, neonicotinoid, and ryanoid compounds, and through investigating the actions of these insecticides, made pivotal discoveries that impacted neuroscience, metabolism, biochemistry, and many other fields.

His many significant research accomplishments include his discoveries on how organophosphate, methylcarbamate, and pyrethroid insecticides, major insecticide classes still in use today, are metabolized in insects compared to mammals to confer selective insecticidal action. He later discovered many other toxicological mechanisms through which organophosphorus pesticides and environmental contaminants may cause harm to mammals through binding to and inhibiting many enzymes important in the brain. Another major achievement is his discovery that botanical insecticide ryanodine blocks an ion channel for calcium, now known as the ryanodine receptor, important in nearly every aspect of neuron and muscle cell function. He also pioneered chemical probes that enable investigations into the functions of important chloride ion channels, the GABA-gated chloride channels, in the brain. He made key critical insights into how neonicotinoid insecticides still widely in use today, confer selective toxicity toward insects compared to mammals, compared to nicotine. These studies yielded key insights into the function of the nicotinic acetylcholine receptor, a key receptor in the brain and muscles involved in neurotransmission, memory, and movement. Each of these discoveries not only led to important insights into the safety or toxicity of pesticides and environmental chemicals, but also enabled investigations into areas of neurobiology that were previously undiscovered or inaccessible to scientists.

John was born on December 22, 1929 in Pheonix, Arizona to Lester Earl Casida and Ruth Barns. Lester and Ruth had three children, and John was the last surviving of the three. He earned a B.S. from the University of Wisconsin at Madison in Entomology in 1951. He completed his M.S. in Biochemistry in 1952 and Ph.D. in Entomology and Biochemistry in 1954 from the same university. Graduate school was interrupted by service in the U.S. Air Force Atomic, Biological, and Chemical Warfare program where he continued to pursue problems on toxicant mode of action. Upon graduation with his Ph.D. from the University of Wisconsin at Madison, he joined the faculty of his alma mater and was promoted to professor where he directed the Pesticide Chemistry and Toxicology Laboratory. In 1964, he moved to the University of California at Berkeley, where he was a professor of Entomology and Toxicology and eventually in the Department of Environmental Sciences and Policy management before transitioning to become a professor of the graduate school in 2014. At Berkeley, he directed the Environmental Chemistry and Toxicology Laboratory. From 1996, he was the William Muriece Hoskins Chair in Chemical and Molecular Entomology and the University of California at Berkeley.

John authored or coauthored more than 850 publications and 30 patents in the field of pesticide toxicology focused on pesticide mode of action and metabolism, particularly on mechanisms of selective toxicity. He trained more than 230 scientists who now occupy leading positions in industry, government, and academia across the world. He won numerous awards, including the 1970 Guggenheim Fellowship, the first International Award for Research in Pesticide Chemistry in 1971 and 1978 Spencer Award for Research in Agricultural and Food Chemistry by the American Chemical Society, 1988 Distinguished Service Award for Research by the USDA, and the 1989 J.E. Bussart Award and Fellow of the Entomological Society of America. In 1993, he was awarded the Wolf Prize in Agriculture "for his pioneering studies on the mode of action of insecticides, design of safer pesticides and contributions to the understanding of nerve and muscle function in insects." He also received the Koro-Sho Prize from the Pesticide Science Society of Japan in 1995. He was elected to the US National Academy of Sciences in 1991 and to the Royal Society (UK) in 1998. In 2008, he received the Career Achievement Award from the College of Natural Resources at UC Berkeley.

John was passionate about science. His curiosity about pesticides and how they worked was infectious. He instilled this curiosity into his students and fellows and trained them to become critical thinkers and to learn how to choose the best scientific questions to pursue. He was an active researcher and teacher until his passing.

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"John and his laboratory at Berkeley provided me with the most exciting years of my scientific career. In his own work John moved from strength to strength creating numerous entire fields along the way," said Bruce Hammock, Distinguished Professor of Entomology and Comprehensive Cancer Center at the University of California at Davis and a Casida mentee. "He was an inspiration and role model not just because he came in early and stayed late, but because he did science for the fun of discovery and taught for the joy of teaching."

"It is unbelievable and so painful to lose a beloved friend, mentor, teacher and a distinguished scientist—John E. Casida—I just recalled a parable likening human life to a ship sailing across the ocean; so when the ship returns to its port, all shall know the record of the ship, that is to say, the successful voyage and mission accomplished. The onlookers are awed, and there is only praise for the ship returned, which has left such a glorious legacy behind," writes Professor Emeritus Izuru Yamamoto, Tokyo University of Agriculture and Casida mentee who directed Casida's lab when he was on sabbatical from 1970 to 1971. "His legacy, shall live on to the benefit of the future generations."

"John's kindness and gentle nature touched so many lives. His keen insights launched pesticide toxicology and had immense impact in many fields of science. John was truly among a small number of rare Renaissance individuals whose ideas and writings will live on forever. He will be missed by many," writes Isaac Pessah, Distinguished Professor and Associated Dean of Research and Graduate Education in the College of Biological Sciences at the University of California at Davis and also former Casida mentee.

"I have lost an incredible mentor, and the scientific community lost the most preeminent pesticide toxicologist in the last two centuries. John changed the way we investigated mechanisms of toxicity at all levels. I certainly will miss him dearly," writes Professor Sarjeet Gill, Distinguished Professor of Molecular, Cell and Systems Biology at the University of California at Riverside and also former Casida mentee.

In a special issue of *Journal of Agricultural and Food Chemistry* celebrating John Casida's career in 2011, Casida wrote an article entitled "Curious about Pesticide Action", where he noted, "Scientific advances are dependent on asking the right questions at the right time and having the intellectual and institutional environments to pursue the answers. Unique discoveries require the freedom to explore pesticide action in whatever direction our curiosity and serendipity might lead us. Only then can we continue to devise and use safe and effective pesticides to maintain food resources and health for an expanding human population."[1]

Outside of lab, John Casida enjoyed photography and collected Russian icons and pre-Columbian pottery from Central and South America. His wife Kati and John both also enjoyed Greek folk dancing. He was a lover of art and Kati's artistic career.

John Casida leaves behind his wife Kati Casida, his sons Mark and Eric Casida, Mark's wife Kim Collins Casida, and two grandchildren Mariposa and Tenaya Casida.

More about John Casida's career can be found in reviews written by Professors Bruce Hammock and wife Kati Casida, Dr. John Johnston, and Professor John Casida himself.[1−3]

Daniel K. Nomura

Departments of Chemistry, Molecular and Cell Biology, and Nutritional Sciences and Toxicology, University of California, Berkeley, 127 Morgan Hall, Berkeley, California 94720, United States

AUTHOR INFORMATION

ORCID

Daniel K. Nomura: 0000-0003-1614-8360

Notes

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