In Memoriam: Peter J. Van Soest (1929–2021)

David R. Mertens and Mary Beth Hall

Peter J. Van Soest, one of the most influential animal scientists and professors of his generation, died March 21, 2021. Van Soest (pronounced “Van Soost”) was born June 30, 1929, and grew up on a dairy farm in Snohomish, Washington. He graduated from the Department of Dairy Science of Washington State University with a BS in 1951, and a MS in 1952. He said that his minor in physical chemistry gave him a new way of looking

at the world. He obtained his PhD in the Department of Dairy Husbandry at the University of Wisconsin in 1955 and was drafted into the Army where he served as a biochemist at Walter Reed Army Institute of Research, working on analysis of minerals in blood.

In 1957, he was recruited by Lane Moore to join the Dairy Cattle Research Branch of the Animal Husbandry Research Division of the USDA-Agricultural Research Service in Beltsville, Maryland. Van Soest was given the mission to develop nutritionally relevant analyses to replace crude fiber. Although its deficiencies were well known, crude fiber had been used since the 1860s, and replacing it was no simple challenge. An early visitor advised Van Soest to ignore fiber because there was no future in it. Van Soest initially focused on the measurement of lignin, the indigestible component of fiber. He used acid and detergents to remove the nitrogen and hemicellulose contaminations that had been serious issues in lignin determination (Van Soest, 1963, 1973). This led to acid detergent fiber, which was a preparatory step in the measurement of acid detergent lignin, and to work that described the effect of heating on increasing the measured lignin content of forages through heat damage of proteins via nonenzymatic browning reactions (Van Soest, 1965). Van Soest realized that acid detergent fiber was not a measure of total fiber and developed the assay for neutral detergent fiber (NDF) as

an estimate of plant cell walls that were recalcitrant to fermentation in feeds and foods (Van Soest and Wine, 1967). Not content with these breakthrough analyses of fiber, he focused his efforts on the variable digestibility of fiber and total dry matter in feeds. With input from Marvin Bryant, Van Soest developed an in vitro fermentation method that measured the digestibility of NDF (Van Soest et al., 1966; Goering and Van Soest, 1970). With this, he created a summative equation that demonstrated that dry matter digestibility was a function of digestible NDF and neutral detergent-soluble matter (Van Soest, 1967). He pioneered the concept of true digestibility and ideal nutritive entities that are the bases for our current evaluation of available energy in feeds. His fiber and in vitro methods, and ideas about how they should be interpreted, are used throughout the world to improve animal health and productivity. These accomplishments alone would have established the significance of any scientist’s career.

In 1968, Van Soest joined the Animal Science Department at Cornell University and continued his research in fiber, markers, ruminant nutrition, and nutritional ecology. For his efforts, he received numerous awards. It was at Cornell that he wrote his textbook, *Nutritional Ecology of the Ruminant* (Van Soest, 1982, 1994)—the definitive work on the concepts of digestion and metabolism, physiological relationships, feed characteristics, and feed evaluation principles important in ruminant and herbivore nutrition. His 1991 *Journal of Dairy Science* paper on carbohydrate methodology co-authored with Jimmy Robertson and Betty Lewis (Van Soest et al., 1991) has received 16,386 citations (Web of Science), and the *Nutritional Ecology of the Ruminant* (Van Soest, 1994) has received 16,387 citations (Google Scholar). He published 27 papers in the *Journal of Dairy Science*, with his last published in 2020 on the stability of liquid passage markers under reducing conditions (Van Soest and Hall, 2020). His final peer-reviewed paper, on lignin, was published in 2020 (Van Soest et al., 2020).

Peter Van Soest was a consummate teacher—he loved to teach at every opportunity. Innumerable students benefitted from his knowledge and ability to explain things in the classroom and laboratory, on walks in the

woods, or over beer. He was still informally teaching Cornell graduate students in his 90th year! His broad knowledge and deep understanding about the chemistry of feeds and principles of animal nutrition were inspiring. He could not only discuss the characteristics of the rare earth elements and the modeling of carbohydrate digestion and passage, but he could also describe the chemistry of plant pigments, the impact on composition of interactions of plants with their environment, the ecological interaction of herbivores with plants, the nutrition of zoo animals, the role of fiber in human diets, the heat-damaged proteins in breakfast cereals, the nutrition of donkeys and elephants, and the principles relevant to digestion in dinosaurs. At times, his knowledge of chemistry could be daunting—he not only understood the basis for the periodic table, but he could also explain it to you! He was dedicated to helping his students and colleagues understand concepts and their applications to nutrition.

Peter had myriad interests beyond science—a modern Renaissance man. His curiosity knew few bounds and he had the passion and intellect to pursue whatever interested him. He was not formal. He was a connoisseur of wild mushrooms and single malt whiskey, and loved to cook, particularly Indian cuisine. Peter loved classical music, geology, art, and history. He passed his love of the arts to his children, John, Anne, and Justin.

Few animal scientists will have the legacy of Peter J. Van Soest. He indelibly changed the analysis of feeds and the understanding of herbivore nutrition throughout the world. His methods were novel, revolutionary, and useful, as well as foundational to what we do today. His ideas were well developed and comprehensive. His work has mattered to many. For those who knew him, “Pete” will be remembered for his awesome intellect, the intensity of his curiosity, his passion for scientific understanding, and his ability to share his knowledge gladly and freely with others.

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ORCIDS

David R. Mertens <https://orcid.org/0000-0002-1825-7205>

Mary Beth Hall <https://orcid.org/0000-0002-5460-3208>