Niels C. Nielsen

Niels C. Nielsen died November 3, 2015, from complications of stomach cancer. Niels was a USDA–ARS professor in the Agronomy Department at Purdue University from 1978 to 2006, where his research focused on improvement of soybean seed traits. After retiring from ARS in 2006, he was appointed university professor in the Department of Crop Science at North Carolina State University (NC State), where he worked until recently.

Niels was born in Madison, Wisconsin, on July 24, 1942. Following his military service, he received his undergraduate degree in biochemistry from the University of Wisconsin in 1966, and he completed his PhD in 1972 at Vanderbilt University, where he worked on the characterization of D-β-hydroxybutyrate dehydrogenase with Sidney Fleisher. Niels received a Marshall Fellowship through the Danmark–Amerika Fondet in 1972, and from 1972 to 1974 he studied chloroplast membrane biogenesis as a research fellow in the Genetics Institute at the University of Copenhagen in Copenhagen, Denmark, with R. M. Smillie and Diter von Wettstein.

He then moved to the University of California, Davis, where he was an associate instructor in the Department of Biochemistry and Biophysics, working with Paul Stumpf on lipid metabolism. Niels began working as an assistant professor in the Agronomy Department at Purdue University in 1977 and became a USDA–ARS scientist the following year. Brian Larkin, an assistant professor in the Botany and Plant Pathology Department at Purdue, and his graduate student, Maurilio Moreira, collaborated with Niels, helping him during the initial phase of his soybean storage protein research.

Niels’s foundation in plant biochemistry served him well in his research on soybean seed storage protein and lipid biosynthesis. Working along with Mark Hermosin in the Biochemistry Department at Purdue, Niels’s laboratory purified the soybean 11S (glycinin) and 7S (conglycinin) storage proteins and characterized their structure. These studies were done in the late 1970s and early 1980s when little was known about the amino acid sequences of these canonical storage proteins and the way they are synthesized and assembled in protein storage vacuoles. Niels’s lab demonstrated that certain acidic and basic subunits of glycinin associate in a precursor and went on to characterize the protease responsible for processing these precursors.

Bob Goldberg collaborated closely with Niels, characterizing glycinin genes and showing they exist in a small gene family, with some members encoding proteins containing higher levels of methionine, the most limiting essential amino acid in soybeans. It was Niels’s exquisite biochemical work on glycinin proteins that enabled gene structures to be described and the positions of introns and exons defined, an important accomplishment at the time. Similar biochemical and molecular approaches were used to characterize the 7S conglycinin proteins and their corresponding genes, as well as the molecular basis of several soybean storage protein gene mutations. This research provided the conceptual basis for understanding the evolutionary relationship of 7S and 11S storage globulins in higher plants.

In addition to his research on storage proteins, Niels was at the forefront of lipoxygenase research to improve soybean food quality. Oxidation of the polyunsaturated fatty acids in soybean seeds causes the oil to become rancid, reducing the quality and value of processed food products. Soybean seeds contain three different lipoxygenase enzymes. To eliminate their activity, Niels and others identified mutations in the corresponding...
genes and then stacked the mutant alleles in commercially valuable soybean cultivars. This effort was successful and resulted in registration of soybean germplasm that lacks lipoxygenase isozymes. Niels’s interactions with major soymilk and tofu manufacturers to create a small-scale method for tofu production was effectively integrated into this work.

Other research from Niels’s lab provided a comprehensive characterization of the complex network of enzymes and associated genes that constitute soybean acetyl-CoA carboxylase, a key enzyme in fatty acid biosynthesis. In later years, Niels’s research also included methods for improving soybean transformation efficiency, the first soybean TILLING population, and the development of a swine inbred line that is hypersensitive to soy and peanut antigens. During his time at NC State, Niels conducted research to identify the proteins responsible for allergens in peanut and soybean. This work led to identification of protein subunits that cause peanut allergies, which were traced back to the respective wild species progenitors of peanut.

Niels’s accomplishments exemplify the value of integrating basic and applied research, and they were recognized by the American Oil Chemists Society with the Archer Daniels Midland Award for Chemistry and Nutrition (1986 and 1988). Niels received the American Soybean Association Meritorious Service Award in 1992 and a Certificate of Merit from USDA–ARS in 1995 and 1997.

Niels was known as an excellent teacher and mentor who guided and provided a good example to his graduate students and postdocs. On first meeting him, one might have had the impression that he was very serious and all about business. However, students quickly found that they were warmly welcomed into his lab, and Niels became a friend and someone with whom they could share life events unrelated to science. One of his former students recalls applying to graduate school at five agronomy departments in the Midwest, and while waiting for answers, Niels called him at home and made an offer. That personal contact sealed the deal.

Niels struck a balance between leading students into projects and giving them a measure of independence to develop their studies. This was excellent preparation for their professional career, and its success is borne out by the many students who subsequently established themselves in academia, industry, and other professional pursuits. Niels was quick to adopt cutting-edge tools and biochemical and molecular approaches, which benefitted students and provided them the opportunity to publish in prominent journals and be competitive for job opportunities. While expecting excellent work, Niels was not overbearing, and his students felt a partnership doing important research with him. With a knock on his office door, he would stop whatever he was doing and listen to a recent result, no matter how small. Niels was not one to overstate his enthusiasm, but it was not difficult to read a raising of the eyebrows, brightening of the eyes, and subtle smile as genuine delight over a recent success.

Niels was an effective collaborator with many scientists and junior faculty members, as he always had good insight and made useful suggestions. Sally Mackenzie, who started her career in the Agronomy Department at Purdue and was the only female member of the department at that time, attributes her early success navigating the academic ladder to Niels’s counsel and advice. Likewise, Eliot Herman, a USDA–ARS scientist who worked on soybean allergens, attributes his early success in soybean allergen research to the foundation Niels created for soybean molecular biology.

Niels’s family was among his highest priorities. He was very supportive of his wife Judy’s career, which included a doctor of veterinary medicine degree from Purdue University. On his retirement from USDA, his move to North Carolina was prompted by her taking a faculty position in the Department of Pathology and Laboratory Science at the University of North Carolina, where she is now a professor. Both of his children—Erik, an associate professor in the Department of Molecular, Cellular, and Developmental Biology at the University of Michigan, and Kirsten, an associate professor at the

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University of Minnesota—received their PhD degrees and have become successful scientists. When not engaged in research, Niels had diverse interests and hobbies. Among them were his boat and salmon fishing on Lake Michigan and the North Carolina coast, flying, playing the mandolin, his woodworking shop where he built furniture for his family, and all things Scandinavian, befitting an American–Dane. Like his biochemical research, his hobbies required technical skill and knowledge in order to maintain and enjoy them, and this contributed to making him an interesting personality. Niels enjoyed the finer things in life, including good food, good wine, and good beer, which we shared at many scientific meetings. He was an early advocate for craft beer and created fine products for his own indulgence.

Niels was generous sharing his knowledge and expertise and was a remarkable scientist and a caring person. Niels left a personal and scientific legacy that will be remembered and missed by those of us who knew him, as well as by the entire plant science community.

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