In memoriam
Jack Ernest Staub, Plant Breeder (1948-2019)

Dr. Jack Ernest Staub, husband, father, friend, educator, mentor, and plant breeder, died unexpectedly on July 8, 2019 at age 70. He spent his last days with his wife Frances at their Big Fork, Montana log home. Jack will be remembered by many beloved colleagues around the world.

Jack was born in 1948 in Denver, Colorado before moving to Bountiful, Utah where he spent his youth. He earned his B.S. in botany (chemistry minor) and M.S. in botany (cytogenetics) from Utah State University, where he lettered in wrestling, which is telling of his tenacious spirit. Somewhere along the line he mastered the banjo. His sister, Sonnya, was a childhood friend of his future wife Frances Cook, whom Jack did not know until their fateful meeting at The Pennsylvania State University, where she was studying for a M.A. in theater and Jack was working on his Ph.D. in Horticulture and Genetics. Kodie Ann entered their lives in 1990.

Jack's career path took a number of turns following his M.S. studies, first as a staff member, Toxicology Department, Sandoz, Ltd., Basel, Switzerland (1973-1974), then returning, to be Head, Cytogenetics Laboratory, Microbiological Reset Corporation, Bountiful, Utah (1974-1975), and finally Research Associate, Pharmacology Department, Medical College of Virginia, Richmond, Virginia (1975-1976).

In 1980 Jack completed his Ph.D. at The Pennsylvania State University. From 1981 to 1983 he served as Project Associate and Adjunct Assistant Professor of Horticulture, University of Wisconsin-Madison as part of Clint Peterson's pickling cucumber team in the USDA-ARS Vegetable Crops Research Unit and began his association with long-time colleague Phil Simon, ARS carrot and onion breeder and geneticist and, later, Mike Havey, ARS cucumber and onion breeder and geneticist. Jack became a USDA-ARS Research Horticulturist at Madison two years later, focusing on cucumber improvement until the mid-1990s when he began to work also with melon (*Cucumis melo*) and then squash (*Cucurbita*).

Jack's research in the ARS Vegetable Crops Research Unit, Madison involved the development of multiple disease resistant, high fruit number cucurbit germplasm that is basic to the needs of private industry and the consuming public. The research included: 1) the collection, identification, description, and application of unique germplasm in *Cucumis* species; 2) investigations of the genetic, biochemical, and physiological nature of cucumber, melon, and squash (*Cucurbita pepo* L.), and; 3) the modification of cultural practices which exploit the genetic potential of cucumber. His scientific interests in the genetic relationships among wild melon and squash and their commercial counterparts, as well as the relationships among melon market classes were initiated because they were not well defined and improvement for yield and quality in U.S. processing cucumber and Western Shipping melon had plateaued around 1990. The widespread debate concerning the potential use of molecular marker technologies for the use of marker/trait associations for plant improvement spurred his activities in mapping, quantitative trait loci (QTL) analysis, and marker assisted selection (MAS). Jack received tenure as an Associate Professor, University of Wisconsin-Madison in 1989 and Full Professor in 1993 in the Department of Horticulture, where he trained 21 graduate students, and mentored six postdocs and seven visiting scientists. As a research mentor, Jack was an ardent supporter of minority recruitment, especially through the Society for the Advancement of Native Americans and Chicanos in Science (SACSNAS), where he regularly convened professional development courses and trained graduate students that are leaders in science today.

Jack relished his germplasm related activities beginning with a 5-week cucumber and melon germplasm collection expedition in 1992 to the states of Rajasthan, Madhya Pradesh, and Uttar Pradesh, India (Figure 1). This cooperative project under the auspices of Indo-NBPGR and USAID Cooperative Agreement and coordinated by USDA, OICD (October-November 1992 increased the U.S. National cucumber and melon germplasm collection each by 20%. Before this time only 10% of each U.S. collection was from the country of origin or diversity where the greatest source of genetic variation occurs. This was followed by three trips in 2000 related to geneflow of melon. First, a 2-week squash and melon germplasm collection expedition in Mississippi, Arkansas, and Louisiana funded by a grant obtained through the U.S. National Research Initiative that resulted in the description of *Cucumis melo* ssp. *agrestis* var. *texanus*, a potential source of traits for melon. Second, a 2-week melon germplasm collection expedition in Arizona, California, and Mexico funded by a grant obtained through Agritope.

One of his more interesting germplasm projects focused on taxonomic relationships of a rare *Cucumis* species (*C. hystrix* Chakr.) with cucumber that led to their interspecific hybridization, a system for micropropagation for hybrid recovery, reproductive and cytogenetic characterization of interspecific hybrids from *Cucumis hystrix*, backcross introgression of the *Cucumis hystrix* Chakr. genome to cucumber to increase genetic diversity in U.S. processing

cucumber, and release of a *Cucumis hystrix*-derived U.S. processing cucumber inbred backcross line population.

Jack implemented and developed marker systems in *Cucumis* that led to: 1) the genomic characterization and moderately saturated maps in cucumber and melon; 2) characterization of evolutionary relationships in *Cucumis* and *Cucurbita* species; 3) construction of genetic stocks to provide the first estimates of linkage marker/trait relationships (morphological traits, disease resistance loci and yield components (QTL)) in cucumber, and linkage analysis in melon; 4) development of methodologies for germplasm diversity assessment; 5) the use of molecular markers for plant variety protection; 6) development and release of genetic stocks that broadens the genetic base of cucumber; and 7) the successful application of marker-assisted multi-trait selection in cucumber, and made comprehensive efficacy comparisons between marker-assisted and phenotypic selection in a vegetable crop species. Jack was the first to characterize cucumber plant response under soil water deficits and chilling temperatures, defined physiological differences in cucumber varieties to water stress to characterize a calcium-related cucumber fruit disorder, and provided irrigation management information that improved water use efficiency through a systems management approach.

Jack yearned to return to his native west and in 2007 moved with Francy and Kodie to Logan, Utah where he was Supervisory Plant Physiologist and Research Leader of the ARS Forage and Range Research Laboratory (FRRL) and Location Coordinator through his retirement in 2017. Jack was responsible at Logan for the genetics and physiology of fine-leafed *Festuca* species to develop improved selection methodologies and strategies. He was also responsible for planning, conducting, and reporting research in scientific and customer meetings, and establishing domestic and international cooperative research linkages related to Pasture, Forage, Turf, and Rangeland Systems. His creative leadership of FRRL resulted in the strategic expansion of FRRL research in emerging areas of importance, and his scientific accomplishments led to the establishment of research on plant endophytes to enhance abiotic stress tolerance and the initiation of fine-fescue germplasm development for use in greenstrips for wildfire control and low-input turf, ornamental, and rangeland settings.

Jack was elected Fellow of the American Society for Horticultural Science (ASHS, 2001), the Heilongjiang Academy of Agricultural Sciences, China (2007), and was recognized for his contributions to cucurbit breeding with the Lifetime Achievement Award at Cucurbitaceae 2018 (Figure 2). Posthumously he received in 2019 the Award of Excellence from the ASHS Vegetable Breeding Professional Interest Group. Jack served as associate editor of four international journals (HortScience, Cucurbit Genetics Cooperative Report, Journal of Crop Production/Journal of New Seeds, Plant Breeding), and was organizing chairman for 17 national workshops or symposia. He authored 163 manuscripts in refereed journals, 27 published proceedings, 19 germplasm releases, 11 book chapters, two books, 71 technical reports, and made 35 presentations at national horticulture and rangeland meetings or workshops, including 17 at international meetings, of which 11 were invited papers at symposia/congresses or at international technical workshops. He attracted more than $2.5 million in grants from stakeholders, the cucumber and melon seed industry and U.S. cucumber processing companies, USDA-NRI, USAID/FAO/OAS, BARD, and USDA-ARS.

For all his widely ranging research interests, Jack was a passionate friend and colleague. He was known by many for his "interviews," whereby, upon meeting you for the first (and any time thereafter), he would query your background, how you got to be where you were, and among other things, your 5-year plan. Your walk in life did not matter, a scientist, a waiter in a hotel restaurant in Hyderabad, India, the Police Chief in Ratlam, India, or a farmer at a roadside fruit stand along the coast of Oregon, Jack loved to meet and know everyone. The biographical sketch at his memorial service in Logan, Utah in 2019 included one of his many poems, 'I Don't Expect.' A line in the second stanza revealed Jack's heart and soul: "…Because I don't consider you a shadow that follows in the sun. And then vanished in the dark when day is done."

(submitted by Dr. Jim McCreight, USDA-ARS, Salinas California, one of Jack's many friends, professional and personal.)

Figure 1. Dr. Jack Staub (right) and host scientist Dr. M.N. Koppar (left, National Bureau of Plant Genetic Resources, New Delhi) on a cucumber and melon germplasm collecting trip in November 1992. The photograph was taken en route from Kajuraho to Bhopal in the west central area of the state of Madhya Pradesh, India. Two wild melon plants are seen near the creek bed.

Figure 2. Dr. Jack Staub congratulated by colleagues after receiving the Lifetime Achievement Award at Cucurbitaceae 2018, Davis California. Left to right: Rebecca Grumet, Jim McCreight, Jack Staub, Linda Wessel-Beaver, Michael Havey, Amnon Levi.