Robert S. Shallenberger

April 11, 1926 — December 28, 2008

Robert Shallenberger was a scholar and a teacher in the highest tradition: he was a man who had a remarkable impact on both science and society. His book, *Taste Chemistry*, will be a classic not so much for the science it introduces as for the creative way it organizes the knowledge of taste around chemical structure. His galvanizing effect on science through his influence on students and colleagues will be felt for generations to come.

What was distinctive about Shallenberger? Like the most gifted scientists, he was fearless; he made intellectual connections that were unusually innovative. Colleagues noted that he never seemed afraid to put forth an idea that wouldn't hold up, and even enjoyed the process of proving himself wrong.

Robert (Bob) Sands Shallenberger was born in Swissvale, Pennsylvania on April 11, 1926. He attended public schools until the age of 17, when he enlisted in the Navy. He served as quartermaster on the U.S.S. Butternut during World War II, ending his tour of duty in February 1946. Bob immediately returned to Swissvale High School, graduating in June of the same year. With support from the G.I. Bill, he studied at the University of Pittsburgh (B.S. 1951); with the help of scholarships he received advanced degrees from Cornell University (M.S. 1953, Ph.D. 1955).

From Ithaca, Bob moved to Hoboken, New Jersey. where he took a position as a research chemist at the General Foods Research Laboratory; there, he developed chromatographic methods for the analysis of sugars in foods. With these methods, he studied the complex chemistry of caramelization and browning until October 1956, when he joined the faculty of Cornell University's Food Science and Technology Department at the New York State Agricultural Experiment Station in Geneva as a Professor of Biochemistry.

Charged with the dual tasks of studying carbohydrate chemistry of horticultural crops and helping improve New York's own crops, Bob became fascinated with the relationship between the three-dimensional structure of sugar molecules and their physical properties and taste chemistry. This led to his life-long quest to determine why different isomers of simple sugars produce such divergent taste sensations.

Although Bob was passionately engaged in the study of structural chemistry, he also made significant contributions to food science. In the beginning of his career at Cornell, he campaigned to convince growers to allow apples to remain on the tree long after the first fruits began to drop. By increasing the sugar-acid ratio the fruit would

become tastier and fetch more profit, even with a one to two percent loss caused by harvesting late. Within two years, applesauce produced in New York went from grade C to grade A.

Later, during a study of carbohydrate sweetness, Bob demonstrated that high fructose corn syrups could duplicate the chemistry and taste of hydrolyzed sucrose (invert sugar) as a replacement for sucrose in beverages. It was a discovery with significant implications in a state where corn is a major agricultural product. Bob never stopped searching for practical applications of his science even as he became more engaged with the fundamental chemistry of sugars.

In 1961 and 1962, while on sabbatical leave at the University of California in Berkeley, Bob embarked on his most important work when he began an exhaustive comparison of the physical properties of the crystalline sugars (mostly hexoses), looking for something that could predict their taste. He could find only one correlation that related to the sweetness intensity per unit mass of the sugars: the presence of hydroxyl hydrogen bond signals in their infrared spectrum. In discussions with faculty and students, he made convincing arguments that these signals could be used to predict the three-dimensional structure of sugars in solutions.

In May of 1963, I met Bob for the first time in a bar on University Avenue in Berkeley. He talked about the subtle and complex structure of sugars with such passion that I was thrilled when, after several drinks and many marked-up napkins, he asked me to be a student in his lab in Geneva. Together in 1967, we published "The molecular theory of sweetness" in Nature; it was a paper that contained ideas still valid at the time of his death. Working in his basement in Geneva, Bob had machined metal models of sugar molecules to use in simulating the transition-state energies between different molecular shapes: sweet molecules could easily be transformed into a specific shape he called A-HB, while non-sweet molecules could not.

Although Bob was hired on a 100% research position at Cornell, he insisted on teaching to help develop his ideas and on maintaining an active extension effort. Two of his students, CY Lee and myself, became Cornell professors and Lee recently completed a six-year term as Chair of the Food Science and Technology Department. During his tenure, Lee has developed programs in nutraceuticals, functional ingredients and enology, all in keeping with Bob's broad view of the mission of agricultural research and role of the Experiment Station. Until his death, Bob continued to share his unique vision through his work on several commissions and committees at both the College and the University levels.

Bob is survived by his wife, Carol; two sons, Richard of Sacramento, California, and Paul of Lake Worth, Florida; two daughters, Susan of Oakland, California, and Eve Tapscott of Geneva, New York.

Terry Acree, Chairperson