Malcolm C. Bourne

May 18, 1926 – October 3, 2016

Dr. Malcolm Cornelius Bourne, emeritus professor of Food Science, passed away at his home in Geneva, NY on Oct 3, 2016. Malcolm was pre-deceased by his first wife of 53 years, Elizabeth, and a son, Andrew. He is survived by his second wife, Janice Stone Bourne, four children (Gwendolyn, Jonathan, Lincoln, and Virginia), and ten grandchildren. Malcolm will be remembered by colleagues, friends and family for his seminal technical contributions to understanding food texture; his dedication to international food science and technology; his ceaseless scientific curiosity; and his extraordinarily gentle and generous disposition.

Malcolm was born in Moonta, South Australia on May 18, 1926, and soon after moved with his parents and twin sister (Margaret) to Adelaide. Malcolm's interest in science led him to pursue an Industrial Chemistry diploma with the South Australian School of Mines and Industries following high school, and he subsequently received a B.S. degree in Chemistry from University of Adelaide in 1949. Malcolm's first job after graduation was as a chemist with Mumzone, a food producer owned by a fruit growers' cooperative. Malcolm had no special interest in food, but the company had the advantage of being in Adelaide, near his family. Malcolm joined the industry at a critical time – Australia needed to feed both its growing post-WWII population its armed forces dispersed throughout the Pacific. Malcolm was the first scientist hired by Mumzone, and he was charged with improving the quality of its preserved foods.

When Mumzone was purchased by Brookers, Ltd. a few years later, Malcolm became Chief Chemist of the largest fruit canning firm in South Australia, with additional oversight on pickles, sauces, jams, and canned vegetables. Malcolm proudly claimed to have produced more beer than anyone else in Australia during this period, and yet to never have tasted a drop – the beer was destined for use in malt vinegar, and as a devout Seventh Day Adventist (later, he founded and

served as Head Elder at the local church in Geneva), Malcolm did not drink alcohol.

In 1958, after nearly 10 years in industry, Malcolm was awarded a one-year, $2500 scholarship by the South Australian Chamber of Manufacturers to study at University of California, Davis. The scholarship was renewed yearly for three years, and during this time Malcolm completed his M.S. in Food Science and Ph.D. in Agricultural Chemistry under the direction of Dr. Walter Jennings. Malcolm's thesis work studied the rate at which detergents stripped soil from the inside of piping, a topic of potential interest to cleaning food equipment. Remarkably, these studies laid the groundwork for the development of gas chromatography (GC), a now-common analytical technique and multi-billion dollar industry – Jennings is best known as the J in J&W Scientific, one of the first producers of GC supplies.

Malcolm and his family had initially planned to return to Australia following his Ph.D., but he accepted a post-doc opportunity at the Cornell University's New York State Agricultural Experiment Station (NYSAES) in Geneva, N.Y. When he arrived in 1962 at the office of the NYSAES Director, Don Barton, he was stunned to find out that he would not be offered a post-doc position – instead, he was offered an assistant professorship in Food Science & Technology. Malcolm protested that he didn't know what he would study as a professor, and it was suggested that he work on improving the texture of foods. Malcolm soon realized that to *improve* food texture properties, he first needed a convenient way to *measure* food texture properties – a much more interesting proposition.

This insight led to several decades of research on 'texture profile analysis' (TPA) – that is, developing instrumental approaches to characterizing food texture properties like chewiness, hardness, and brittleness. The principle behind TPA tests was deceptively simple – the instrument would mimic "chewing", often by pressing and retracting on the food in two successive "bites", and the forces applied by the instrument over time could then be related to the textural qualities. When Malcolm began his work in the 1960s, the instruments available for TPA were custom built and not commercially available. Malcolm's research showed that a commercially available instrument (the Instron Universal Analyzer) could be adapted to TPA of foods (*Food Tech.*, 1966). The Instron was designed for testing the strength of materials, for example, evaluating if car seat cushion covers had suitable durability. Adapting the Instron for food texture analyses often required mechanical alterations and long evenings for Malcolm and his students in the basement machine shop of the NYSAES Food Research Lab. During tests, Malcolm often cautioned colleagues to ignore data emerging from the strip chart recorder and instead focus on the food being probed in the texture analyzer – the better to ensure that instrumental data matched human sensory experience. A Bourne-designed test for evaluating apple firmness, for example, was meant to simulate the action of a thumb pressing on the skin, just as a consumer does when selecting fruit at a supermarket.

Other early papers (*J. Text. Stud.*, 1966 and *J. Food Sci*, 1966) were critical steps towards describing these empirical food texture tests within the language of physics. These breakthroughs made texture measurements both broadly accessible and scientifically rigorous, and commercial food texture analyzers are now in routine use. Starting with a study of pear texture (*J. Food Sci.*, 1968), Malcolm and his collaborators embarked on developing instrumental approaches to texture analyses, and (at last) using this information to improve the texture of fruits and

vegetables. One representative article, among dozens written from 1968 until the 2000s, evaluated the effect of blanching temperature on carrot firmness, and also related these changes to rates of pectin hydrolysis (*J. Food Sci.*, 1979). These studies led to a widely-used review of practical applications and best practices for TPA (*Food Tech.*, 1978; 1543 citations as of Sep 2017) and the publication of a textbook (Food Texture and Viscosity: Concepts and Measurement, 1982). The textbook has been broadly adopted by both academics and industry, and was used in Malcolm's popular Cornell graduate student course on food texture (FDSC 509 – Rheology, first taught in 1972). A second edition of the book appeared in 2002, and remains the definitive source on the topic. In acknowledgment of these contributions to food technology, Malcolm received the 2011 Institute of Food Technologists (IFT) Nicholas Appert Award.

In 1968, Malcolm was promoted to associate professor with tenure and, at the suggestion of a colleague (Keith Steinkraus), spent two years developing the first food science program in the Philippines at the University of Los Baños as part of a ten year Ford Foundation project. For the first time, Malcolm was immersed in issues of the developing world, in which food scarcity (and not food quality) was the major challenge. The opportunity fit well with Malcolm's Christian faith, and his belief that his scientific abilities were meant to help better the lot of others. One early project was to develop soy milk as an inexpensive protein source for schoolchildren, which presented two hurdles; the technical challenge was producing a milk without beany off-flavors, which Malcolm overcame with his scientific background; the sociological challenge was convincing the teachers to allow their students to drink the soy milk, without fear of food-borne illness or causing lactose intolerance. Malcolm negotiated the addition of one cup of soy milk a week to the students' diet, and within a month observed an increase in students' weight.

While in the Philippines, Malcolm noted that many food scarcity issues arose from food spoilage or damage. Malcolm was promoted to full professor in 1974, and during a sabbatical with the United States Agency for International Development (USAID), he researched the idea that food scarcity could not only be addressed by increasing food production (a major focus of the 1960s), but also by limiting food waste. His 1977 monograph (reprinted in 1993), Post-Harvest Food Losses - The Neglected Dimension in Increasing the World Food Supply, helped codify this emerging paradigm.

Recommendations in this report included deploying food preservation equipment to developing countries; improving access to food science education; and developing new approaches to food preservation, such as inexpensive refrigeration. Malcolm subsequently worked with others to develop best practices, including drafting the United Nations Environment Programme's Guidelines for Postharvest Food Loss Reduction Activities (1983). In 1977, Malcolm started a course on post-harvest food systems at Cornell. The class was taught for two decades, and was likely the first at any university to explicitly discuss the topic of food waste.

In 1992, Malcolm was selected for the IFT International Award (later called the Bor S. Luh International Award), the highest award for contributions to international food science. Malcolm's passion for international agriculture was far more personal than simply writing monographs and papers. Over his career, he gave no less than 200 talks internationally in over 40 countries, including a *US-China Seminar on Handling, Storage and Processing of Fruits and Vegetables* in 1984 – one of the first joint conferences between the countries. He trained dozens

of international graduate students, post-docs, and visiting scholars in his lab. During his time as Editor-in-Chief of the *Journal of Texture Studies* (1980-2006), Malcolm would note when interesting submissions arrived from non-English speaking countries. When a paper arrived with poor English but interesting results, Malcolm would work with authors, one-on-one, to improve the paper before sending it off to critical reviewers.

In 1996, in honor of his retirement, over 250 letters arrived from Malcolm's family, mentors, colleagues, collaborators, and students from around the world, providing well-wishes and personal accounts of how Malcolm had made lives better. The thoughts of Dr. Alina Szczesniak (General Foods), another major early contributor to food texture analysis – and a close colleague and friend of Malcolm's – are representative.

"What words come to mind when asked to describe you? Foremost, a friend and an exemplary human being. Always kind always willing to offer advice and a helping hand. An accomplished scientist and mentor sharing gladly his knowledge and expertise. A devoted family man, living his spiritual life in a quiet and dignified manner."

Malcolm's passion for promoting food science and technology globally did not abate with his retirement. As an emeritus professor, he served as chair of the International Academy of Food Science and Technology (IAFST) from 2003-2006, and he traveled tirelessly – among other destinations, he delivered an invited talk at the World Food Congress in Shanghai, another at the Australian section of IFT, headlined a workshop on food texture at a Chinese university, and paid a visit to an old graduate student (now a professor) in Chihuahua, Mexico. On one occasion during retirement, he received a cold-call from a doctor who asked if he could speak at a conference in Montreal on the relationship of food texture and dysphagia. Malcolm replied he would be happy to, so long as the organizer could tell him the meaning of 'dysphagia'. After Malcolm got his answer ('a medical condition related to difficulty swallowing'), he promptly visited a local nursing home to observe residents and prepare for the talk.

Malcolm was known by his colleagues as a gentleman with limitless curiosity and loving kindness, who could always find time to answer a question – no matter if it came from an esteemed professor or an unknown graduate student. Late in his life, during treatment for mesothelioma, Malcolm was visited at home by a food science graduate student seeking advice. The student brought a gift of chocolate, Malcolm's favorite treat for reasons both hedonic (he enjoyed a small piece almost every day) and intellectual (differences in chocolate texture are intimately tied to its chemical structure). When the student asked Malcolm for advice to a young scientist, Malcolm's reply was immediate, "Find something big. Don't work on small things to fill up your days".

Written by Gavin Sacks