JAMES J. CHRISTENSEN (1931–1987)

Teacher, Innovator, Author, Friend, Family Man

As Jacques said in Shakespeare's *As You Like It* (Act 2, Scene 7) "All the world's a stage and all the men and women merely players. They have their exits and their entrances and one man in his time plays many parts". This passage aptly describes the life of Professor James J. Christensen, a colleague who achieved recognition for his work in numerous areas of his chosen profession of chemical engineering. In addition, he was a good friend of many of us and a devoted husband and father. His professional accomplishments were recognized just prior to his death by the American Society of Engineering Education when in 1987 they awarded him their prestigious Chemical Engineering Lectureship Award. His Award lecture has been published recently [1].

Professor Christensen was recognized by his colleagues locally and internationally as a first-rate research scientist, a gifted teacher, and a capable administrator. During his thirty-year career at Brigham Young University (BYU), Jim developed a research program in chemical thermodynamics which was recognized as one of the most productive in the world. His work using flow calorimeters designed and constructed by him was not confined to well-behaved systems. Rather, he studied unusual and difficult mixtures that exhibited strong non-ideality and unexpected phase behavior. His recent experimental calorimetric studies of mixtures near critical conditions represented pioneering contributions at the cutting edge of research. A measure of the quality of his research program was the consistent support it received from the United States Department of Energy and National Science Foundation for over two decades.

Jim had important involvement with industry during his career. Calorimeters based on his design have been marketed worldwide by Tronac, Inc. (Orem, Utah) for over twenty years. He was a consultant with several industrial companies and presented a successful short course on creativity to many industrial audiences. This course was well received and there was a significant demand for it by industrial firms. Jim's research program attracted the attention of numerous industrial organizations and received funding during the past two decades from several of these including Union Carbide, EXXON, Air Products, Marathon, Allied Chemical, Electric Power Research Institute, Conoco, and Monsanto. From 1982 to 1987, Jim was Principal Investigator of an experimental research program for the Gas Processors Association Enthalpy Research Committee. The thermodynamic data generated under his direction have been useful in expanding the understanding of gas treating which is a widely used industrial process. Jim was involved in a significant way in the early development of calorimeters

capable of measuring very small heat changes. These calorimeters have had a significant impact in the field of monitoring heart pacemaker batteries. These particular calorimeters, marketed by Tronac, have been sold to over twenty firms, many of which manufacture batteries.

These assessments of Jim's research program and the close collaboration he had with several industry and government laboratories provide insight into the reasons for the enthusiasm his graduate and post-doctoral students had for his program. The mix of industrially relevant and fundamental research was stimulating to the students and provided involvement with industrial people at an early stage of their careers. He showed himself to be a gifted teacher as he worked with these students. He was in the laboratory with them on a frequent basis. He and the students built equipment, he supervised closely the operation of the equipment, and he was intimately involved in data analysis and manuscript preparation. In the process of doing these things, he took time to become a close companion with his students. The students learned the steps involved in approaching research problems creatively, the reasons for giving close attention to their work, how well designed research efforts on important problems could lead to exciting results, and how to organize and present their results effectively in written and oral forms. A favorite statement of his was that he didn't want to hear about a problem, but about a solution to the problem. Jim's teaching of graduate students did not end with measuring thermodynamic quantities. He provided opportunity for these students to prepare manuscripts, to aid in responding to referee comments in the manuscript review process, and to present their results at scientific meetings.

He was a major contributor to the chemical literature in the fields of calorimetry development and use, production of thermodynamic data, and carrier-mediated transport in liquid membrane systems. Of his more than 260 publications, 36 were books, book chapters and major review articles. He had long had a keen interest in compiling thermodynamic data with the intent of making them available to others. Several of his books involve such data which are of value to the practicing chemical engineer and chemist. Particularly important in this regard was *Heats of Mixing: A Compilation* published in 1982 [2]. A supplement to this volume, essentially completed before his death, was published in 1988 [3].

Jim received the following local and national awards related to his research activities (year of receipt given in parentheses): Senior Postdoctoral Fellowship, U.S. Public Health Service (1965); Sigma XI Annual Lecturer at Brigham Young University (1966); Brigham Young University Karl G. Maeser Research Award (1967); Career Development Award, U.S. Public Health Service (1967-1972); Seventh Annual Distinguished Faculty Lecturer, Brigham Young University (1970); Huffman Memorial Award, The Calorimetry Conference (1976); and Utah Award for Outstanding Contributions in the Field of Chemistry while residing in Utah, American Chemical Society (1977).

His enthusiasm in teaching equaled that which he demonstrated in his research program.This enthusiasm was recognized by his colleagues at the University, College and Department levels and by the students in the BYU Chemical Engineering Department. He was recognized as being a superior teacher. This recognition was confirmed by his receipt of numerous awards for his teaching activities. He won the Outstanding Teacher Award in the Chemical Engineering Department on three occasions (1976, 1977 and 1984), the university-wide Blue Key Professor of the Year Award in 1969, the Karl G. Maeser Distinguished Teaching Award in 1981, and the first College of Engineering Science and Technology Distinguished Faculty Member Award in 1979. Particularly noteworthy was his development of a course on creativity which was taught by him on a regular basis. Students enjoyed the novel approaches which he brought to the discussion in this class. He took the point of view that there are many ways of approaching a problem. His object in the class was to encourage creative approaches to problem solving. He promoted this by insisting that "there was no 'right' answer or method" in approaching a problem in this class. He had a collection of puzzles and encouraged students to present novel solutions to these puzzles. These solutions were then discussed in class. Needless to say, this class was a popular one. Those who took it found it to be useful in their later employment as indicated in responses by former students to Department questionnaires. It received top rankings in the Department by students year after year. His personal qualities and ability to see clearly the issues in various situations were valuable to him in the administrative work in which he was involved.

He was the first Chairman of the Chemical Engineering Department at Brigham Young University (1959–1961) and helped set the course which led this department to its present status as one of the most productive at the university. His contributions to the Department were recognized and valued. His leadership qualities were also recognized by the professional organizations with which he was involved. For nearly two decades, he had an active role in directing the Calorimetry Conference. This Conference is the national society for all who are interested in the exchange of information involving calorimetry. Jim served as a member of the Board of Directors (1970–1973), and as Program Chairman, Chairman-Elect, Chairman, Past Chairman, and Pluperfect Chairman in successive years from 1972–1976. Much of the impact he had in calorimetry was through his consistent service in this organization. He served as Chairman of the Central Utah Section of the American Chemical Society in 1970–1971. He had several responsibilities in the Salt Lake Section of the American Institute of Chemical Engineers. He was a member of the Board of Directors 1963–1964 and of the Career Guidance Committee 1977–1980. In addition, at the national level he served on the Career Guidance (1964–1970), Education Projects (1964–1970), and Pilot Plant (1977–1980) committees.

In addition to his professional accomplishments, Jim was a "Renaissance" man. His interests and knowledge ranged across a wide variety of seemingly unrelated fields. He and his wife Virginia were members of a great books club for over two decades and were involved in the operation of a Faculty Academy which featured each semester of lectures by faculty members covering a range of topics (law, science, economics, humanities, etc.). These interests and his awareness of activities in other disciplines contributed to Jim's ability to interest audiences. He had a large reservoir of knowledge to draw upon. His creativity extended to the home which he and Virginia built in 1985. I quote from her account [3].

> "The house called for windows on two sides of the garage. I didn't want guests who came to our house looking inside our cluttered garage, so I eliminated the windows. Jim said that we had to have something on those bare brick walls. He gave a lot of thought as to how he could make them interesting. His first idea was to put a star there because we built our house in the year of Halley's Comet. He talked to a BYU professor who suggested making the star out of brown concrete. Jim felt that concrete would be very difficult to put up on the wall once you poured it; he didn't particularly feel that that was an appropriate medium to use for a star, and he didn't like the color brown. He made several cardboard models of a star and finally came up with an idea which he took to the BYU metal shop. The longer rays were to be his height, and the short rays mine. The star was to represent the star of Bethlehem, man's last horizon and his origin since we are all made up of the elements of the stars. He decided that he wanted to put his logo on the other wall. The logo consisted of three parts (See photograph): a book, a map of the world featuring the Americas, and the symbol, Q. He selected a book because we've both been teachers, we've belonged to a great books group for 28 years and have enjoyed reading. Our son-in-law made an open book out of wood from Jim's design. The grain of the wood shows the text on the book and the waves on the ocean. Because we've had an opportunity to travel, the world would be the next emblem. The third symbol, Q, will be familiar to thermodynamicists, but I questioned using something that most people wouldn't recognize. He liked the idea of something which had an esoteric meaning to it. Since he felt this logo represented his life, I had it carved on his tombstone. I think that he would enjoy hearing people ask, 'What does the Q mean?' "

Jim exemplified traits which are important in society. He truly left the world better for having been in it. An innovator by nature, he used this ability to create new and important instrumental designs in calorimetry and to bring a refreshing newness to the university courses he taught. He loved his family and was interested in their welfare. Each of us carries his or her own memory of a personal or professional relationship with him. He will be missed, but his enrichment of our lives will be long remembered.

REFERENCES

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3 J.J. Christensen, R.L. Rowley and R.M. Izatt, Handbook of Heats of Mixing, Supplementary Volume, Wiley–Interscience, New York, 1988.
4 Virginia B. Christensen, presented at the 43rd Calorimetry Conference, Bartlesville, OK, 8–12 August 1988.

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