

## Memorial Tributes to Professor Ivan Catton

### *The following is a tribute by Dr. Vijay K. Dhir.*

Professor Ivan Catton was born in British Columbia, Canada. At a young age, he migrated with his family to the Los Angeles area. He was a Bruin through-and-through: twice an alumnus of the UCLA School of Engineering and Applied Science, where he completed his undergraduate and graduate degrees. During that period, the UCLA School of Engineering offered a unified engineering curriculum under the leadership of the late Dean L.M.K. Boelter. As an undergraduate student, Ivan Catton was a member of UCLA's wrestling team. His Ph.D. advisor was the late Prof. Donald K. Edwards. Upon the completion of his doctoral degree, Prof. Catton worked for some time at the aircraft manufacturing company McDonnell Douglas before joining UCLA as an assistant professor in 1967. He continued his service to UCLA, and several years prior to his retirement in 2015, he was named Distinguished Professor of Engineering and Applied Science.

Professor Catton had broad-based training as a student, which is reflected in his research work as a faculty member. He was equally comfortable doing research in Environmental Science and Engineering, Thermal Science and Engineering, and Nuclear Reactor Thermal Hydraulics and Safety. The breadth and depth of his scholarly work are amongst the top few in the technical community worldwide. Over his career, he was prolific in publishing his scholarly work in archival journals and in proceedings of conferences. He graduated a large number of M.S. and Ph.D. students, several of whom are now leaders in the field in their own right. His commitment to research and mentoring of students was so deep that even after his retirement, he continued to be involved in research, advising graduate students, and serving on Ph.D. student dissertation committees. Students miss him and definitely feel the void left behind by him. For his scholarly contributions to the technical literature, he received a number of recognitions. He was the recipient of the Heat Transfer Memorial Award of the Heat Transfer Division of the American Society of Mechanical Engineers (ASME) and the Max Jakob Award of ASME and American Institute of Chemical Engineers (AIChE). The latter is the highest award in the field of heat and mass transfer, both nationally and internationally. He was a Fellow of both ASME and American Nuclear Society (ANS).

Professor Catton was not only a mentor to me; he was also like an older brother when I started at UCLA. He gave me guidance as to what was expected from a successful faculty member in terms of research and mentoring of graduate students. He got me involved in research projects that he was working on in the areas of nuclear reactor thermal hydraulics and safety. In fact, he even gave me space in the Nuclear Energy Laboratory (NEL), where he was the director, to start my experimental research. Additionally, he kindly allowed me to use the services of the NEL technical support staff. Over the years, our friendship grew, and we collaborated as colleagues on a number of extramurally funded projects. During project discussions, Prof. Catton very quickly got to the heart of problems and came up with innovative ideas and directions for research. We did have our disagreements, but the greatest quality Prof. Catton had was that soon he would forget what we were arguing about and suggest we go for lunch or coffee. Often, we found ourselves in the student coffee shop sneaking apple pies!

Professor Catton was very much engaged in providing service to the profession. Prominent amongst his professional activities is his service on the Advisory Committee on Reactor Safeguards (ACRS) of the U.S. Nuclear Regulatory Commission. The advice he offered as a member of ACRS contributed to the enhanced safety of the current operating nuclear reactors in the United States.

Professor Catton passed on June 12, 2021, surrounded by his family and students who had become part of his family. He is survived by his wife Susan, and sons Mark, Michael, and Craig as well as a number of grandchildren.

### *The following is a tribute from Dr. Portonovo S. Ayyaswamy.*

Upon the successful completion of my Ph.D. Preliminary exams at UCLA's Dept. of Energy and Kinetics, now the Department of Mechanical and Aerospace Engineering, Dept. Head Prof. Donald Edwards asked me in which field I would write my Ph.D. dissertation. When I told him natural convection and buoyancy-driven flows, Prof. Edwards suggested that I talk with Prof. Ivan Catton. His suggestion was amongst the very best advice I have ever received, and this was a pivotal moment in my career.

I made an appointment to talk with Prof. Catton, who agreed to advise me, and we soon embarked on an excellent three years of my doctoral research. Prof. Catton was a superb advisor, providing me with deeply insightful suggestions. He was also exceedingly kind and generous with his time with all of his students. Prof. Catton had a unique ability for conceptually describing complicated thermal fluidic phenomena in simple terms. This rare characteristic enabled me to develop a comprehensive analytical/numerical program of systematic study of natural convection in enclosures oriented at an arbitrary angle to the gravitational vector. The results, when they were eventually published, have stood the test of time and are referenced in almost all textbooks and monographs related to heat transfer when those texts deal with natural convection in enclosures.

Subsequent to receiving my Ph.D. Degree, I worked for some time under the joint direction of Profs. Ivan Catton and Donald K. Edwards as a postdoctoral scholar. In our research, we developed a fundamental equation for the friction factor governing capillary-driven flows occurring in grooved geometries. This equation is also referenced in almost all archival publications, monographs, and textbooks when they discuss capillary flows in grooved geometries. Such remarkable accomplishments were made possible due to Prof. Catton's excellent guidance.

A further benefit of working under the guidance of Prof. Catton was that he would discuss some of his consulting projects for major aerospace companies with me. These discussions enriched my understanding of the field in a very direct manner. Furthermore, he would be very generous by paying me a portion of the consulting fee he had received.

Professor Catton was remarkably capable in working with diverse problems in heat and mass transfer, which span an enormous variety of subfields. The legacy of this capability includes his huge contributions to archival literature and his consultancy to various advanced engineering companies and national agencies.

To celebrate this legacy, I organized a seminar on his 65<sup>th</sup> birthday, wherein his vast cohort of doctoral students who had gone on to achieve excellence in their own fields and fellow faculty delivered invited lectures. Taking place at the UCLA campus, this grand celebration was attended by scholars from around the country who had flown in for this special occasion as well as a huge number of faculty at UCLA and neighboring universities. The event was a testimony to his excellence in the field.

After I retired as the Asa Whitney Distinguished Professor of Dynamical Engineering at the University of Pennsylvania, I returned to UCLA, where I now serve as a Distinguished Adjunct Professor in the Department of Mechanical and Aerospace Engineering. Here again, I had the unique opportunity to work with Prof. Catton on a research project involving high-pressure, high-temperature compact heat exchangers especially for space-based applications. This work has resulted in some important archival papers. Sadly, toward the end of this project, Prof. Catton fell ill and passed on. While I am greatly saddened by his passing, I consider myself to be wonderfully lucky that I was able to be his coauthor on the final archival papers that he published.

Indeed, Prof. Catton is greatly missed by us all.

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