In memory of Dr. Chang H. Oh

Dr. Chang Ho Oh, a long-time member of the ANS Thermal Hydraulics Division (THD), passed away on August 7, 2013, just one day after he retired from INL. He was 67. He valiantly fought gastric cancer for over two years. He is survived by his wife Theresa, two sons Paul and John, and John's wife Tara. Dr. Oh was born in Pyongyang, North Korea, on April 28, 1946. He graduated from the Dept. of Chemical Engineering at Yonsei University and completed his military duty in the Korean Army. He came to the US with the American dream as so many foreign students do. He received his M.S. in Chemical Engineering from the University of Florida and Ph.D. in Chemical Engineering from Washington State University. He spent the prime of his career at Idaho National Laboratory (INL) where he rose through the ranks as Senior Engineer, Principal Engineer, Advisory Engineer, culminating at the highest technical rank, INL Distinguished Engineer.

Chang was a senior-most active member in the nuclear thermal hydraulics community, well respected by his peers around the world. He was a world-class engineer, scientist, innovator, inventor, and leader with international reputation and influence. Those who knew him held great respect and admiration for his research, dedication, integrity, and leadership. He served as chair of both ANS THD and ASME Heat Transfer Division (HTD), a clear indication of the trust and high esteem placed in him by his peers in the technical community.

During his long professional career, Chang carried out some impactful research and development. His contributions run the gamut from critical heat flux correlations for a very narrow channel mimicking low pressure loss-of-coolant accidents, flow mixing for the conceptual Advanced Neutron Source project, computer code developments such as TPAC (tritium permeation analysis code), GAMMA (gas multi-component mixture analysis), and HyPEP (hydrogen production efficiency calculation program), two-phase flow instability analysis, flow and chemical reaction modeling of supercritical water oxidation, to heat transfer in very-high temperature gas-cooled reactor (VHTR). In recent years, Chang was engaged in enhancing the performance, reliability, and safety of VHTR. VHTR operates at a very high temperature that enhances thermal efficiency as well as hydrogen production. However, the very high temperature in turn also has adverse effects on materials integrity. Chang found a way to reconcile these two conflicting factors by reducing the exit temperature of VHTR by as much as 200oC (thereby alleviating the materials concerns) while compromising the efficiency by only a small fraction. This breakthrough can be achieved by employing a suitable combination of several pertinent technical elements and was verified by a computer code simulation. Chang's innovation will go down in history as one of the most significant technical advancements in the design of VHTR. Chang also proposed a new mechanism for air ingress driven by density-stratified flow as opposed to that due to molecular diffusion. This is a surprising shift in paradigm, as molecular diffusion was accepted as the dominant plausible mechanism for air ingress in VHTR until Chang proposed an alternate mechanism. The new mechanism is much more effective in accelerating air ingress into the reactor core and the lower plenum than the commonly accepted molecular diffusion mechanism. Chang was the first one to raise the possible relevance of density-gradient-driven stratified flow in air ingress process. This new finding is very important to the VHTR conceptual design and developing a mitigation plan for the graphite oxidation. The industrial savings from his contributions are estimated to range in the hundreds of million dollars if his breakthrough inventions are implemented in commercial VHTR reactors, showing that Chang's research is not only of scientific interest but has real practical significance. He holds a number of patents in these areas.

Chang has made significant contributions to ANS THD. He regularly contributed to ANS Summer and Winter Annual Meetings as author, speaker, session organizer, and session chair. Notably, he also served as Chair of ANS THD. His spirit of dedicated service has been an inspiration for his professional colleagues and has set a good example for them to follow. In addition to his activities in ANS THD, he was also highly visible in the ASME HTD affairs and widely respected by his peers at ASME. He chaired ASME HTD, overseeing some 4,000 primary members and 4,000 secondary members of the Division.

Chang garnered numerous honors and awards: he received the Heat Transfer Memorial Award from ASME – the highest recognition bestowed in heat transfer by ASME; he was a Fellow of ASME; served as Associate Editor of the Journal of Heat Transfer; received a Best Paper Award from ANS THD; received the Best Paper Presentation Award at the 8th International Heat Transfer Conference, to name just a few. At his INL, he received the Performance Excellence Award twice and the most prestigious INL Director's Award for Exceptional Engineering Achievement – the highest engineering achievement award bestowed on an individual by INL. He was selected for this year's ANS Thermal Hydraulics Technical Achievement Award (TAA) but sadly he passed away prematurely. The ANS THD Honors and Awards Committee unanimously voted to confer the award to him posthumously.

Much accomplished as Chang was in technical and scientific research, he was also a devoted family man, a warm friend to people around him, and an entertaining and engaging person to his professional associates. His sense of humor, innocent smile, and unassuming laughter were his signature and his passion to help others in need remains his personal legacy. We bid farewell to our beloved friend Chang ---- but will meet him in our garden of memory.

Here are some special words from Chang's colleagues and friends as they reminisce about him:

Hisashi Ninokata: Chang and I were of the same age. He let me talk to him as his brother and I did; I tried to do so to an elderly brother, respecting his just a little bit earlier birthday, emphasizing that, in our oriental spiritual inspiration, seniority should precede everything. The time we spent together may be very brief in the scheme of the universe and has gone into my memory, but I sensed that he existed for other people, for those whose smiles and well-being his own happiness depended on. I miss him, who was always found beside me when I needed a friend.

Karen Vierow: Chang was a mentor and friend during many years of my interaction on ANS Thermal Hydraulics Division committees. I was one year behind him in the rotation through THD officer-ship. I am grateful to his guidance throughout my officer duties. I am truly pleased to have chaired the Honors & Awards Committee in the year that we selected him as our TAA recipient. On a lighter note, I enjoyed Chang's sense of humor and family devotion throughout our interactions. One of our longer-running jokes was about how I watched a Korean drama series in Japanese (English title: Winter Sonata) and he stated proudly that the popular movie star in the drama looked just like his son! Thanks, Chang, for the good times!

F.B. (Bill) Cheung: I was overwhelmed with an immense sense of loss when I learned about the sad news of Chang, a wonderful colleague whom I have great respect for and a dear friend whom I've known for nearly three decades. Our research interests overlapped one another and we had served on a variety of national and international committees and conferences. He was truly a role model particularly in terms of research and service. Not only was he technically strong and capable but also he was always willing to help, ready to encourage, and prepared to get the job done in a timely and perfection manner. His unselfish services, his dedication, his technical impact, his positive attitude, his generosity, his smile, and more importantly, his friendship will long be remembered.

Yassin Hassan: I am shocked by the sad news that Chang has passed on. Chang certainly had the knack for making even the most serious things a good fun. He was an optimistic and selfless man who went through his life helping others. I had known Chang for more than two decades. He was chivalrous and a true gentleman. He contributed immensely in the nuclear field. He published in top journals and was a dedicated reviewer. I depended on his technical judgments. He was a lovely man and we thank him for sharing his life with us. His energy will be missed but his memories will live in my heart.

Xiaodong Sun: I deeply miss Chang, his laughter, humor, advice, and all the positive energy he brought to us. Whenever I think of him, his smile and laughter come directly to me and I feel he is just somewhere near me.'

John Luxat: Chang was one of the most generous persons I have had the honor of knowing. Not only was he selfless in nurturing those individuals who were establishing their careers, but he continued to support them as they progressed to greater achievement. It is the mark of a great individual that one can be so magnanimously supportive of others as he, in turn, achieved constantly increasing recognition. I shall miss him beyond mortal expression.

Si Young Lee: I was one of those who were fortunate enough to know and work with Dr. Chang H. Oh as a dear friend and a valued colleague. I respected Dr. Oh as a member of our ANS-THD community. Not only will his contributions to nuclear thermal-hydraulics be missed, but also his leadership skills and the great kindness he showed others. He was a worthy role model in every sense.

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