A K OPPENHEIM
1915 – 2007

On January 12th, our colleague, and friend to many in the combustion community, Tony Oppenheim passed away at his home in Kensington, CA. As ever, the "Captain of his Ship," he had opted for hospice care in the comfort of familiar surroundings rather than spend his remaining days in a hospital. He had also requested that there be no memorial service, but he did imply that we might gather at some point for a celebration of his life and his contributions to combustion science.

Tony was widely recognized, and earned much formal recognition, for his fundamental contributions to unsteady gas dynamics and combustion. He was known for his extraordinary energy and involvement in many issues, his capacity to mentor and to inspire his colleagues in their research, his optimism and enthusiasm for many aspects of life, and for his ability to present technical information in an entertaining and humorous manner.

We would be remiss if we did not note the key role that Tony played in establishing ICDERS. In the 1960's, he, along with Rem Soloukhin and Numa Manson, recognized the need to create a forum where recent research advances could be shared and discussed freely with our colleagues from Russia and Eastern Europe. The first meeting, held in Brussels in 1967, was a great success; the fact that the 22nd ICDERS will be held in Minsk is 2009 is a testament to Tony's vision.

Tony's active study of combustion technology spanned more than six decades. His retirement from the University of California-Berkeley in 1986 enabled him to focus his prodigious energy on the exploration and development of his ideas on improving the performance of internal combustion engines. His monograph "Combustion in Piston Engines" (published by Springer Verlag in 2004) details his concept of how future engines may employ distributed ignition sources to both increase fuel efficiency and also reduce the formation of pollutants. Another noteworthy monograph (published by Springer Verlag in 2006) "Dynamics of Combustion Systems" details the analysis of confined compressible fields in which exothermic reactions occur. A second edition of this latter monograph is scheduled to appear in 2008.

The combustion community will greatly miss Tony, but we are much richer for his having been among us.

For our colleagues who did not have an opportunity to see the UC-Berkeley press release concerning Tony's passing, it follows.

BERKELEY – Antoni Kazimierz Oppenheim, professor emeritus of mechanical engineering at the University of California, Berkeley, and one of the world's leading experts on combustion and radiation heat transfer, died Saturday, Jan. 12, at the age of 92.

Oppenheim died in his sleep at his home in Kensington, Calif., one month after doctors discovered that cancer had spread to his lungs, liver and back. Known for the passion he had for his research, Oppenheim continued to work while under hospice care, and was often seen sitting up in bed with a laptop, revising papers.


Antoni Oppenheim (Peg Skorpinski photo)

"Tony was an outstanding scholar whose contributions to the field of combustion have been enormous," said Stanley Berger, UC Berkeley professor of mechanical engineering. "He was just bigger than life. He had an incredibly dynamic personality, and when he entered a room, people noticed."

At a time when the mechanics of detonations were largely a mystery because such events occurred at supersonic speeds, Oppenheim tackled the task of studying them by helping develop a type of high-speed photography that uses a laser light source to capture sub-microsecond exposures. As a result of this technique, Oppenheim was able to design experiments that led to groundbreaking descriptions of blast waves and of the process by which a detonation occurs.

"Tony was among the first to apply supersonic instrumentation and shock tubes (metal tubes used to contain experimental blasts) to the study of combustion and detonation," said Patrick Pagni, UC Berkeley professor emeritus of mechanical engineering and an expert on fire safety engineering science. "Detonations are incredibly hard to study because they happen so fast, but Tony loved hard problems. There was a sign inside his office that read, 'One man's research is another man's routine.' That summarizes his approach to his work."

Oppenheim is also credited with developing a method for quantifying radiation heat transfer - how heat moves through space - by viewing the movement as a network, much like an electronic circuit.

"This method for studying radiation heat transfer is now taught in universities throughout the world," said Pagni. "He had a tremendous impact on heat transfer education."

Oppenheim's most recent research focused on improvements to the efficiency of the internal combustion engine powering most automobiles on the road today.

Currently, spark plugs ignite a fuel-air mixture injected into a cylinder. Because the flame is diluted as it moves across the chamber, a significant amount of fuel is left unburned. The incomplete combustion results in increased emissions of carbon monoxide, nitric oxides and hydrocarbons.

Oppenheim proposed and tested a pulsed jet combustion system in which the air-fuel mixture is ignited at multiple points throughout the cylinder. Experiments showed that this more efficient system allows for a leaner air-fuel mixture and lower operating temperatures. He calculated that this system could ultimately double the gas mileage while drastically reducing pollution in current internal combustion engines.

Eilyan Bitar, UC Berkeley graduate student in mechanical engineering who had been working with Oppenheim on this research, noted that these ideas came as attention was shifting to electric and then hydrogen cars, and that the auto industry has been slow to react to Oppenheim's ideas. But Bitar noted that the developments needed to make hydrogen vehicles mainstream are still far off, while improving current internal combustion engines is a goal that could be achieved in the near future.

"The main thing to know is that Tony wanted to improve society," said Bitar, who had become close friends with Oppenheim. "He wanted to make mankind better, and that principle guided his work to the end."

Oppenheim was born in Warsaw, Poland, on Aug. 11, 1915. He was home-schooled in French until the age of nine, when he attended local schools and began learning Polish. After graduating as valedictorian from his high school in 1933, he entered the highly competitive Warsaw Institute of Technology, where he studied aeronautical engineering.

His studies were interrupted in 1939 by Nazi Germany's invasion of Poland. Oppenheim fled his home country, making his way through Romania, Greece, France, Spain and Portugal before arriving in England in June 1940.

Soon after, he enlisted in the Polish army in Scotland, teaching himself English. In 1942, on leave from the Polish Army, he managed to complete his requirements for a degree from the Warsaw Institute of Technology in 1943 by taking courses at the City and Guilds College in London. He also earned a Ph.D. in mechanical engineering at the University of London, and a Diploma of Imperial College degree in 1945.

After his studies, he spent three years as a lecturer in mechanical engineering at City and Guilds College, where he and his post-graduate students built the institution's first supersonic wind tunnel.

During his stay in England, Oppenheim worked with scientists to improve the engines used in Britain's Spitfire and Hurricane fighter planes which, until then, had been outperformed by Nazi warplanes.

"Tony's research provided the critical edge in speed and acceleration the British aircraft needed," said J. Ray Bowen, dean emeritus at the University of Washington's College of Engineering and one of Oppenheim's first Ph.D. students. Bowen edited a research volume, "Dynamics of Exothermicity," published in 1996 in honor of Oppenheim's 80th birthday.

Oppenheim was also charged with analyzing the operational mechanism of pulsed jet engines, a type of internal combustion engine that powered German VI flying bombs, pilotless monoplanes carrying 845 kg warheads. After the war, he was sent to Germany as a British intelligence officer to meet with the scientists and engineers involved in developing the engine. Oppenheim's interest in detonation phenomenon and combustion grew from this early research in pulsed jet engines.

In 1948, Oppenheim moved to the United States, joining Stanford University as an assistant professor in mechanical engineering. Two years later, he made his way to UC Berkeley as an assistant professor in mechanical engineering. He was promoted to associate professor in 1954 and full professor in 1958.

In 1967, Oppenheim and two colleagues co-founded the International Colloquium on the Dynamics of Explosions and Reactive Systems, scientific meetings held every two years for specialists in gaseous explosions and nonsteady combustion.

Among the numerous awards Oppenheim received throughout his career were the Dionizy Smolenski Medal of the Polish Academy of Sciences for outstanding contributions towards advances in the knowledge of combustion and especially to the dynamics of explosions and reactive systems; the Alfred C. Egerton Medal of The Combustion Institute for distinguished, continuing and encouraging contributions to the field of combustion; and the Berkeley Citation, one of the highest honors bestowed by the university to those who have exceeded the standards of excellence in their fields.

Oppenheim received honorary doctorate degrees from the University of London, the University of Poitiers, and Warsaw's University of Technology. He was also a member of the International Academy of Astronautics, a fellow and honorary member of the American Society for Mechanical Engineers, a member of the U.S. National Academy of Engineering; and a foreign member of the Polish Academy of Sciences.

Oppenheim officially retired from UC Berkeley in 1986, but he remained very active in his research until his death.

He is survived by his wife, Lavinia (Min) of Kensington, Calif.; their daughter, Terry Ann Cort of El Cerrito, Calif.; and two grandchildren.

At Oppenheim's request, there will not be a memorial service. Donations in his memory may be made to Cal Performances, 100 Zellerbach Hall #4800, UC Berkeley, CA 94720-4800, or to Sutter VNA and Hospice Foundation, 1900 Powell Street, Suite 300, Emeryville, CA 94608-1815.