

Y. T. Lee



Photograph by Ernest Orlando, Lawrence Berkeley National Laboratory

Preface

This special issue of *The Journal of Physical Chemistry B* marks the celebration of the 60th birthday of Yuan T. Lee, which was held during the joyous week of the December 8, 1996, at Academic Sinica, Taipei, Taiwan, and participated by more than 300 people including his former mentor Dudley Herschbach and many of his friends, colleagues, and students. Yuan Lee's career has been multifaceted and colorful. He is a great scholar, a respected teacher, and an effective administrator.

His career as a scientist can be best described as a unique combination of experimental virtuosity and scientific creativity. From the point of view of instrumentation, he is best known for the development of the "universal crossed molecular beams

apparatus", which opened up vast new areas in chemical dynamics. In this instrument, one could collide two molecular beams (or a molecular and laser beam) under single-collision conditions and measure the angular and translational energy distributions of the products. Since product detection was based on mass spectrometry, this instrument could be used to characterize the products of virtually any chemical reaction, in contrast to many of the other detection schemes used in scattering experiments. The key to the instrument was the extensive differential pumping used in the detector so that the ionization chamber was nested within several differentially-pumped regions in order to reduce background in the experiment to acceptable levels.

The significance of the universal crossed beams apparatus was demonstrated repeatedly in Yuan's laboratories at Chicago and Berkeley as he used it to attack an incredible variety of problems in chemical dynamics. Yuan's high-resolution measurements of elastic scattering differential cross sections led to high-quality potential energy functions for rare gas atoms. His studies of fundamental chemical reactions ($F + H_2$, $Li + HF$, $D + H_2$) are textbook examples of how one can learn about the potential energy surfaces for chemical reactions through reactive scattering. His work on infrared multiphoton dissociation (IRMPD) of molecules played a key role in unraveling the mechanism of that process, and he used both IRMPD and chemical activation to elucidate the flow of energy in highly excited molecules. His ultraviolet photodissociation experiments on O_3 , C_2H_2 , CH_3I , and many other small molecules yielded a detailed picture of the thermochemistry and dissociation dynamics of these species. His reactive scattering experiments using electronically excited and aligned Na and Ba atoms beautifully demonstrated the role of orbital orientation in chemical reactions.

In addition to studying relatively simple "model systems", Yuan has shown that one can use crossed molecular beam and beam/laser experiments to study the bimolecular chemistry and photodissociation of complex chemical systems. His experiments on reactive scattering of atomic oxygen with a variety of hydrocarbons were, in many cases, the first definitive determination of the primary products of these reactions and often contradicted the prevailing wisdom at the time. In a similar vein, his studies of the ultraviolet photodissociation and IRMPD of hydrocarbons and other large molecules often provided the first insights into the collisionless photochemistry of these species.

The above examples, impressive as they are, reflect only a fraction of Yuan's research accomplishments over the last 20 years. In addition to crossed beam experiments, he has developed state-of-the-art experiments in photoionization mass spectroscopy and photoelectron spectroscopy, ion-molecule reaction dynamics, and the spectroscopy of neutral and ionic clusters. It is difficult to find an area of chemical dynamics which has not been profoundly affected by his work. Yuan's

dominance in this field was recognized in 1986 when he was awarded the Nobel Prize in Chemistry, along with Dudley Herschbach and John Polanyi.

Yuan was instrumental in the establishment of the Institute of Atomic and Molecular Sciences (IAMS), where he now has his laboratories. IAMS officially became an institute in May 1994 after 12 years of planning, constructing, and staffing under Yuan's guidance as Chairman of the Advisory Board to its preparatory office, headed by C. T. Chang and after his passing in 1993 by S. H. Lin.

Since his return to Taiwan in January of 1994, Yuan has accomplished three monumental tasks.

First, as the president of Academia Sinica overseeing 23 research institutes, Yuan has greatly improved the level of academic achievements of the Academy. He succeeded in increasing its budget, convinced the government to increase the funding for the National Science Council to promote scientific research, and persuaded industry to contribute part of their profits for the same cause.

Second, not long after his return to Taiwan, Yuan was asked by President Lee Teng Huie to head a committee to make recommendations on reforming Taiwan's (primary) education system. It took him and the committee more than two years, and they have recently turned in the committee report. During this period, Yuan traveled throughout the Island to visit nearly 100 schools to discuss and exchange ideas on education reforms. His committee has made sweeping suggestions that should help to improve Taiwan's education system for the 21st century.

Third, in order to recruit overseas Chinese scholars and to encourage domestic scholars, Yuan established the Foundation for the Advancement of Outstanding Scholarships three years ago. Through his efforts, the Foundation has already obtained funding of about 30 million US dollars from private donations. Scores of scholars have received the awards. Yuan is a great scholar and teacher, and a very fine person. We are very happy to have this opportunity to participate in this special event.

Finally, we thank A. W. Castleman, Jr., Senior Editor of *The Journal of Physical Chemistry*, in charge of this special issue, for his valuable guidance and Dudley Herschbach for preparing the *Odyssey* and the *Biographical Notes*, which give such personal insight into the career of Yuan.

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