

ADVANCED ENERGETIC MATERIALS AND TECHNIQUES FOR ROCKET PROPULSION: IN HONOR OF PROF. KENNETH KUAN-YUN KUO

This Special Issue of the *International Journal of Energetic Materials and Chemical Propulsion* (IJEMCP) is the second of a sequel of three Memorial Issues meant to honor Prof. Kenneth (Ken) Kuan-Yun Kuo, founder and Editor-In-Chief of IJEMCP, who passed away on July 31st, 2016. The Co-Editors considered it appropriate to dedicate this and the following issue to the widely known conferences series started by Ken called the International Symposium on Special Topics in Chemical Propulsion (ISICP), with the first symposium being held in Athens, Greece, in 1988, and the last one in Poitiers, France, in 2014. For a matter of space, the first 1 to 5 ISICPs are recalled in this issue and the following 6 to 10 ISICPs will be recalled in the next and final Memorial Issue.

- 1-ISICP, Athens, Greece, 1988
- 2-ISICP, Lampoldshausen, Germany, 1991
- 3-ISICP, Scheveningen, the Netherlands, 1993
- 4-ISICP, Stockholm, Sweden, 1996
- 5-ISICP, Stresa, Italy, 2000

Unfortunately, both organizers of the 4th ISICP passed away. As such, their contribution is missing. For the 3rd ISICP, no photo could be found.

This 2nd Memorial Issue also comprises a total of seven papers stressing the vast scope and the worldwide influence of Ken's professional activities on researchers and scholars from different countries carrying out advanced research activities in energetic materials and chemical propulsion:

- S. Chen, Y. Tang, W. Zhang, R. Shen, L.T. DeLuca, and Y. Ye: Effect of Azobisformamide Particles on the Regression Rate of HTPB-Based Fuels for Hybrid Rocket.
- H. Shukla, G.R.S. Nandan, P. Shukla, N.V. Kumar, and M. Varma: Ignition and Combustion Characteristics of a MEMS Pyrotechnic Thruster for Micropropulsion Applications.
- W.Q. Pang, J.Q. Li, L.T. DeLuca, K. Wang, X.L. Fu, X.Z. Fan, and H. Li: Effects of Different Deceleration Agents on the Properties of Hydroxyl Terminated Polyether (HTPE)-based Composite Solid Propellants.
- Z. Qin, C. Paravan, G. Colombo, F.Q. Zhao, R.Q. Shen, J.H. Yi, and L.T. DeLuca: Ignition and Combustion of HTPB-based Solid Fuels Loaded with Innovative Micron-sized Metals.



Group photo of the IV International Seminar on Flame structure, Novosibirsk, Russia, in 1992



Birthday of Professor Summerfield at his house, 1969

- G.P. Garbinski and J.S. T'ien: Cyclic Quenching and Ignition of Low-stretch Diffusion Flames.
- M. Domingues and J. Rocco: High-Temperature Coating: Hybrid Rocket Motor Thermal Protection Case History.

- R. Acharya, B. Evans, J. Pitt, F. Costanzo, and K. Kuo: Coupling of Transient Thermal and Mechanical Stresses Computations in Graphite Nozzle Materials.

A full obituary was published by this journal in volume 15, issue 4, 2016, pages v–vii. In the first Memorial Issue, a vivid and captivating portrait of Ken at the very beginning of his academic career at Princeton University was compiled by Dr. Leonard H. Caveny, for years a very close coworker of Prof. Summerfield at the Guggenheim Aerospace Lab of Princeton University. In addition, several former colleagues at Guggenheim provided short snapshots of the young Ken as remembered from the years of Princeton University (1968–1972). Further short reminiscences were offered by international colleagues who met and became familiar with Ken from all over the world.

Our goal for this Special Issue sequel is to honor Ken in the first anniversary of his death. We hope that this additional small token to his memory will further reinforce the greatest respect that Ken deserved from each and all of us!

Guest Editors:

Luigi T. DeLuca
Italy

Keiichi Hori
Japan

John F. Zevenbergen
The Netherlands

Symposium number: 1**Location: Athens, Greece****Date: November 23–25, 1988****Primary Host Symposium: Jim Fleming, Director of Fleming Consulting International****Memories/Anecdotes:**

The idea of a symposium on the subject of Base Bleed was my own, but Prof. Kuo, who was invited to be the chairman, had the vision to recognize that this could form the basis of a series of symposia on special topics.

I had first met Prof. Kuo when I worked at Space Research Corporation (SRC). The President of SRC was the legendary Dr Gerald Bull, and, during a two-year period when I worked as a consultant (before returning to SRC), he had suggested to me that Prof. Kuo would make a fine Chairman. In addition to Prof. Kuo, Dr. Bull, and myself, the other Steering Committee members were Bernard Zeller (then Research Director of France's SNPE) and Dr. Alon Gany (of Technion).

There were some 90 attendees from 18 countries at the 1st symposium, which concluded with a round table discussion. The high scientific standards coupled with a friendly and informal approach have been features of the remaining symposia.

Ken suggested that the European Research Organisation (ERO) of the US Army could be a sponsor and we were successful in securing funding from ERO.



Opening remarks at the 1st ISICP

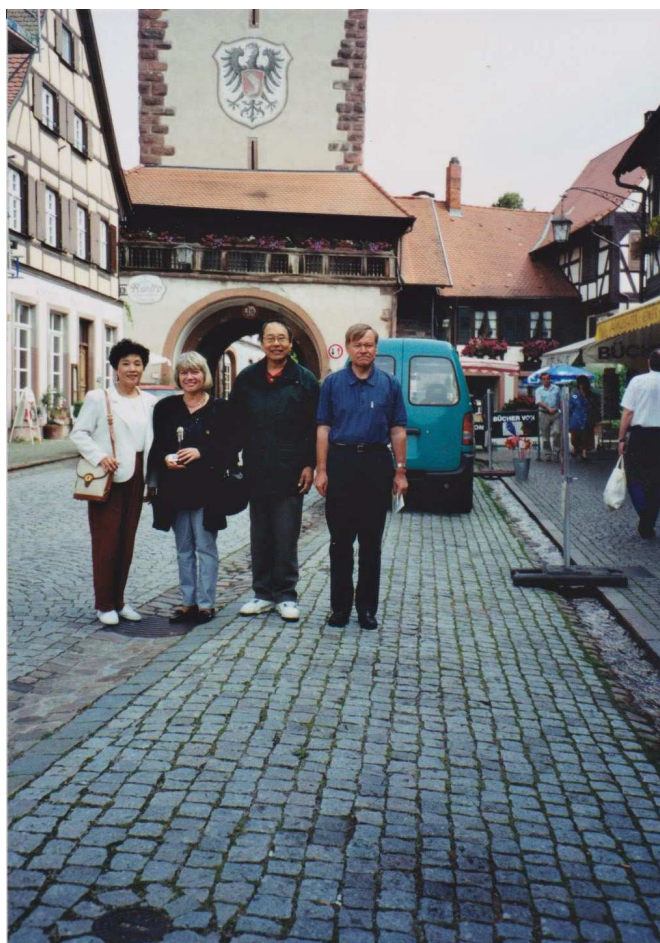
There were three themes to the Base Bleed symposium: (1) Chemistry/ignition and combustion, (2) modeling/performance calculations, and (3) experimental/ballistics.

Ken proposed to publish the first symposium and was successful in securing a publisher together with reviewers.

I had the pleasure of seeing Ken at the 10th ISICP (Poitiers); he also attended the paper I presented and made generous remarks about our friendship and the work to start the ISICP.

Symposium Number: 2**Location: Lampoldshausen, Germany****Date: March 4–6, 1991****Primary Host Symposium: Dr. Roland Pein, DLR Germany****Memories/anecdotes:**

The 2nd ISICP was held in the German Aerospace Research Establishment (DLR) in Lampoldshausen on March 4–6, 1991. The symposium provided an active forum for communication between researchers, propulsion system developers/designers, and manufacturers of boron and its compounds. Five plenary lecturers were invited; about 50 persons visited the conference. The small, very special meeting generated an informal atmosphere with fruitful international discussions. Chairperson's dinner was held at Insel Hotel in Heilbronn, a larger town nearby. The Lord Mayor of Heilbronn invited us to an audience at City Hall. The symposium also included a guided tour around the rocket test facilities of DLR Lampoldshausen. A small spouses program was organized for Prof. Kuo's wife Olivia and my wife Barbara.



Olivia Kuo, Barbara Pein, Ken Kuo, and Roland Pein on a round trip through Black Forest, Germany

I first met Prof. Kuo at an AIAA conference about one year before. He was looking for a local organizer for the 2nd ISICP and we soon agreed to conduct it in 1991. As I was relatively new in the field of Aerospace Engineering, I was surprised that he selected me for such an ambitious task, and felt very honored. I realized that he was very open-minded. Thus, I did my best, and we had a brilliant symposium in Lampoldshausen. Later on he selected me many times as chairman and steering committee member for the following ISICPs as well as associate editor of IJEMCP.

A few years later, Prof. Kuo happened to be in Germany; and as I knew that Americans are very fond of Black Forest, I invited him for a three days round trip by car. We were accompanied by Olivia Kuo and my wife Barbara. The Photo shows us four visiting Gengenbach, an old medieval town. We had a nice time and visited a waterfall, Lake Titisee, Schluchsee Dam, a cuckoo clock shop, and ate the famous Black Forest gateau.

With the death of Prof. Kuo, his wife Olivia, all his friends, and the whole scientific community lost a very active, kind, and open-minded person and scientist.

Symposium Number: 3**Location: Scheveningen, the Netherlands****Date: May 10–14, 1993****Primary Host Symposium: Dr. H.J. Pasman, Director Defence Research TNO (1993); TEES Research Professor, Mary Kay O'Connor Process Safety Center, Texas A&M University, Emeritus Professor Chemical Risk Management, Delft University of Technology (2018).****Memories/anecdotes:**

I organized the third ISICP in Scheveningen, the Netherlands, more than three decades ago. I remember that during the symposium, together with my TNO colleagues Herman Schöyer and Paul Korting, we had a long discussion with Ken about the challenges we were facing regarding combustion waves in large-caliber guns and rocket engines. How can we control these unruly waves that destroyed our ideas of a simple scale-up? I remember how Ken explained the complex transient interactions of combustion chemistry and physics with such immense passion and dedication. We absolutely adored his intensity as well as his accessibility and courteous way he was dealing with everybody.

Symposium Number: 4**Location: Stockholm, Sweden****Date: May 27–31, 1996****Primary Host Symposium: Tekn. Lic. Nils-Erik Gunners, MEGA Energy Technology (Västerhänge, Sweden); Prof. George B. Manelis, Russian Academy of Sciences (Moscow Region, Russia)**

Symposium Number: 5**Location: Stresa, Italy****Date: June 18–22, 2000****Primary Host Symposium: Dr. Luigi T. DeLuca, Politecnico di Milano, Italy****Memories/anecdotes:**

The Fifth International Symposium on Special Topics in Chemical Propulsion (5-ISICP) was titled “Combustion of Energetic Materials” and was held in the beautiful area of Stresa Lake, Northern Italy, June 18–22, 2000. The objective was to promote technical communication and to encourage advancements in the important area of Energetic Materials. This was my first chance to deal with Prof. Ken K. Kuo as an organizer. Without much surprise, Ken revealed himself to be a careful organizer and attentive administrator as much as he was a first-class scientist.

The Symposium was attended by 130 participants from 19 countries. In total, 153 technical papers were offered, including 86 oral presentations and 67 poster papers. Of these, 100 were selected for publication in the corresponding edited book of proceedings. The accepted papers were grouped into 12 technical areas.

Three awards were given at the Symposium to promote excellence in technical work. The first award was the Martin Summerfield Memorial Best Paper Award, named for Professor Martin Summerfield of Princeton University, who had passed away in 1996. This award was given to Dr. Richard Behrens of the Sandia National Laboratory for his invited plenary lecture. The other two awards were given to the best oral presentation and best poster presentation papers. These two awards were presented to Dr. Genie G.M. Stoffels of Delft University of Technology and Dr. Antoine E.D.M. van der Heijden of TNO Prince Maurits Laboratory of the Netherlands, respectively.



Participants photo in front of Regina Palace Hotel, venue of the conference