

## **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 third and final one of a sequel of three Memorial Issues meant to honor Professor Kenneth (Ken) Kuan-Yun Kuo, founder and Editor-in-Chief of IJEMCP, who passed away on July 31, 2016. The co-editors considered it appropriate to dedicate the last two issues to the widely known conference series started by Ken, which is 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 being held at Poitiers, France, in 2014. For a matter of space, the first five ISICP were recalled in the second issue, and the last five ISICP conferences are recalled in this third Memorial Issue, which were held in the following cities:

- 6-ISICP, Santiago, Chile, 2005;
- 7-ISICP, Kyoto, Japan, 2007;
- 8-ISICP, Cape Town, South Africa, 2009;
- 9-ISICP, Québec City, Canada, 2012; and
- 10-ISICP, Poitiers, France, 2014.

This 3rd Memorial Issue also comprises a total of 7 papers stressing the vast scope and the world-wide influence of Ken's professional activities on researchers and scholars from different countries carrying out advanced research activities in energetic materials and chemical propulsion:

1. Wen-gang Qu, Feng-qi Zhao, Yan-jing Yang, Hong-xu Gao, and Zhi-feng Yuan: Nanoscale SnO<sub>2</sub> with Well-Defined Facets Improving Combustion Performance of Energetic Materials.
2. Nianbei He, Yiru Chen, Lizhi Wu, Wei Zhang, Yinghua Ye, and Ruiqi Shen: Combustion Characteristics of 5-Aminotetrazole-based Propellant for Laser-Augmented Propulsion.
3. Zhi-feng Yuan, Feng-qi Zhao, Yan-jing Yang, Xiu-duo Song, Hong-xu Gao, and Si-yu Xu: Comparative Investigation of Different NanoMetal Materials on Combustion Properties of DB and CMDDB Propellants.
4. Alexander B. Vorozhtsov, Nikolay G. Rodkevich, Marat I. Lerner, Alexander S. Zhukov, Sergey S. Bondarchuk, and Nikolay N. Dyachenko: Metal Nanoparticles in High-Energetic Materials Practice.

5. Arif Karabeyoglu: Challenges in the Development of Large-Scale Hybrid Rockets.
6. Yu Daimon, Hideyo Negishi, Hiroumi Tani, Yoshiki Matsuura, Shigeyasu Iihara, and Shinichi Takata: Flowfield and Heat Transfer Analysis in a MON/MMH Bipropellant Rocket Engine.
7. Chihiro Inoue, Go Fujii, and Yu Daimon: Mixing Length Scale of Bi-Propellant Thrusters for Characteristic Velocity Formulation.

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, a very close coworker of Prof. Summerfield for years 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  
Netherlands

**Symposium Number: 6****Location: Santiago, Chile****Date: March 8–11, 2005****Primary Host Symposium: Dr. Juan de Dios Rivera, Pontificia Universidad Católica de Chile****Memories/Anecdotes:**

The sixth ISICP was held in Santiago, Chile (March 8–11, 2005), and was hosted by Dr. Juan de Dios Rivera from Pontificia Universidad Católica de Chile. This was the first ISICP Dr. Kuo organized in the Southern Hemisphere. Planning the symposium was complicated by the sudden passing of Professor G.M. Faeth on January 24, less than two months before the meeting. Professor Faeth had been invited as the main speaker for the opening session and it was quite hard to find a suitable replacement at such short notice. Dr. Kuo managed to solve this and other unexpected problems with his customary energy and thoroughness.

This symposium had 54 oral presentations, nine invited speakers, and 14 posters. The gala dinner was held at the Navy Club in Valparaíso, which is the main Chilean port and base of the Chilean Fleet. At the end of the meeting, a small group of attendees led by Dr. Kuo made a two-day trip to the Andes Mountains close to Santiago. The goal was to visit the statue “Cristo Redentor,” erected on the border between Chile and Argentina, at the altitude of 3,854 m (12,640 ft). The statue, inaugurated in 1904, was built to commemorate the friendship between both countries. However, the group could not reach the place because at an altitude of 3,500 m (~ 11,480 ft), the road was covered with snow.



Group photo at the Military Club in Lo Curro, Santiago

**Symposium Number: 7****Location: Kyoto, Japan****Date: September 17–21, 2007****Primary Host Symposium: Prof. Keiichi Hori, ISAS/JAXA****Memories/Anecdotes:**

All of the ISICPs until the fifth one were held in Europe, with the sixth symposium being held outside of Europe for the first time in Santiago, Chile. After the 6-ISICP, the city of Kyoto was selected by Professor Kuo for the 7-ISICP, which was the first Asian site. After that, the site selection was done by vote of the chairpersons or participants.

The seventh ISICP was held in Kyoto, Japan (September 17–21, 2007), and was hosted by Professor Keiichi Hori, Institute of Space and Astronautical Science/Japan Aerospace Exploration Agency (ISAS/JAXA). Professor Kuo brought five students to Kyoto and helped the inexperienced local organizing committee with the preparations for the symposium. Owing to his tremendous efforts, the 7-ISICP was very successful. Eighty high-level papers (54 oral presentations and 26 posters) were presented and 140 scientists from all over the world participated. Eight plenary lecturers were invited, and Professor Alon Gany won the Summerfield Award. The chairperson's dinner at the Honen-in Temple was one of the highlights of the 7-ISICP. September is typhoon season in Japan; however, our enthusiasm blew away typhoons and the 7-ISICP had the good fortune of sunny days for the entire week. The symposium was wrapped up with a technical tour of the Daicel Corporation and a sightseeing tour of Himeji castle.



Group photo prior to Chairperson's Dinner at Honen-in



Dinner with Penn State Staff



**Symposium Number: 8****Location: Cape Town, South Africa****Date: November 2–6, 2009****Primary Host Symposium: Prof. Hansie Knoetze, University of Stellenbosch, South Africa and Dr. Deon van Zyl, Rheinmetall Denel Munition, South Africa****Memories/Anecdotes:**

During the first day of the 7-ISICP in Kyoto in September 2007, I was approached by Ken about organizing the next ISICP in South Africa. I contacted the management of Rheinmetall Denel Munition about his proposal and they approved it. The next day I had to prepare a presentation for hosting the next ISICP in South Africa on somebody else's laptop. This proposal to host the 8-ISICP in Cape Town in 2009 was accepted during the Chairman's Meeting at the end of the symposium. Although it was a great honor to host such a conference in South Africa, I made it clear to Ken that we can only accept this task if two conditions were met. The first condition was that a South African academic institution had to be part of the organizing committee—and we were grateful that Professor Hansie Knoetze from the Department of Chemical Engineering, University of Stellenbosch, accepted the invitation to be a Co-Chair. The second condition was that the ISICP Foundation had to provide the initial financial support to pay all the deposits and organizing fees to host the symposium. Ken did not hesitate to give the organizing committee in South Africa the necessary bridging financial support and we acknowledge his contribution. Thus, the 8-ISICP was held in Cape Town, South Africa (November 2–6, 2009), and was hosted by Professor Hansie Knoetze, University of Stellenbosch, South Africa, and Dr. Deon van Zyl, Rheinmetall Denel Munition, South Africa. The symposium was a tremendous success because of Ken's insightful input, knowledgeable guidance, and enthusiastic efforts.



Social excursion before dinner at Blouwbergstrand

**Symposium Number: 9****Location: Québec City, Canada****Date: July 9–13, 2012****Primary Host Symposium: Dr. Robert Stowe, Co-Chair, Defence R&D Canada  
Memories/Anecdotes:**

The ninth ISICP was held in Québec City, Canada (July 9–13, 2012), and was hosted by Dr. Robert Stowe, Co-Chair, Defence R&D Canada. We were honored to work with Distinguished Professor Kenneth Kuo to host the 9-ISICP, the first time the symposium had ever been held in North America. After having attended the 8-ISICP in Cape Town, and seeing the excellent job those organizers had done, we did our best to put on a worthy conference. Fortunately, we were able to secure a great venue at Hôtel Le Concorde, beside the famous Plains of Abraham and next to the walls of beautiful Québec City, the cradle of French civilization in North America and a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. With a record number of participants and papers (140 in total), we had three full days of technical sessions along with three poster sessions and nine invited talks. A short course on the characterization of energetic materials was also attended by 40 people. The Chairman's Dinner took place at the Citadelle of Québec, an active military installation and summer home to the Governor General of Canada. The highlight of the symposium banquet was a show by the First Nations troupe, Yahndawa. To cap off the week, a Friday morning visit to the Defence R&D Canada Valcartier Research Centre featured the Propulsion Laboratory, Trisonic Wind Tunnel, Aeroballistic Range, and Hypervelocity Impact Laboratory. The afternoon included a gondola ride and lunch at Montmorency Falls, followed by an excursion to Ile d'Orléans and a taste of New France at the Manoir Mauvide-Genest. We truly enjoyed the company of Ken and his lovely wife, Olivia, the entire week.



Chairman's Dinner at the Citadelle of Québec

**Symposium Number: 10**

**Location: Poitiers, France**

**Date: June 2–6, 2014**

**Primary Host Symposium: Prof. Emeritus Charles Kappenstein, IC2MP,  
University of Poitiers**

**Memories/Anecdotes:**

The tenth ISICP was held in Poitiers, France (June 2–6, 2014), and was hosted by Professor Emeritus Charles Kappenstein, IC2MP, University of Poitiers. The best memory of the 10-ISICP was the traditional banquet, which took place in an old abbey close to Poitiers. Ken was, as usual, the ceremony master to offer different distinctions and prizes to symposium participants chosen by ballots or selected by dedicated committees just before the bus departure to the banquet. Therefore, we had to print the diploma with the name of the winners and find European currencies (euros) at the last minute, but we managed to get it all done in due time—much to our relief. Last but not least, the banquet was followed by a very nice fireworks display, which remains in all our memories. This was a tribute to the topic of the symposium, chemical propulsion, and to its founder, Professor Kenneth K. Kuo.

### **Ken and French History: A Fond Memory**

Three years ago, before the 10-ISICP, on a very nice, quiet Sunday in June, we made a journey through history with Olivia and Ken. We had a picnic and visited a very old abbey site (Nouaille)



Picture of the welcome reception at the 10-ISICP in Poitiers (at ENSMA) with Ken and a small group of participants



close to Poitiers, which dates back to the seventh century. In the fourteenth century, this had been the site of the battle between the Black Prince and the King of France, who was captured by the English in 1356. This is one of my most pleasant memories of Olivia and Ken.