

IMI - I²CNER Joint Seminar on Applied Math

Institute of Mathematics for Industry / International Institute for Carbon-Neutral Energy Research
Kyushu University

Advances in Combustion Science during the past five decades From an Applied Mathematician perspective

Speaker : Prof. Moshe Matalon

Caterpillar Distinguished Professor,
Mechanical Science and Engineering,
University of Illinois at Urbana-Champaign
USA



Abstract

Many accomplishments in combustion science during the past five decades could be attributed to applied mathematician who have used systematically asymptotic methods to tackle the complexity of the mathematical equations describing combustion phenomena. Among the various examples presented in this talk are: the derivation of an explicit analytical expression for the laminar flame speed; flame extinction due to excessive heat loss; unambiguous definitions of flame speed and flame stretch for multi-dimensional time-dependent flames; criteria for various intrinsic flame instabilities including the hydrodynamic instability and thermo-diffusive effects; nonlinear descriptions of flame dynamics based on the Michelson-Sivashinsky and Kuramoto-Sivashinsky equations; the structure of non-premixed flames from complete combustion to extinction; stabilization of non-premixed flames by means of edge flames and lifted flames. This development has been successfully used in guiding laboratory experiments, interpreting experimental data and validating large-scale computations.

About the Speaker

Prof. **Moshe Matalon** received his undergraduate and Master's education at Tel Aviv University, followed by a Ph.D. in Mechanical and Aerospace Engineering from Cornell University in 1977. He has worked at Cornell University, the Polytechnic Institute of New York, Northwestern University, and since 2007 has been at the University of Illinois at Urbana-Champaign, where he is the College of Engineering Caterpillar Distinguished Professor. Matalon's research interests are in combustion theory, theoretical fluid mechanics and applied mathematics. Matalon is Fellow of the American Physical Society, Institute of Physics, American Institute of Aeronautics and Astronautics (AIAA) and a member of the Society of Industrial & Applied Mathematics and of the Combustion Institute. He received several awards including the AIAA Pendray Aerospace Literature Award in 2010, the AIAA Fluid Dynamics award in 2016 and more recently (in 2017) the Numa Manson Medal of the Institute for the Dynamics of Explosions and Reacting Systems (IDERS). Matalon serves as Associate Editor of the *Journal of Fluid Mechanics* and is Editor-In-Chief of *Combustion Theory and Modelling*.

Date / Time : October 31 (Tue.) 1:30 p.m. - 2:30 p.m.

Venue : IMI Auditorium (West 1, D-413), Ito Campus, Kyushu University
<http://www.imi.kyushu-u.ac.jp/eng/>

Chair : Kaname Matsue (Assist. Prof. of IMI / I²CNER, Kyushu University)

Contact : kmatsue@imi.kyushu-u.ac.jp