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SEMINAR
«DYNAMICS OF DETONATIONS: FROM THEORY TO APPLICATIONS»

Dr Aslan Kasimov

October 22, 2015

13.30 - 15.00

Room 148

TPOC-3

SEMINAR ABSTRACT:

This talk will center around my recent work on the theory of detonations – self-sustained shock waves in chemically reacting mixtures. A detonation represents a particularly interesting and challenging regime of combustion, in which very rapid and often unstable process of chemical energy release takes place. Understanding intricacies of detonation dynamics is important from theoretical as well as practical points of view. For example, a detonation wave represents a complex infinite-dimensional dynamical system that admits chaotic behavior and pattern formation, which are not very well understood. From a practical point of view, understanding detonation dynamics is of particular relevance to supersonic propulsion and to detonation engines. Detonation also turns out to have unexpected analogy to many seemingly unrelated phenomena. These include jamitons in highway traffic, hydraulic jumps, spin avalanches in molecular magnets, among others. Valuable insight into the nature of these phenomena is gained from our knowledge about detonations, and this will be discussed along with various open problems in these areas.

SPEAKER INTRODUCTION:

Aslan Kasimov holds a Ph.D. in Theoretical and Applied Mechanics from the University of Illinois at Urbana-Champaign (2004), M.Sc. in Mechanical and Aerospace Engineering from the University of Virginia (1999), and Diploma of Engineer-Physicist from Moscow Engineering Physics Institute (MEPhI), Russia (1993). From 2005 to 2009, he was an instructor and lecturer in applied mathematics at MIT. In 2009 he joined KAUST as a founding faculty member. He leads there a research group in Physical Applied Mathematics. Prof. Kasimov's interests are in fluid dynamics and applied mathematics with particular emphasis on understanding shock waves in variety of physical systems. His recent work includes: asymptotic analysis of detonation dynamics, traffic modeling, water waves, numerical simulation of reactive flows, modeling of Bose-Einstein condensates, pattern formation in population dynamics, and hydrodynamic quantum analogs.