Editorial

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Biographical notes: Bruno Chanetz received his PhD in 1986 and HDR in 1997 from the University of Lyon I. He was an Associate Professor at the University of Versailles from 2003 to 2009. Since 2009, he is an Associate Professor at the University of Paris-West. He was a Research Engineer at ONERA in 1983, Head of Hypersonic Group in 1990, Head of Hypersonic Hyperenthalpic Project in 1997 and Head of Experimental Simulation and Physics of Fluid Unit in 1998. Since 2003, he is the Deputy Director of the Fundamental and Experimental Aerodynamics Department. He is an AAAF member, and member of the Aerodynamic Committee.

Amer Chpoun is a Professor of Mechanical Engineering at the University of Evry, France. He graduated in Mechanical Engineering from the *Institut National des Sciences Appliquées* (INSA) of Toulouse. He also obtained his post-engineering degree (DEA) in Thermal Sciences and Energy from the University of Nice and Ecole des Mines de Paris, France. He prepared and received his PhD from the University of Pierre et Marie Curie and the Laboratoire d'Aérothermique du CNRS at Meudon on the subject of shock

wave boundary layer interaction. He obtained his Habilitation à Diriger des Recherches (HDR) degree from the University of Evry for his extensive work in the field of hypersonic. During the mid-'90s, his contribution to the study of Mach reflection has led to the first experimental and numerical observations of the hysteresis phenomenon during the Mach to regular reflections transition in steady flows. His current focus is on supersonic nozzle flows.

Viviana Lago is a CNRS Engineer Researcher at the Laboratoire ICARE. She received her PhD in 1993 from the Université Paris XI, Orsay specialised in gas and plasmas physics. Her research development concerns experimental investigations on: high-temperature gas, dynamics and plasma-dynamics, re-entry and hypersonic aerodynamics, stability and transition of hypersonic flows, thermo-chemical non-equilibrium flows and high-temperature thermo-chemistry. She develops numerical tools for the investigation on molecular and atomic emission in non-equilibrium flows, and for the investigation on electron probe theory in non-equilibrium plasmas and magnetised plasmas. She is the Scientist Manager of the platform 'Fast': Facilities for Aerothermo-dynamics and Supersonic Technologies. She is an AAAF member and member of the Aerodynamic Committee.

At the end of the Second World War and during the '50s and '60s, motivated by the conquest of space and associated international competition, the field of hypersonic flows as a national priority has gained a considerable advance and attracted many distinguished scientists. During this period, many hypersonic wind tunnels and facilities have been built worldwide. Experimental approaches were often associated with developing analytical and increasingly numerical methods. Tremendous efforts were employed to reduce the system of equations to obtain analytical solutions and in the case of a numerical resolution to reduce the computation time. This first set of significant knowledge in the field of hypersonic flows is often called the 'old hypersonic'. For the past two decades, the field of hypersonic gained a renewed interest after a period of standby and relative decline during the '70s in the aftermath of the Apollo programme.

Compared to the 'old aerothermodynamics' of space vehicles developed mainly during the '50s and the '60s, for the past decades considerable advance has been made in this field. This advance has been achieved by a spectacular progress in computer science, development of numerical methods and new measurement techniques. The scientific progress inevitably leads to the reduction of launching cost and therefore to a better environmental protection. In this field, a score of scientific papers have been published in specialised journals. The aim of the present special issue is to bring to the attention of readers an overview of these achievements through leading scientific works in the field.

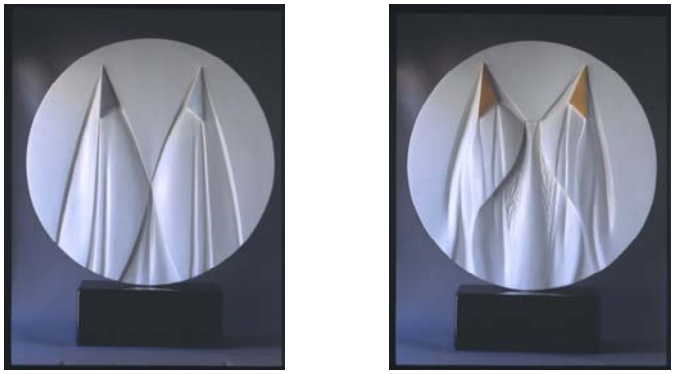
The issue is devoted to the development of aerothermodynamics for space vehicles. It covers selected studies from leading laboratories in the field related to the high-speed flight of advanced launchers, re-entry vehicles and planetary descent. The works presented in this special issue deal with drag reduction, propulsion, numerical methods and fundamental physics of flows.

Among ten articles, the thematic of 'hysteresis phenomena associated with shock waves interference in steady hypersonic flow' is discussed in this issue.

In this regard and in an unconventional note, the editors would like to dedicate this special issue to the great French sculptor Jean Letourneur who also devoted his work to the fascinating world of fluid mechanics.

His personal research related to aerodynamics led him to initiate a collaboration with ONERA, first at low speed in water tunnel, and then at hypersonic speeds. In the frame of the World Year of Physics in 2005, he made a medal-sculpture on the theme of the intersection of shocks. The well-known types I and II shock/shock interferences were thus represented with relief. Jean Letourneur uses for his sculptures the traditional materials, stone, marble and bronze. Isn't it an eloquent tribute rendered to hypersonic aerodynamics?

Figure 1 Types I and II shock/shock interferences represented with relief (see online version for colours)



Source: http://www.jeanletourneur.com