

UNIVERSITÀ DEGLI STUDI DI GENOVA

Dottorato in Fluidodinamica e Processi dell'Ingegneria Ambientale
Progetto Marie Curie EST "FLUBIO"

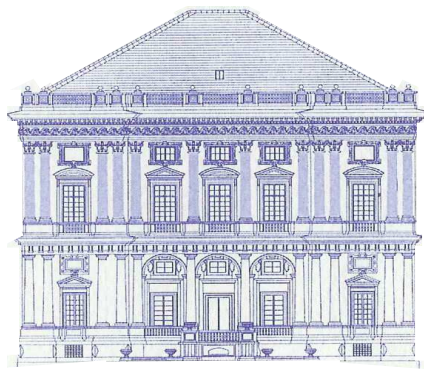
AVVISO DI SEMINARIO

"NUMERICAL STUDIES OF COMPLEX WALL-BOUNDED FLOWS"

Prof. Luca Brandt

Royal Institute of Technology
Stockholm, Sweden

Martedì 10 Novembre, 2009 – ore 16.00
Facoltà di Ingegneria,
Aula A11
Villa Giustiniani Cambiaso



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Numerical studies of complex wall-bounded flows

Numerical simulations have become an independent and extremely useful tool to gain new knowledge in fluid flow problems. In the seminar, some examples of the work of the author at the Linne FLOW Centre will be presented. The simulations include the response of a boundary layer to external turbulence, flow control with LES, turbulent boundary layers with passive scalars at high Reynolds numbers, inertial particles in turbulence and more recently swimming microorganisms in biological polymeric fluids. Besides these multi-physics problems, new interest is now in the simulation of flows in complex geometries. To this end, the Spectral Element Method is currently considered. The latter combines the flexibility of the finite element approach with the accuracy of the spectral approximation. The numerical tools are developed in collaboration with P. Fischer, Argonne National Lab, and C. Mavriplis, University of Ottawa. As an example, simulations of the leading-edge of a thin body will be presented. Vortical perturbations in the oncoming free-stream are considered, impinging on two leading edges with different aspect ratio to identify the effect of bluntness. The relevance of the three vorticity components of a natural free-stream turbulence field is illuminated by considering axial, vertical and spanwise vorticity separately at different angular frequencies. The mechanisms of disturbance entrainment are clearly identified from the simulations.

Biographical sketch of Luca Brandt

Luca Brandt obtained his master degree in Mechanical Engineering with honors in 1997 at the University of Rome, "la Sapienza". After this, his scientific activity has mainly taken place at the Department of Mechanics at KTH, first as graduate student (supervisor: Prof. Dan Henningson; PhD in 2003), then as Assistant Professor and currently as Associate Professor. He has been involved in numerous international collaborations; in particular, he has spent 9 months at the Hydrodynamics Laboratory (LadHyX) of Ecole Polytechnique, Paris, and the collaboration with the Technical University in Eindhoven has led to an agreement between the two universities for a joint PhD project. He was awarded a prestigious Special Researcher Position from the Swedish Research Council (VR) in Mechanics in 2008. It was the first time a position in Applied Mechanics was announced in Sweden. His research activity focuses on hydrodynamic stability and flow control using both theory and large-scale direct numerical simulations. He has 25 publications in international journals. He is Director of Studies of the FLOW graduate school, associated to the Linne FLOW Centre, an excellence centre established by the Swedish Research Council in 2006.