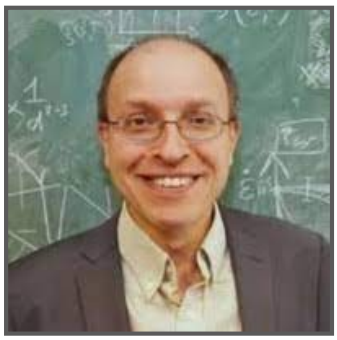
UNIVERSITÀ DEGLI STUDI DELL'AQUILA
M&MOCS
International Research Center on
MATHEMATICS AND MECHANICS
OF COMPLEX SYSTEMS

LAUDATIO FOR PROFESSOR ABDUL BARAKAT



Prof. Abdul Barakat is Director of Research and the AXA Endowed Professor of Mechanics and Biology at CNRS-Ecole Polytechnique in France.
He is Adjunct Professor of Mechanical and Manufacturing Engineering at the University of New South Wales in Sydney (Australia) and Principal Investigator of the Beijing Advanced Innovation Center for Biomedical Engineering at Beihang University in China.
From July 2022 he's Co-Director of Engineering for Health (E4H) Interdisciplinary Research Center at Palaiseau, Île-de-France, France.
He's is an elected Fellow of the American Institute for Medical and Biological Engineering.

He received his Ph.D. in biofluid mechanics from Massachusetts Institute of Technology (MIT, U.S.) in 1994. After a year as an NIH Postdoctoral Fellow at the University of Chicago, he was recruited as Assistant Professor in the Department of Mechanical and Aerospace Engineering at the University of California, Davis. He was promoted to Associate Professor in 2001 and to Full Professor in 2006, position he held until 2010. At UC Davis, he was also on the faculty of the Biomedical Engineering, Biophysics, and Applied Mathematics graduate programs. Relocated to France in 2010, in 2014 he co-founded the startup company Sensome, which develops state-of-the-art sensors to equip medical devices.

His research interests are in biomedical engineering with specific focus on arterial fluid mechanics and mass transport, cellular mechanobiology, vascular cell engineering and endovascular devices.
Starting from the belief that the rapid growth of biomedical and digital health innovations has blurred once impermeable frontier between medicine and engineering, and that the inclusion of engineering approaches and modern tools can influence powerful changes in life sciences, he and his team focused firstly attention on cardiovascular diseases, the world's leading cause of mortality.
The results achieved by the AXA Chair for Cardiovascular Cellular Engineering since its creation in 2010 have contributed fundamental new knowledge to the fight against atherosclerosis, a process known to cause coronary heart disease (CHD) and stroke. Research has addressed a crucial gap in our understanding of why and how changes in blood flow impact the structures within the nuclei of vascular cells, a process thought to play a role in the development of atherosclerosis. Using a mechanobiology approach, – an emerging field that stands at the interface of biology, engineering, and physics –, they were able to identify the involvement of a specific class of proteins (Nesprins), in how mechanical stimuli are transmitted from the surface of endothelial cells to their nucleus – endothelial cells are the cells that line the inner surfaces of blood vessels and control the flow of substances and fluid that travels between the bloodstream and the vascular wall. Having identified these proteins as playing a fundamental role could lead to new avenues of treatment.

The two main other lines of activity concerns:

- the development of artificial arteries to test new medical devices and drugs. The new in vitro platform is a world first and has generated a lot of interest from companies making stents and blood pumps, as well as from research groups studying blood clots;
- the design of stents (i.e., metallic or polymeric wire-mesh structures that are inserted into a vessel to keep the passageway open). Using a biomechanical approach, his team showed that the shape of the stent elements, by disrupting the blood flow, affects the vascular healing process, as well as drug effectiveness. Based on engineering principles, they demonstrated that, compared to the traditional criss-cross design, a spiral stent design would lower these risks.

The results of his entire career path are materialized in over 200 publications in peer-reviewed journals and conference proceedings and in over 130 invited presentations all over the world.

Extremely relevant, alongside 'pure' research, is his commitment to education of a French physicists, engineers and medical doctors new generation, through the opening of a series of BioMedical Engineering programs at École Polytechnique including a new 5-year integrated Master's/PhD program.

For the profound value of his research, for the attention to technology transfer for medical and industrial scopes, for his vision aimed at ''pushing the frontiers of Biomedical Engineering to defeat critical diseases'' the Committee, entrusted by the Scientific Committee of the International Research Center MeMoCS with the responsibility of awarding the International Eugenio Beltrami Prize unanimously proposes Professor Abdul Barakat as recipient of the 2020 edition.