Colloquium **"Contact mechanics and interfacial phenomena: the role of thickness"**
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Tribology is the science of rubbing surfaces in dry and wet conditions. It is a very interdisciplinary topic, involving several branches of fundamental and applied science, ranging from physics and chemistry to surface science and lubrication. Engineering in general, and specifically mechanics, are extremely involved in tribological problems, as controlling the behavior of interfaces between bodies in relative motion is a key factor in modern industry. Therefore, topics such as controlling interfacial friction, wear, sealing properties, and so on, in the presence of complex interactions (e.g., chemical adhesion, electro-adhesion) are some of the current focuses of modern tribologists.

Among the others, contact mechanics is one of the oldest branches of tribology (since 19th century). Its main focus is on the accurate description of both repulsive and attractive interactions occurring at the interface between deformable solids, both in static and sliding conditions. Most of the existing studies and theories in contact mechanics share the assumption of dealing with semi-infinite solids, where the size of the contact area at the interface is negligible compared to the thickness of the bodies involved in the contact. Although this assumption holds true in several practical applications, recent studies have shown that there exist conditions in which the real interface behavior may significantly differ from the predictions produced within this framework.

The proposed aim of this colloquium is to introduce the science of tribology, qualitatively reviewing the milestones of contact mechanics studies. We will show the possible limitations of the semi-infinite bodies assumption, with specific focus on the qualitative behavior of the interface (contact stiffness, area, friction). We will then introduce recent advances in modelling the contact behavior of substrate of finite thickness (e.g., coatings), also commenting on the physical results in terms of net frictional response in rubbing conditions.

Nicola's Short Biography

Nicola obtained his Master cum laude in Mechanical Engineering at Polytechnic University of Bari (Italy). Consequently, he took up a PhD studentship in Tribology, funded by GE Avio, at the same institute. During his PhD, he was Visiting PhD student for 8 months in the Tribology group at Imperial College London. His PhD thesis dealt with the effect of adhesion and friction in periodic contacts of elastic and viscoelastic thin layers. After the PhD, he spent three years post-doc at Polytechnic University of Bari working con contact mechanics, adhesion and viscoelasticity of layered and multilayer materials. At the same time, he was Visiting Academic in the Tribology group at Imperial College, working in tight collaboration with Prof. Dini and Dr. Reddyhoff.
In 2019, he was granted with a Marie Skłodowska-Curie Fellowship at Imperial College London (UK), and he is currently enrolled in the Tribology group. In 2020, he gained a Senior Lectureship in Applied Mechanics at the Department of Mechanics, Mathematics and Management, Polytechnic University of Bari.
His research interests mainly consist in the contact mechanics of elastic and viscoelastic thin layers, with specific focus on interfacial phenomena such as adhesion and friction. Other topics of scientific interest are associated to the nonlinear dynamics of multi-dof systems under nonlinear damping arising from viscoelastic contact interactions. He currently counts more than 25 publications in international journals with about 400 citations and a H-index score of 12.