Dipartimento Meccanica Matematica Management

MUR
Dipartimento
di Eccellenza
2018-2022
2023-2027

Research project

Nome and Surname: Carmine Putignano

Title: SBIT-Soft Bio-Interfaces Tribology

Description:

This fellowship project proposes a comprehensive study of lubrication phenomena at biological interfaces, grounded in the principles of multiscale bio-tribology. The research will explore the complex interplay between fluids and soft biological solids across multiple length and time scales. From the fluid mechanics perspective, emphasis will be placed on non-Newtonian lubricants, particularly shear-thinning and viscoelastic biofluids such as synovial fluid and mucus, whose rheological properties critically influence interfacial friction and load-bearing capacity. Solid interfaces will be modeled using viscoelastic and hyperelastic constitutive laws to capture the nonlinear, time-dependent behavior of tissues like cartilage, skin, and cellular membranes.

A key focus will be the role of surface roughness, characterized across several orders of magnitude, and its impact on lubrication regimes—from boundary to hydrodynamic. The multiscale modeling framework will integrate numerical simulations, analytical methods, and potentially experimental validation, tailored to the fellow's profile and expertise. Applications will cover a wide biomedical spectrum, including articular cartilage contact, dermal friction in wearable technology, and cellular/tissue-level mechanics relevant to diagnostics and therapeutics.

Hosted by a leading research group with over 20 years of experience and international recognition in tribology—including Marie Curie, Fulbright, and Humboldt awards—this project provides a high-impact platform for career development in applied mechanics and biomechanics.

Candidates should provide detailed CV

Contacts

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