Dipartimento Meccanica Matematica Management

MUR
Dipartimento
di Eccellenza
2018-2022
2023-2027

CALL FOR EXPRESSION OF INTEREST FOR MSCA POSTDOCTORAL FELLOWSHIPS AT POLITECNICO DI BARI

Research project

Nome and Surname: Antonio Boccaccio

Title: Mechanobiology of Cell Adhesion: From Mechanical Forces to Gene Regulation

Description: Cell adhesion is not merely a biochemical anchoring process, but a highly dynamic mechanical interface through which cells sense, interpret, and respond to their physical environment. The mechanobiology of cell adhesion investigates how mechanical forces generated at the cell–matrix and cell–cell interfaces are transmitted across the cytoskeleton to the nucleus, ultimately influencing gene expression and cell fate decisions.

Adherent cells actively probe their surroundings by generating contractile forces through the actomyosin cytoskeleton, which are transmitted to the extracellular matrix via focal adhesions. These structures function as mechanosensitive hubs, where variations in substrate stiffness, topography, and applied mechanical loads are converted into intracellular signals. The magnitude, direction, and temporal dynamics of these forces regulate cytoskeletal organization and drive long-range force transmission toward the nucleus.

A growing body of evidence demonstrates that mechanical stresses applied to the cell surface are directly conveyed to the nucleus through the LINC (Linker of Nucleoskeleton and Cytoskeleton) complex. This mechanical coupling can induce nuclear deformation, alter chromatin organization, and modulate nuclear envelope tension. Such mechanically induced changes affect transcriptional activity by regulating chromatin accessibility, transcription factor localization, and epigenetic states, thereby linking physical forces to gene regulation.

Understanding how mechanical cues control transcriptional programs is central to many physiological and pathological processes, including stem cell differentiation, tissue morphogenesis, cancer progression, and fibrosis. By integrating principles of solid mechanics, cell biomechanics, and molecular biology, this research theme aims to elucidate the fundamental mechanisms by which cells translate mechanical information into biochemical and genetic responses. This mechanobiological perspective offers powerful insights for the development of innovative biomaterials and mechanotherapies targeting cell behavior at its most fundamental level.

Candidates should provide detailed CV

Candidates must be eligible according to the criteria established by the 2026 MSCA Postdoctoral fellowship call:

- to have a PhD by the call deadline.
- to have up to 8 years of research experience after PhD.
- to be citizens of an EU State or of an Associated Country.
- not to have resided or carried out their main activity in Italy for more than 12 months in the 36 months before the call deadline.

Contacts

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