Final Defense

PhD Course in Bioengineering – Final Thesis Defense

PhD Candidate: Francesca Donnaloja
Advisor: Prof. Manuela Teresa Raimondi
Co-advisor: Prof. Emanuela Jacchetti
Co-advisor: Prof. Monica Soncini

05.05.2021
h. 15:30
@ Microsoft Teams

Thesis: A new mechanotransduction mechanism acting on the nuclear pore complex via cytoskeletal linker proteins

COMMITTEE MEMBERS

Prof. Andrea Remuzzi	Prof. Riccardo Gottardi	Prof. Lorenza Draghi
Bergamo University, Bergamo, Italy	University of Pennsylvania and Children Hospital of Philadelphia, Philadelphia, PA, USA	Politecnico di Milano, Milano, Italy

SCHEDULE OF THE DAY

15:30 – 15:45	Committee Meeting
15:45 – 16:45	Thesis presentation - Discussion
16:45 – 17:00	Committee meeting
17:00	Award Ceremony

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PhD in Bioengineering

Final Defense

POLITECNICO MILANO 1863

PhD student: **DONNALOJA FRANCESCA – XXXIII Cycle**

Thesis title: **A new mechanotransduction mechanism acting on the nuclear pore complex via cytoskeletal linker proteins**

Advisor: Prof. Manuela Teresa Raimondi
Prof. Emanuela Jacchetti
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Abstract:

Mechanotrasnduction; Nuclear pore complex; lamina; LINC complex; cellular fate; stemness

Cell fate control is one of the main challenges in stem cell clinical application. In this context, basing on the literature data, I proposed the nuclear pore complex involvement behind the cellular differentiation mechanism. In particular, I suggest that SUN1 protein splits the force received between the lamina and Nup153 protein according to their relative stiffness. To validate the proposed theory, I confirmed SUN1 strong interaction with Nup153 via experimental technique and computational Molecular Dynamic simulation. On the other hand, I fully characterized the CC1b lamina domain from the mechanical point of view via Molecular Dynamic simulations. The results predicted lamina viscoelastic behavior characterized by Young's modulus proportional to the value of the force imposed.

The results suggest that, in case of incoming force at the SUN1 protein, lamina stiffness increases, altering the force transmission to Nup153. Impaired force transmission to Nup153 would trigger the nuclear pore complex opening, reducing the impedance to the nuclear molecular flux and thus altering cell fate.