



Online
seminar

Wednesday **March 16** at 16:30

Hosted on: [Zoom](#)

Valentina BALBI

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Mechanics of a twisted brain

Prof. Giverso introduces the seminar.

Abstract

Biological soft tissues are particularly common in nature. For instance, many organs in the human body such as the skin, the brain, the gastro-intestinal system are made of soft tissues. The brain, among all is particularly soft and delicate. Following an impact to the skull, brain matter can experience large stretches, possibly resulting in Diffuse Axonal Injury (DAI), which is the second leading cause of death from traumatic brain injury. Previous studies have focused on linear (uni-axial) stretches of brain to investigate DAI, but in reality brain matter undergoes a mix of deformation modes during an accident. This talk will focus on the mechanical behaviour of the brain under torsion (twisting). In collaboration with University College Dublin, we collected data from torsion tests on (pigs) brain samples and modelled the experiments to finally quantify the elastic properties of the brain tissue. I will show that torsional impacts, such as a hook punch in boxing and a side impact in a car accident can also lead to dangerous levels of stretch compatible with DAI [1].

[1] Balbi, V., Trotta, A., Destrade, M., & Annaidh, A. N. (2019). Poynting effect of brain matter in torsion. *Soft matter*, 15(25), 5147-5153.

Biography

Valentina Balbi joined the School of Maths in January 2021 as a lecturer in Applied Mathematics. Her research field is soft tissues mechanics, she is interested in both experimental and theoretical aspects. Due to their complexity, soft tissues are difficult to test. From the experimental viewpoint, Valentina is interested in developing robust and reliable testing protocols suitable for different tissues. Theoretically, she develops new mathematical models to capture the non-linear mechanical behaviour of soft tissues. Continuum mechanics, non-linear elasticity and visco-elasticity are her everyday tools.