

Nematic Bubbles and the Breaking of Spherical Symmetry



Dott.ssa Silvia Paparini

Premio AIMETA JUNIOR 2026
Università degli Studi di Padova

In this talk I will present a continuum model coupling two-dimensional nematic order with a deformable, mass-conserving spherical shell to understand defect-mediated morphogenesis in biological vesicles. Investigating the temperature-driven isotropic-to-nematic transition reveals that symmetry breaking yields distinct shapes governed by shell deformability. Axisymmetric configurations with two $+1$ defects emerge via discontinuous bifurcations, creating stable prolate or metastable oblate shapes. Conversely, non-axisymmetric configurations with four $+1/2$ defects arise through continuous bifurcations. While integer defects strongly couple with local shell thinning or thickening, half-integer defects induce no local deformation. Ultimately, shell softness drives the transition's first-order character, offering a mechanical framework for biological body-axis formation.

Mercoledì 28 ottobre 2026 – ore 10:00
Aula Seminari della Sezione Matematica – DICATAM
Via Valotti 9, Brescia



Università
di Brescia

L'iniziativa è finanziata dal Seminario Matematico di Brescia.



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