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Gyrification from constrained cortical expansion

TUOMAS TALLINEN, University of Jyväskylä

The convolutions of the human brain are a symbol of its functional complexity. But how does the outer surface of the brain, the layered cortex of neuronal gray matter get its folds? In this talk, we ask to which extent folding of the brain can be explained as a purely mechanical consequence of unpatterned growth of the cortical layer relative to the sublayers. Modeling the growing brain as a soft layered solid leads to elastic instabilities and the formation of cusped sulci and smooth gyri consistent with observations across species in both normal and pathological situations. Furthermore, we apply initial geometries obtained from fetal brain MRI to address the question of how the brain geometry and folding patterns may be coupled via mechanics.