14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19- 24, 2020, Paris, France

MECHANICS OF BRAIN DEVELOPMENT

TRACK 400

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Key words: Development, Brain, Biomechanics.

ABSTRACT

Mechanicians and neuroscientists have been interested in the processes that create the complex shape of the human brain for over a century. Increasing evidence indicates that brain development, particularly the morphogenesis of the intricately folded cortex, is the result not only of genetic processes, but also the mechanical forces that growing cells generate and by which they are in turn affected.

Despite recent advances, many questions remain. For example, what is the relative influence of biomechanical, genetic, and other factors in brain development, and does that vary over time? Among biological processes, what is the role of cortical (neuronal migration, apoptosis, etc.) and subcortical (axon growth, tension, myelination, etc.) mechanisms in cortical folding? How are aspects of folding patterns both conserved across species and varied within species? What aspects of brain morphology differ between healthy and typically developing individuals, and those with neurological diseases and disorders - and why? Current efforts to answer these questions face challenges in the development of computational models that accurately represent the biological and physical aspects of development, and in the effective use of new and existing neuroimaging data to inform hypotheses about cortical folding.

In this minisympoisum, we welcome contributions that describe advances in our understanding of brain development as a result of innovative computational models, potentially informed by novel data from experimental techniques, or new efforts in neuroimaging data collection or analysis.