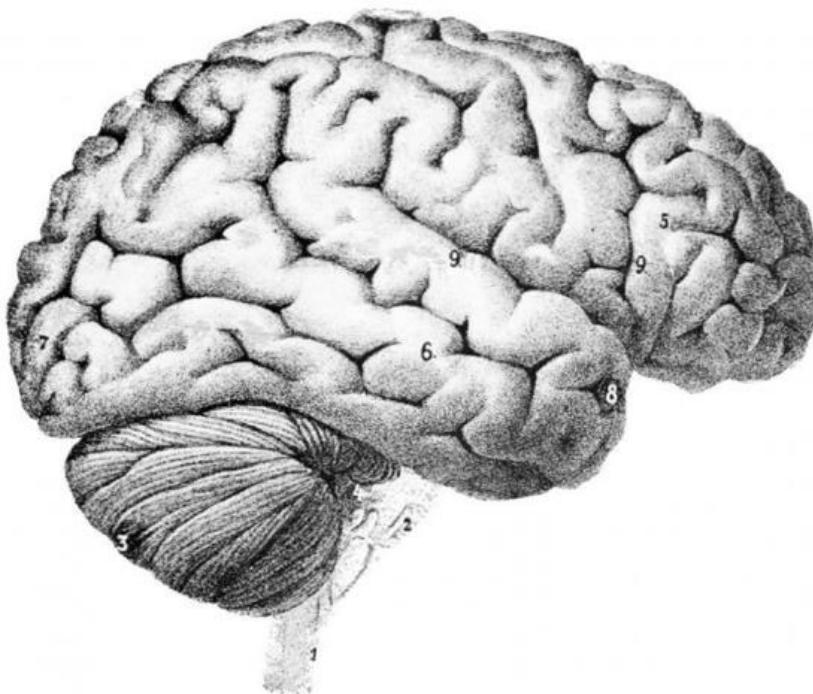


Alain Goriely

"Old and New Challenges in Brain Mechanics"

The human brain is an organ of extreme complexity, the object of ultimate intellectual egocentrism, and a source of endless scientific challenges. Despite a clear evidence that mechanical factors play an important role in regulating brain activity, current research efforts focus mainly on the biochemical or electrophysiological activity of the brain. However, classical concepts from mechanics including deformations, stretch, strain, strain rate, pressure, and stress also play a crucial role in modulating both brain form and function. In this talk, I will review our current understanding of the brain and present several important mechanical problems related to brain geometry, proper brain function, and brain pathology. In particular, I will present simple models for brain edema formation and propagation, a dangerous consequence of traumatic brain injury and stroke.



Shortly after receiving his Ph.D in mathematical physics from the University of Brussels in 1994, Alain Goriely joined the Department of Mathematics at the University of Arizona where he established a research group within the renown Program of Applied Mathematics. In 2010, he moved to the University of Oxford as the Chair of Mathematical Modelling. At the scientific level, he is an applied mathematician with broad interests in mathematics, sciences, and engineering. His research includes the mechanics of biological growth and its applications to plants and physiology; the mathematical foundations of elasticity; the dynamics of curves, knots, and rods; the design of proteins; the modelling of the brain; the dynamics of cancer; data analysis of genomics experiments; the development of new photovoltaic devices; the modeling of lithium-ion batteries and, more generally the study of mathematical methods for applied sciences. Prof. Goriely also enjoys popular science and scientific outreach. He has published various articles about miscellaneous scientific problems for large audience connected to his research including the perversion of tendrils in plants, the twining of climbing plants, the knotting of umbilical cords, the cracking of whips, the dynamics of the chameleon tongue and the problem of handedness.