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Elasticity Theory of Viral Capsids

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The continuum elasticity theory of icosahedral thin shells has been applied with success to shape transitions of the protein shell surrounding the viral genome, the capsid. The talk presents an extension of thin-shell elasticity theory that is applicable to aggregates of *functional biomolecules* at length scales comparable to that of the component molecules themselves. Unlike classical elasticity theory, the stress and strain fields have a network of *mathematical discontinuities* along the interfaces of the proteins, due to the conformational incompatibility of packing proteins as well as to conformational transitions of the proteins. The method is applied to the P-II to EI transition of the protein shell of the virus HK97 driven by hexon skewing. The combination of the intrinsic stresses of icosahedral shells and the conformational pre-stress turns the P-II state into a "critical" state whose shape is independent of the bending and Young's moduli.

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