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Chirality of Viral Capsids SANJAY DHARMAVARAM, Dept. of Mechanical and Aerospace Engineering, UCLA, FANGMING XIE, University of Science and Technology, China, ROBIJN BRUINSMA, Dept. of Physics and Astronomy, UCLA, WILLIAM KLUG, Dept. of Mechanical and Aerospace Engineering, UCLA, JOSEPH RUDNICK, Dept. of Physics and Astronomy, UCLA — Most icosahedral viruses are classified by their T-number which identifies their capsid in terms of the number of capsomers and their relative arrangement. Certain T-numbers ($T = 7$ for instance) are inherently chiral (with no reflection planes) while others (e.g. $T = 1$) are achiral. We present a Landau-Brazovskii (LB) theory for weak crystallization in which a scalar order parameter that measures density of capsid proteins successfully predicts the various observed T-numbers and their respective chiralities. We find that chiral capsids gain stability by spontaneously breaking symmetry from an unstable chiral state. The inherently achiral LB-free energy does not preferentially select a particular chiral state from its mirror reflection. Based on the physical observation that proteins are inherently chiral molecules with directional interactions, we propose a new chiral term to the LB energy as a possible selection mechanism for chirality.

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