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Multiple Scale Structures: From Faraday Waves to Soft Quasicrystals [1]

For many years, quasicrystals were observed only as solid-state metallic alloys, yet current research is actively exploring their formation in a variety of soft materials, including systems of macromolecules, nanoparticles, and colloids. Much effort is being invested in understanding the thermodynamic properties of these soft-matter quasicrystals in order to predict and possibly control the structures that form, and hopefully to shed light on the broader, yet unresolved, general questions of quasicrystal formation and stability. I shall give an explanation for the stability of certain soft-matter quasicrystals---inspired by the physics of a different phenomenon known as Faraday waves---and provide a recipe for designing pair potentials that yield so-called "cluster crystals" with symmetries ranging from square and hexagonal to decagonal and dodecagonal.

[1] S. Savitz, M. Babadi, and R. Lifshitz, IUCrJ 5 (2018) 247-268.

