

Abstract Submitted
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Dynamics of growth and form in prebiotic vesicles THOMAS FAI, Brandeis University, TERESA RUIZ-HERRERO, L. MAHADEVAN, Harvard University — The growth, form, and division of prebiotic vesicles, membraneous bags of fluid of varying components and shapes is hypothesized to have served as the substrate for the origin of life. The dynamics of these out-of-equilibrium structures is controlled by physicochemical processes that include the intercalation of amphiphiles into the membrane, fluid flow across the membrane, and elastic deformations of the membrane. To understand prebiotic vesicular forms and their dynamics, we construct a minimal model that couples membrane growth, deformation, and fluid permeation, ultimately couched in terms of two dimensionless parameters that characterize the relative rate of membrane growth and the membrane permeability. Numerical simulations show that our model captures the morphological diversity seen in extant precursor mimics of cellular life, and might provide simple guidelines for the synthesis of these complex shapes from simple ingredients.

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