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A simple discrete-time model for describing droplet generation in a periodic energy landscape GEORGIOS KATSIKIS, Stanford University, ANATOLY RINBERG, Harvard University, MANU PRAKASH, Stanford University — The generation of droplets at low Reynolds numbers is driven by non-linear dynamics that give rise to complex patterns concerning both the droplet-to-droplet spacing and the individual droplet sizes. Here we demonstrate an experimental system in which a time-varying energy landscape provides a periodic magnetic force that generates an array of droplets from an immiscible mixture of ferrofluid and silicone oil. The resulting droplet patterns are periodic, owing to the nature of the magnetic force, yet the droplet spacing and size can vary greatly by tuning a single bias pressure applied on the ferrofluid phase; for a given cycle period of the magnetic force, droplets can be generated either at integer multiples (1, 2, etc.), or at rational fractions (3/2, 5/3, 5/2, etc.) of this period with mono- or multidisperse droplet sizes. We develop a discrete-time dynamical systems model not only to reproduce the phenotypes of the observed patterns but also provide a framework for understanding systems driven by such periodic energy landscapes

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