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**Gravitational collapse of colloidal gels: Origins of the tipping point**[1] ROSEANNA ZIA, POORNIMA PADMANABHAN, Cornell University —
Reversible colloidal gels are soft viscoelastic solids in which durable but reversible bonds permit on-demand transition from solidlike to liquidlike behavior; these O(kT) bonds also lead to ongoing coarsening and age stiffening, making their rheology inherently time dependent. To wit, such gels may remain stable for an extended time, but then suddenly collapse, sedimenting to the bottom of the container (or creaming to the top) and eliminating any intended functionality of the material. Although this phenomenon has been studied extensively in the experimental literature, the microscopic mechanism underlying the collapse is not well understood. Effects of gel age, interparticle attraction strength, and wall effects all have been shown to affect collapse behavior, but the microstructural transformations underlying the tipping point remain murky. To study this behavior, we conduct large-scale dynamic simulation to model the structural and rheological evolution of colloidal gels subjected to various gravitational stresses, examining the detailed micromechanics in three temporal regimes: slow sedimentation prior to collapse; the tipping point leading to the onset of rapid collapse; and the subsequent compaction of the material as it approaches its final bed height.

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