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A Time Crystal

made of waves and grains

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This sequence of video frames shows two millimeter-diameter beads levitated in neighboring nodes of an acoustic standing wave. The suspended beads interact by exchanging scattered sound waves. Remarkably, these wave-mediated interactions are non-reciprocal. The unbalanced forces enable the beads to harvest energy from the standing wave to power spontaneous, self-sustained oscillations that realize a classical continuous time crystal...a state of matter that spontaneously breaks spatiotemporal symmetry.

Each snapshot is colored according to the order parameter of the time crystal to highlight its ticking. The entire sequence captures 350 ms at 170 frames/s.