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The vibrating life of Leidenfrost drops

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A volatile liquid is deposited on a hot solid can survive for minutes, which is known since Leidenfrost to rely on the presence of an insulating vapor layer beneath the liquid. In this levitating state, vapor prevents liquid adhesion leading to thriving dynamics, either spontaneous or forced. Among those spectacular features is the liquid ability to undergo a shape transition from axisymmetric to self-organized oscillations. Such liquid stars are not only encountered with Leidenfrost drops, but with weakly adhering liquids subjected to external periodic forcing. Brunet et al. reported stars are observed provided excitation exceeds a threshold. For Leidenfrost drops, however, the mechanism remains a mystery since there is no prescribed forcing - stars spontaneously appear and sustain. Various mechanisms were proposed invoking thermal convection. Yet, drops supported by steady air flow perform such oscillations. Our plan is to discuss the origin of Leidenfrost stars. We report that vapor self-vibrates, and explain the ensuing coupling that leads to those spectacular oscillations.

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