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Cowboy Fluid Mechanics: Lariat Modes of a Viscous Rope NEIL RIBE, Laboratoire FAST, Orsay, France, SARAH BADR, Universite de Paris-Sud, Orsay, France, STEPHEN MORRIS, University of Toronto, Toronto, Canada — A thin filament of viscous fluid falling onto a surface winds itself into a helical coil whose angular frequency of rotation Ω depends on the fall height H, the flow rate, and the fluid properties. We have studied a novel variant of this phenomenon in which the nozzle ejecting the fluid rotates about a vertical axis at a constant rate ω. In laboratory experiments using viscous corn syrup, we observe that the filament coils in the normal way when $\omega \ll \Omega$. However, when $\omega \approx \Omega$ and H is sufficiently large, a new "lariat" mode appears in which the filament is thrown outward in the form of a spiral of large diameter (up to tens of cm) rotating at a rate $\approx 0.9\omega$. The transition between the coiling and lariat modes is hysteretic with respect to variations in ω. In addition to the laboratory experiments, we will also present preliminary results of numerical calculations of the lariat mode based on a "slender body" model for a viscous filament with inertia.

Neil Ribe
Laboratoire FAST, Orsay, France

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