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Elastohydrodynamics of a free cylinder near a soft wall L MAHADEVAN, Harvard University, THOMAS SALEZ, ESPCI — We consider the motion of a fluid-immersed negatively buoyant particle in the vicinity of a thin compressible elastic wall. We use scaling arguments to establish different regimes of settling, sliding, rolling and complement these estimates using thin-film lubrication dynamics to determine an asymptotic theory for the sedimentation, sliding, and spinning motions of a cylinder. Numerical integration of the resulting equations confirms our scaling relations and further yields a range of behaviours such as spontaneously oscillations when sliding, lift via a Magnus-like effect, a spin-induced reversal effect, and an unusual sedimentation singularity. Our description also allows us to address a sedimentation-sliding transition that can lead to the particle coasting over very long distances, similar to certain geophysical phenomena.

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