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Glancing, reversing, tumbling, and sliding: sedimentation near walls in viscous fluids WILLIAM MITCHELL, SAVERIO SPAGNOLIE, University of Wisconsin - Madison — The sedimentation of ellipsoidal particles near a wall in a viscous fluid has been studied from a numerical perspective by a number of authors, but analytical solutions have been given only in special cases, such as for spherical particles. As an application of the method of images, the dynamics of ellipsoids of arbitrary aspect ratio in a wall-bounded Stokes flow may be reduced to a system of ordinary differential equations. In many cases the system leads to analytical descriptions of the particle motion which agree very well with full numerical simulations. As an application, we investigate the conditions under which the "glancing" and "reversing" trajectories first observed by Russel et al. prevail, and we identify two new possibilities: a periodic "tumbling" trajectory for nearly spherical bodies and a "sliding" trajectory which occurs when the wall is inclined at a small angle from the vertical. The sliding trajectory is an attracting fixed point for the dynamics, and thus may have applications in sorting processes for heterogeneous dilute suspensions.

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