Abstract Submitted
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Microorganism billiards in closed plane curves MADISON KRIEGER, Brown University — Recent experiments and numerical simulations have demonstrated that many species of microorganisms reflect aspecularly from a solid surface — due to steric and hydrodynamic interactions with the wall, their outgoing angle is fixed and independent of the angle of incidence. Motivated by these results, we discuss theory and computation of the "aspecular billiard", a modification of the classical billiard in which the outgoing angle is constant. We restrict our attention to closed plane curves, focusing on three canonical examples: the ellipse, the Bunimovich stadium, and the Sinai billiard. These systems can have a rich array of orbits, and the Lyapunov exponent is shown to be dependent on the billiard geometry and the outgoing angle. We apply these results to the design of tunable passive sorting mechanisms.

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