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**Micro-navigation in complex periodic environments**[1] ALEXANDER CHAMOLLY, DAMTP, University of Cambridge, TAKUJI ISHIKAWA, Department of Finemechanics, Tohoku University, ERIC LAUGA, DAMTP, University of Cambridge — Natural and artificial small-scale swimmers may often self-propel in environments subject to complex geometrical constraints. While most past theoretical work on low-Reynolds number locomotion addressed idealised geometrical situations, not much is known on the motion of swimmers in heterogeneous environments. We investigate theoretically and numerically the behaviour of a single spherical micro-swimmer located in an infinite, periodic body-centred cubic lattice consisting of rigid inert spheres of the same size as the swimmer. We uncover a surprising and complex phase diagram of qualitatively different trajectories depending on the lattice packing density and swimming actuation strength. These results are then rationalised using hydrodynamic theory. In particular we show that the far-field nature of the swimmer (pusher vs. puller) governs the behaviour even at high volume fractions.

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