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Rotation and propulsion in 3d active chiral droplets[1] LIVIO NICOLA CARENZA, GIUSEPPE GONNELLA, University of Bari - INFN Sezione di Bari, DAVIDE MARENDUZZO, University of Edinburgh, GIUSEPPE NEGRO, University of Bari - INFN Sezione di Bari — Chirality is an ubiquitous feature of biological matter. This may arise due to thermodynamic or non-equilibrium effects. Moreover biological fluids evolve far from thermodynamic equilibrium, since they are internally driven by the injection of energy at the level of the individual constituents. Despite much effort has been taken to understand the dynamics of active gels in bidimensional environments, much less is known about chiral systems and in general about active matter in 3d. Here we consider a three-dimensional droplet of inherently chiral and apolar material that can be modelled - in the passive limit - as a Cholesteric Liquid Crystal. Intrinsically chiral droplets display a range of astonishing behaviors. First, we find that active force dipoles strengthen the equilibrium chiral pattern, enabling a novel and fascinating motility mode, where the fan-like rotational motion of surface defects is converted into propulsion. Second, an active torque dipole sets up a periodical mirror rotation of two pairs of disclination lines exhibiting a "coiling and relaxing" dynamics.

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