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Self Propelled Hard Disks Against a Membrane : Mechanical Pressure and Instability OLIVIER DAUCHOT, RENE LEDESMA-ALONSO, GASPARD JUNOD, GUILLAUME BRIAND, UMR Gulliver 7083 CNRS, ESPCI ParisTech, PSL Research University, 10 rue Vauquelin, 75005 Paris, France — We experimentally study the mechanical pressure exerted by an assembly of respectively isotropic/diffusive and polar/self-propelled disks onto a flexible unidimensional membrane. For the isotropic disks, the mechanical pressure, inferred from the shape of the membrane, is independent of the length of the membrane and follows the equilibrium equation of state of hard disks. On the contrary, for the self-propelled disks, the mechanical pressure depends on the membrane length and is thus not a state variable. When self propelled disks are present on both sides of the membrane, we observe an instability of the membrane akin to the one predicted theoretically for Active Brownian Particles against a soft wall. The weaker the pressure difference across the membrane, the largest is the amplitude of the instability.

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