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Mechanical Pressure of self-propelled particles¹

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Pressure is the mechanical force per unit area that a confined system exerts on its container. For macroscopic equilibrium systems, the pressure depends only on bulk properties (density, temperature, etc.) through an equation of state. For active systems containing self-propelled particles (e.g. migrating cells or molecular motors) the pressure instead generically depends on the precise interactions between the particles and the confining walls. The mechanical pressure of an active system is therefore generically not given by an equation of state. I will show how one is nevertheless recovered in certain limiting cases. More generally, I will discuss the various interesting properties of the pressure of active fluids.

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