Self-propelled topological defects in active matter

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Active materials, such as bacteria, molecular motors and self-propelled colloids, are Nature’s engines. They continuously transform chemical energy from their environment to mechanical work. Dense active matter shows mesoscale turbulence, the emergence of chaotic flow structures characterised by high vorticity and self-propelled topological defects.

The chaotic nature of active turbulence means that it is likely to be difficult to harness its energy. Hence it is interesting to consider ways to `tame' active turbulence, channelling the energy input into coherent flows. This can be done by screening hydrodynamics through confinement or friction, and I will describe flow patterns and defect trajectories in active matter in confined geometries.

Moreover the ideas of active matter suggest new ways of interpreting cell motility and cell division. In particular recent results indicate that active topological defects may help to regulate turnover in epithelial cell layers and contribute to controlling the structure of bacterial colonies.