Phase separation in active Brownian particles

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In this talk, I will discuss models for active matter systems consisting of many self-propelled particles. These can be used to describe biological systems such as bird flocks, fish schools, and bacterial suspensions. In contrast to passive particles, these systems can undergo phase separation without any attractive interactions, a mechanism known as motility-induced phase separation. Starting with a microscopic model for active Brownian particles with repulsive interactions, I will discuss four possible macroscopic PDEs (ranging from a nonlocal model to a local cross-diffusion system). I will discuss work in progress concerning the stability and analysis of such models.