Abstract Submitted
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Collective dynamics of sperm in viscoelastic fluid[1] CHIH-KUAN TUNG, Deptment of Biological and Environmental Engineering (BEE), Cornell University, ALYSSA G. FIORE, BEE, FLORENCIA ARDON, Department of Biomedical Sciences (Biosci), Cornell University, SUSAN S. SUAREZ, Biosci, MINGMING WU, BEE — Collective dynamics of artificial swimmers has gathered a lot of attention from physicists, in part because of its close relations to emergent behaviors in condensed matter, such as phase transitions. However, the emergence of order tends to be less drastic in the systems composed of real living cells, sometimes due to the natural variability in individual organisms. Here, using bull sperm as a model system, we demonstrate that the local orientation order of sperm spontaneously emerges in viscoelastic fluids, migrating collectively in clusters in high cell concentrations, or pairs in low cell concentrations. This collectiveness is similar to a liquid-gas phase transition, as both phases coexist simultaneously in our system. Unlike bacterial swarming, this collectiveness does not require the cells to be in a different phenotype than the regular swimming one, providing further simplicity to the physicists. We will discuss the underlying interaction mechanism, and the potential influence in biology.

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Chih-kuan Tung
Cornell University

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