1. Record Nr.   UNISA996418175403316

   Autore   Nishiguchi Daiki

   Titolo   Order and Fluctuations in Collective Dynamics of Swimming Bacteria
                        [[electronic resource]] : Experimental Exploration of Active Matter
                        Physics / / by Daiki Nishiguchi

   Pubbl/distr/stampa   Singapore : , : Springer Singapore : , : Imprint : Springer, , 2020

   ISBN   981-329-998-3

   Edizione   [1st ed. 2020.]

   Descrizione fisica   1 online resource (XIII, 128 p. 66 illus., 19 illus. in color.)

   Collana   Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-
                        5053

   Disciplina   530.13

   Soggetti   Amorphous substances
                        Complex fluids
                        Statistical physics
                        Physical chemistry
                        Computational complexity
                        Soft and Granular Matter, Complex Fluids and Microfluidics
                        Statistical Physics and Dynamical Systems
                        Physical Chemistry
                        Applications of Nonlinear Dynamics and Chaos Theory
                        Complexity

   Lingua di pubblicazione   Inglese

   Formato   Materiale a stampa

   Livello bibliografico   Monografia

   Nota di contenuto   General Introduction -- Standard Models on Collective Motion --
                        Collective Motion of Filamentous Bacteria -- Active Turbulence --
                        Encounter of Bacterial Turbulence with Periodic Structures -- General
                        Conclusion and Outlook.

   Sommario/riassunto   This thesis focuses on experimental studies on collective motion using
                        swimming bacteria as model active-matter systems. It offers
                        comprehensive reviews of state-of-the-art theories and experiments
                        on collective motion from the viewpoint of nonequilibrium statistical
                        physics. The author presents his experimental studies on two major
                        classes of collective motion that had been well studied theoretically.
                        Firstly, swimming filamentous bacteria in a thin fluid layer are shown to

exhibit true, long-range orientational order and anomalously strong giant density fluctuations, which are considered universal and landmark signatures of collective motion by many numerical and theoretical works but have never been observed in real systems. Secondly, chaotic bacterial turbulence in a three-dimensional dense suspension without any long-range order as described in the first half is demonstrated to be capable of achieving antiferromagnetic vortex order by imposing a small number of constraints with appropriate periodicity. The experimental results presented significantly advance our fundamental understanding of order and fluctuations in collective motion of motile elements and their future applications.