Contribution ID: **117** Type: **Oral**

Polarization mechanism of bacteria motion in aquatic media

Thursday, 26 September 2024 13:10 (20 minutes)

A new mechanism is proposed to explain the reasons for the bacteria's motion in the aquatic environment. The mathematical model of this mechanism is based on the hydrodynamic equations of active matter and takes into account the dynamics of the environment polarization and polarization of individual bacteria. It is assumed that the flow of light and the active motion of dielectric regions with different refractive indices inside the bacterium lead to the formation of a nonuniform distribution of dipole moments at the interface between the bacterium and the aqueous medium. This distribution is nonequilibrium and evolves along the bacterium and rotates. The interaction of this distribution with the environment due to surface deformation or due to ponderomotive force leads to the bacteria's motion. Such a motion can be represented as a type of turbine effect without attachment or as an interaction of the polarization current with a change in the local polarization of the medium. This mechanism differs significantly from the flagella motion mechanism and can explain the motility of flagellate bacteria. In addition, such a mechanism depends on the concentration of charged particles in the medium. Namely, with an increase in their concentration, the polarized region motion increases, which creates a greater bacterial surface deformation and causes a redistribution of polarization. Moreover, the collective bacteria motion can cause water mixing.

Primary authors: Dr CHERNIAK, Oleksandr (Bogolyubov Institute for Theoretical Physics); Prof. LEV, Bohdan (Bogolyubov Institute for Theoretical Physics)

Presenter: Dr CHERNIAK, Oleksandr (Bogolyubov Institute for Theoretical Physics)

Session Classification: Morning Session 3

Track Classification: STATISTICAL PHYSICS AND KINETIC THEORY