



**S N BOSE NATIONAL CENTRE  
FOR BASIC SCIENCES**

*Block JD, Sector III, Salt Lake, Kolkata 700 106*

## **DEPARTMENTAL SEMINAR**

# **Physics of Complex Systems**

**25<sup>th</sup> September, 2023**

**3.00 PM**

**ONLINE / FERMION**

### **SPEAKER**

**Dr. Arnab Saha,  
Assistant Professor,  
Department of Physics,  
UNIVERSITY OF CALCUTTA**

### **TITLE OF THE TALK**

## **Self-Organisation And Flow Of Information Within Confined Flock**

### **ABSTRACT**

We consider the collective dynamics of soft, spherical self-propelling particles in two dimensions and confined within a circular trap. They can align themselves according to the direction of propulsion of their neighbours, together with small rotational fluctuations. The softness of the trap boundary is tuneable. When the trap is hard, particles flock along its boundary. They form a polar layer that spreads all over the boundary. However, the layer is spatially disordered. When the trap becomes soft beyond a threshold, the cluster becomes round, compact and eventually spatial order emerges in addition to the pre-established polar order. First, we investigate the kinetics of such ordering with varying softness. Next, followed by a quenching experiment (in-silico) from soft to hard boundary, we investigate the flow of information within the ordered cluster. In particular, we show that the information front spans over the linear size of the flock and it moves ballistically.

### **HOST FACULTY**

**Prof. Jaydeb Chakrabarti, Senior Professor  
DEPT. OF PHYSICS OF COMPLEX SYSTEMS**

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