Janus particles are a unique class of colloids that have two surfaces. These distinctive surfaces can be used to impart different functionality within a single particle. An example for this would be a silica-gold Janus particle, wherein the silica side could be functionalized with enzymes (like catalase) and the gold side could be modified with DNA. Such a particle can be activated via a substrate (hydrogen peroxide) for the enzyme present on the silica side while the gold side with the DNA can be used for sensing and the entire system can be utilized as an autonomous self-propelling biosensor.

Janus particles come under the banner of active matter systems and are being widely explored from a long time owing to their promising applications in a wide range of fields like drug delivery, sensing and environmental remediation.

In this practical course, we will work with Si-Pt Janus particles which propel themselves in the presence of a fuel- hydrogen peroxide. We will track the motion of these particles at different fuel concentrations using an inverted microscope and observe how the particles transcend from Brownian motion to diffusiophoresis after fuel addition. We will analyse the tracking movies using Fiji and Matlab. Data analysis will give us information about the mean squared displacements, the diffusion coefficients and the velocities of the particles which we will correlate to the fuel concentrations used.

This practical course will be a quick introduction to active matter physics, particle tracking microscopy and data analysis for the students.