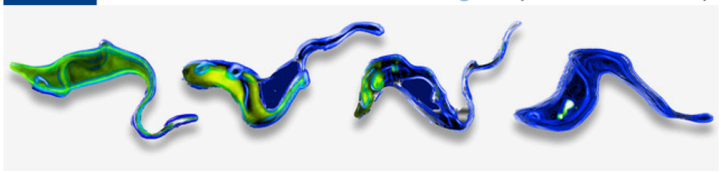

Contribution ID: **68** Type: **Poster**

Chlamydomonas Reinhardtii 3D Motion Captured by Holographic Microscopy

Motility of microscopic entities is a central question in biology. In an idealization attempt, the problem could be reduced to four key elements: viscous flow, soft confinement, thermal fluctuations and activity.
To address this matter, a novel method based on Mie holography and stochastic inference was developed in the group [1]. In a nutshell, this method allows to track particles in 3 dimensions, with a resolution of 10 nm. Over the past years, it led to quantify experimentally and theoretically how a Brownian sphere is affected by complex confined situations, such as rigid and charged walls, elastomeric ones or liquid interfaces. Specifically, in the case of a sphere diffusing in salted walter on top of a glass wall, fine deviations from the bulk Gaussian statistics of displacements were quantified theoretically and numerically and measured experimentally [2]. Also, surface forces are measured down to a few femtonewtons. Thus, the method is a promising contactless and gentle probe, since it is only driven by thermal fluctuations.
After that robust calibration of the technique, more complex situations can be studied. The first one is the motion ofthe active alga Chlamydomonas *reinhardtii*. Its 3D motion was successfully tracked, which paves the way for tackling questions concerning the alga's behavior in confinement, or even gliding properties.

References

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