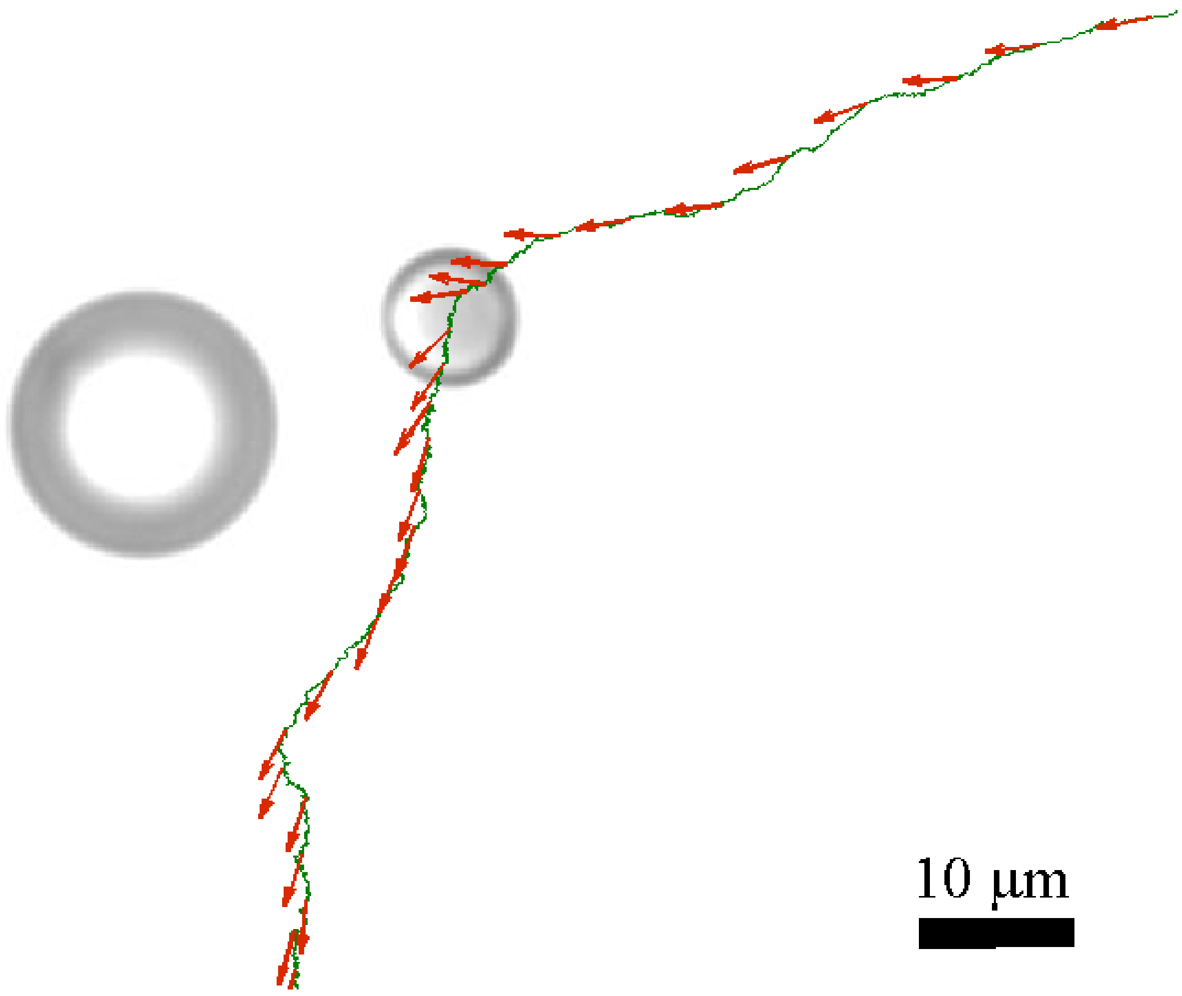
106th MSS-Seminar
Wednesday, February 1st, 15:30
Nägelsbachstr. 49b

Non-equilibrium dynamics of colloidal particles in viscoelastic fluids

Juan-Ruben Gomez-Solano
2.Physikalisches Institut, Universität Stuttgart



The ideal random walker has led to a deep insight into fundamental and applied sciences over many decades regarding statistical physics out of equilibrium. Colloidal particles are the almost perfect experimental realization of such walkers, as their relaxation times are many orders of magnitude larger than those of the surrounding (Newtonian) solvents. Thus, even when colloidal particles are strongly driven, all known experiments agree with a theoretical description where the surrounding bath is assumed in equilibrium [1]. Here, I will present recent experiments on the motion of colloids either externally driven [2,3] or self-propelled [4] through (non-Newtonian) viscoelastic media. Such materials are ubiquitous in nature, e.g. biological fluids, polymers and micellar solutions, and may exhibit large relaxation times comparable to those of the embedded colloids. Our results show that the coupling between the directed particle motion and the slow structural relaxation of the surrounding viscoelastic fluid gives rise to a wealth of new non-equilibrium phenomena with no counterpart in Newtonian liquids, ranging from enhanced translational and rotational diffusion, non-Gaussian fluctuations, elastic repulsive interactions under confinement to microscopic shear thinning.

References

[1] U. Seifert, Rep. Prog. Phys. 75, 126001 (2012).

[2] J. R. Gomez-Solano, and C. Bechinger, EPL 108, 54008 (2014).

[3] J. R. Gomez-Solano, and C. Bechinger, New J. Physics 17, 103032 (2015).

[4] J. R. Gomez-Solano, A. Blokhuis, and C. Bechinger, Phys. Rev. Lett. 116, 138301 (2016).