



INSTITUT ZA FIZIKU

ZAJEDNIČKI SEMINAR

11. ožujak 2014. (utorak) u 11:00 sati (točno)

Institut za fiziku, Bijenička cesta 46, Predavaonica III krilo

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Cellular uptake of nanoparticles by wrapping

Nanoparticles have recently attracted increased interest due to a variety of potential applications. However, not much is known about their interaction with biological cells. Cellular uptake of particles, viruses, and parasites is a complex biological process: particles with sizes comparable to the thickness of the lipid bilayer enter by penetration, while particles with sizes of 20nm or larger get wrapped by the membrane. We calculate the energies for wrapping and characterize particle uptake analogously to thermodynamic phase transitions. We present wrapping phase diagrams for various curvature-elastic properties of the membrane, membrane-particle interaction strengths, and particle sizes and shapes. The transitions between unbound, partially-wrapped, and completely-wrapped states can be continuous or discontinuous and may involve reorientation of the particle. By systematic studies for the particle shape, we find that in particular elongated particles show reduced complete wrapping, but enhanced binding to the cell membrane.

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Thorsten Auth studied physics at Frankfurt University where he graduated in 2000. He moved to Forschungszentrum Jülich in 2001 and worked with Prof. Gerhard Gompper on simulations of polymer-membrane interactions, closely connected to experimental studies on oil-water microemulsions. Thorsten received his Ph.D. from University of Cologne in 2004. From 2005 to 2007, he spent 2.5 years at the Weizmann Institute as a Minerva fellow, where worked with Prof. Nir Gov and Prof. Sam Safran on active fluctuations of red blood cells. After his return to Jülich, he works mainly on nanoparticle wrapping by lipid bilayer membranes and on collective behavior of self-propelled particles.

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