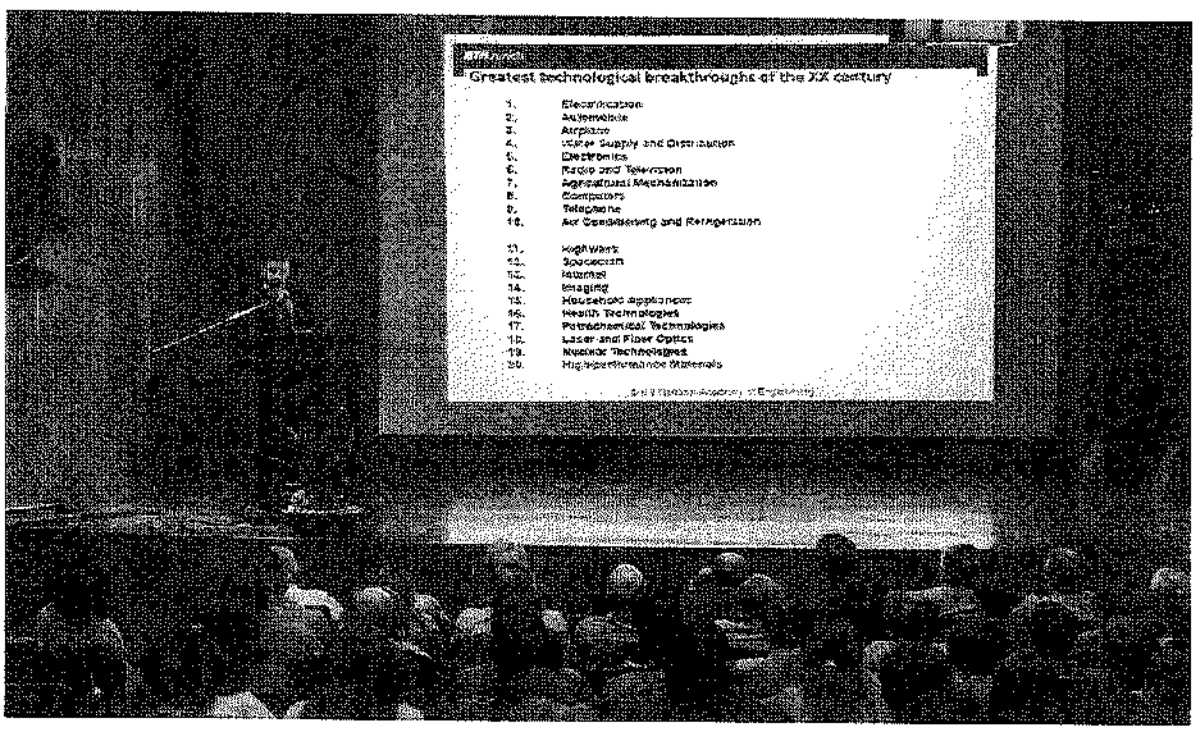
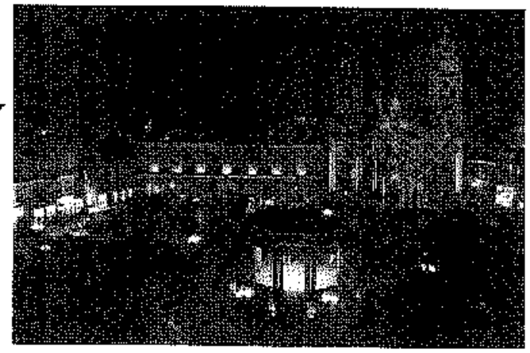
Cátedra del Instituto de Física 2017: Dr. Pietro Gambardella



29th International Conference on Science and Technology of Complex Fluids

June 19-23 2017
San Luis Potosí, México



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Program

	Monday	Tuesday	Wednesday	Thursday
8:30-9:00	Registration			
9:00-9:30	Opening	Pavel Castro	Mario Sandoval	Julien Lombard
9:30-10:00	Eric Weeks	Fernando Donado	Pedro Ramirez	Bernardo Yañez
10:00-10:30	Eric Weeks	Eric Weeks	Eric Weeks	Gerhard Nägele
10:30-11:00	Marco Laurati	Eric Weeks	Eric Weeks	Gerhard Nägele
11:00-12:00	Coffee break			
12:00-12:30	Sound bites	Perla Viveros	Sound bites	Ulises Torres
12:30-1:00	Jose Martinez	Guillermo Aguilar	Guillermo Aguilar	Planning Session
1:00-1:30		Guillermo Aguilar	Guillermo Aguilar	Planning Session
1:30-16:00	Lunch			
16:00-16:30	Antonio Tavera	Guillermo Aguilar	Gerhard Nägele	Gerhard Nagele
16:30-17:00	Cristina Martinez	Guillermo Aguilar	Gerhard Nägele	Gerhard Nägele
17:00-18:30	Poster Session	Poster Session	Poster Session	Poster Session
19:30-21:00				Conference dinner

Keynote speakers

Prof. Eric Weeks

Physics Department, Emory University

"Colloidal glasses: Insights from microscopy"

What would we learn if we could clearly see individual atoms deep inside materials? My group studies colloidal suspensions, which are solid micron-sized particles in a liquid. In many ways, these particles are analogous to atoms. At high particle concentration, the sample is a good model system for a glassy material, with the particles randomly packed together. We use an optical confocal microscope to view the motion of these colloidal particles in three dimensions to see how the motion is changed as the glass transition is approached. In particular, I will discuss three puzzles. First, we'll examine how rotational and translational diffusion of tracers differ as the glass transition is approached. Second, we'll study how how the behavior of glassy samples change when they are confined, and how this depends on the nature of the confining boundaries. Third, we'll discuss how the glass transition is different (or not) in a two-dimensional system.

Prof. Guillermo Aguilar

Department of Mechanical Engineering, University of California Riverside

"Windows to the Brain: a new material, concept, and application--product of a new working approach"

At the laboratory of Transport Phenomena for Biomedical Applications (LTPBA) at UCR, we have carried out studies aimed at understanding how lasers can better assist in a variety of biomedical applications. Originally, we were interested in understanding how sprays can be more effective in removing heat from the skin during laser irradiation. Then we looked at feasible ways to improve transdermal drug delivery by taking advantage of the thermal and mechanical property changes of tissue induced by cryogen liquid deposition on the skin surface. Yet another set of studies was aimed at using CW laser radiation to generate multiple vapor bubbles within a thin liquid layer. This phenomenon is called thermocavitation and results from the formation of an overheated region followed by an explosive phase transition and consequently the formation of vapor-gas bubbles. These bubbles expand and later collapse, emitting intense shockwaves capable of producing damage to various surfaces such as skin and even harder metallic surfaces. Currently, one of the research thrusts in my research group aims at developing a novel transparent polycrystalline Yttria-Stablized-Zirconia (YSZ) cranial implant ("window") that enables life-long, non-invasive delivery and/or collection of laser light into and from shallow and deep brain tissue on demand. Such an implant would allow for real-time and highly precise visualization and treatment of diverse brain pathologies, such as those resulting from traumatic brain injury (TBI) or brain tumors, without the need of highly-invasive craniotomies or trepanation procedures. The window could be permanently covered with native scalp that can be rendered temporarily transparent on demand in a minimally-invasive manner using percutaneous drug delivery of optical clearing agents (OCAs) with microneedles.

In this course I will present the main results of these investigations and the methods we have developed to study them. I will also present a brief description of the current and future research lines in my laboratory

Prof. Gerhard Nägele

Institute of Complex Systems, Research Centre Jülich

"Dynamics in colloid and protein systems: with applications to microgels, lysozyme and filtration theory"

Mesoscale particles dispersed in a viscous fluid are encountered in numerous technological processes, in synthetic colloidal systems with widespread applications such as microgel suspensions, and in biological systems such as protein solutions. The microstructure, phase behavior and dynamics of these systems are determined by direct particle interactions including van der Waals and hydrophobic attraction, steric repulsion, and screened Coulomb repulsion in case of charged particles. The particle dynamics is influenced additionally by Brownian motion, and by hydrodynamic interactions (HIs) transmitted by the solvent flow. The latter interactions can give rise to phenomena that are often unexpected.

I will discuss the statistical physics and low-Reynolds number hydrodynamics of globular particles undergoing correlated Brownian motion in a Newtonian fluid. Theoretical methods are described for the calculation of dispersion-averaged transport properties including collective and self-diffusion coefficients and viscosities. Recent experimental applications of these methods include ionic and nonionic microgel suspensions, and protein (lysozyme) solutions with competing short-range attraction and long-range electrostatic repulsion where clustering is observed. The performance of the methods is assessed by the comparison with simulation results. The calculated dispersion properties are the main ingredient to our modeling of convective-diffusive particle transport during the concentration and purification of dispersions by cross-flow filtration. In this industrially used method, a feed dispersion is steadily pumped through an array of hollow cylindrical membranes. We discuss the resulting concentration-polarization particle layer buildup at, and the permeate flux through the membrane fibers, for non-ionic microgel and charge-stabilized silica feed dispersions.

Contributed talks

Marco Laurati, UGTO: Dynamics of sub-populations in polydisperse colloidal glasses

Jose Martínez, Argonne National Laboratory: Martensitic Transformation in Soft Matter Systems with Complex Structures of Topological Defects

Antonio Tavera, IFUNAM: Rheology and microrhelogy of viscoelastic-gel systems

Cristina Martinez, AMOLF: A nanoscale study of the mechanical and proteolytic stability of fibrin fibers

Pavel Castro, Facultad de Ciencias en Física y Matemáticas-UNACH: Persistent motion in curved surfaces

Fernando Donado, Universidad Autónoma del Estado de Hidalgo: Granular system as a model for a magnetorheological fluid

Perla Viveros, Universidad Autónoma de Zacatecas: Assessment by Monte Carlo computer simulations of the phase behaviour of hard spherocylinders confined within cylindrical cavities

Mario Sandoval, UAM Iztapalapa: Self-driven particles in linear flow and trapped in a harmonic potential

Pedro Ramirez, IFUASLP: TBA

Julien Lombard, Facultad de Química, UNAM: Nanobubble generation around laser-heated gold nanoparticles

Bernardo Yañez, IFUASLP: National Lab of Engineering of Matter out of Equilibrium

Ulises Torres, Universidad Nacional Autónoma de México: Strategy to measure flow within elastic nanostructures: A theoretical proposal