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Scientific Program

Schedule (31st August-4th September)

Download suggested zoom backgrounds, 1 and 2

Plenary and Semiplenary talks will be streamed at cmd2020gefes channel on youtube

CEST	Monday	Tuesday	Wednesday	Thursday	Friday
09:30	Mini-colloquia	Mini-colloquia	Mini-colloquia	Mini-colloquia	Mini-colloquia
12:30	Break	Break	Break	Break	Break
13:30				CMD EPS general assembly	
14:15	Opening				
14:30	Plenary: Pablo Jarillo-Herrero	Plenary: Beatriz Noheda	Plenary: CMD Europhysics Prize 2020. Jörg Wrachtrup	Plenary: María García Parajo	Plenary: Olli Lounasmaa Prize 2020. Seamus Davis
15:45	Semiplenaries: K. Franke F. J. García Vidal	Semiplenaries: R. Dullens T. Jungwirth	Semiplenaries: H. Bouchiat S. Baroni	Semiplenaries: M.G. Betti N. Araujo	Closing
17:00	Special sessions: Posters and pre-recorded talks. Diversity and inclusiveness. EPS Young Minds I.	Special sessions: Posters and pre-recorded talks. EPS Young Minds II.	Special sessions: Posters and pre-recorded talks. EPS Young Minds III.	Special sessions: Posters and pre-recorded talks. GEFES awards.	

31st Aug 2020

09:30 - 12:30 Monday Morning Mini-colloquia.

14:15 - 14:30 Inaugural session.

With the participation of:
Prof. Rafael Garesse Alarcón, Rector of the Universidad Autónoma de Madrid.
Dr. María José Calderón, President of the Condensed Matter Physics Division (GEFES) of RSEF.
Prof. Kees van der Beek, Chairman of EPS - CMD.

14:30 - 15:30 Plenary Talk 1.

- Pablo Jarillo Herrero, Massachusetts Institute of Technology (USA).
Magic-Angle Graphene: Superconductivity, Correlations, and Beyond.
Chair: José María De Teresa; Zoom host: Maria José Calderón.

15:45 - 16:45 Semiplenary Talks Monday.

- Katharina Franke, Freie Universität Berlin (Germany).
Photon-assisted tunneling at the atomic scale: Probing resonant Andreev reflections from Yu-Shiba-Rusinov states.
Chair: Alfredo Levy Yeyati; Zoom host: Agustina Asenjo.

- Francisco J. García Vidal, Universidad Autónoma de Madrid (Spain).
Manipulating matter by coupling to vacuum fields.
Chair: Hermann Suderow; Zoom host: Ramón Aguado.

17:00 - 19:00 Special sessions Monday Afternoon

EPS Young Minds I: Career opportunities in Academia.
Diversity and Inclusiveness.

1st Sept 2020

09:30 - 12:30 Tuesday Morning Mini-colloquia.

14:30 - 15:30 Plenary Talk 2.

- Beatriz Noheda, University of Groningen (The Netherlands).
  Why is everyone talking about hafnia-based ferroelectric devices?
  Chair: Maria José Calderón; Zoom host: José María De Teresa.

15:45 - 16:45 Semiplenary Talks Tuesday.

- Roel Dullens, University of Oxford (UK).
  Two-dimensional melting of colloidal hard spheres.
  Chair: Kees van der Beek; Zoom host: Harvey Amorín.

- Tomáš Jungwirth, Academy of Sciences (Czech Republic) and University of Nottingham (UK).
  Antiferromagnetic spintronics: from memories to ultra-fast optics, neuromorphics, and topological phenomena.
  Chair: Agustina Asenjo; Zoom host: Lola Martín.

17:00 - 19:00 Special sessions Tuesday Afternoon
EPS Young Minds II: Meet the editors.

2nd Sept 2020

09:30 - 12:30 Wednesday Morning Mini-colloquia.

14:30 - 15:30 Plenary Talk 3.

- Jörg Wrachtrup, University of Stuttgart (Germany).
  Engineering quantum systems atom by atom.
  CMD Europhysics prize 2020, with the participation of:
  Petra Rudolf, EPS president
  Kees van der Beek, chairman of EPS - CMD
  Bart van Tiggelen, Editor-in-Chief of EPL, Europe's premier letter journal, sponsor of CMD Europhysics prize
  Chair: Kees van der Beek; Zoom host: Hermann Suderow.

15:45 - 16:45 Semiplenary Talks Wednesday.

- Helene Bouchiat, Université de Paris Sud (France).
  Revealing the topological nature of transport at mesoscopic scales with quantum interferences.
  Chair: José María De Teresa; Zoom host: Agustina Asenjo.

- Stefano Baroni, SISSA Trieste (Italy).
  Quantum topological effects on the transport properties of ionic conductors.
  Chair: Ramón Aguado; Zoom host: Juan Aragonés.

17:00 - 19:00 Special sessions Wednesday Afternoon
EPS Young Minds III: Career opportunities in the Industry.

3th Sept 2020

09:30 - 12:30 Thursday Morning Mini-colloquia.

13:30 - 14:30 General Assembly EPS-CMD.

14:30 - 15:30 Plenary Talk 4.

- María García-Parajo, Institute of Photonic Sciences (Spain).
  Deviation from Brownian diffusion in living cell compartments: physical and biological implications.
  Chair: Maria José Calderón; Zoom host: Isabel Guillamón.

15:45 - 16:45 Semiplenary Talks Thursday.

- Maria Grazia Betti, Universitá la Sapienza (Italy).
  Title TBA.
  Chair: Kees van der Beek; Zoom host: Harvey Amorín.

- Nuno Araujo, Universidade de Lisboa (Portugal).
  Self-folding Kirigami at the microscale.
  Chair: Hermann Suderow; Zoom host: Ramón Aguado.

17:00 - 19:00 Special sessions Thursday Afternoon
GEFES awards.

4th Sept 2020

09:30 - 12:30 Friday Morning Mini-colloquia.

14:30 - 15:30 Plenary Talk 5.

- Seamus Davis, University of Oxford (UK).
  A New Visual Quantum World is Discovered to the Understanding.
  Olli Lounasmaa prize 2020.
  Chair: Hermann Suderow; Zoom host: Maria José Calderón.

15:30 - 15:45 Closing and poster prize session.
With the participation of:
Prof Kees van der Beek, Chairman of EPS-CMD
Hermann Suderow, José María de Teresa and María José Calderón,
Chairs of CMD2020GEFES

CMD2020GEFES mini-colloquia

- Advances in Magnetic Imaging
- Artificial Intelligence for Condensed Matter Physics
- Casimir Effect and Heat Transfer Advances
- Emergent Transport Phenomena in Functional Quantum Materials
- Exploring Molecular Interactions: from Sorption in (non-)Porous Media to Surface Effects
- Fermi Surface Topological Transitions: Classification and Effects on Correlated Systems
- Flat Band Moires
- Focused Ion Beam Induced Processing
- High-Order Harmonic Generation in Solids
- High Resolution SPM on Low Dimensional Materials
- Hybrid Semiconductor-Superconducting Nanostructures: from Andreev to Majorana Bound States
- Iontronics and the Field Effect Control of Semiconductor Nanodevices
- Magnetism and Correlations in 2D Materials in and out of Equilibrium
- Modern Trends in Topological Quantum Matter
- Molecularly Functionalized Low-Dimensional Systems
- Nanomagnetism: Permanent Magnets, Applications and Sustainability
- Novel Functionalities in Nano- to Mesoscale Magnetism
- Out-of-Equilibrium Physics in Biology
- Oxide Heterostructures and Interfaces: from Fundamentals to Applications
- Physics and Function of Protein Nanoshells: from Viruses to Biomimetic Nanocontainers
- Physics in 2D Nanoarchitectonics
- Plasmonic Metamaterials: from Surfaces to 3D Supercrystals

CMD2020GEFES mini-colloquia

- Quantum Thermoelectrics and Heat Currents at the Nanoscale
- Scanning Probe Lithography for Novel Materials and Advanced Devices
- Spin Orbit Physics in Condensed Matter
- Spin Transport via Geometric Design at the Nanoscale
- Strain in Metal-Halide Perovskites and Other Emerging Nanomaterials
- Strongly Disordered Superconductors
- Symmetry and Non-Linearity in Low-Dimensional Systems
- Synthesis of Nanoparticles: Applications and New Perspectives
- Topology- and Geometry-controlled Functionalization of Nanostructured Metamaterials
- Ultrafast Dynamics and Transient States in Matter
- Ultrastable Glasses: New Perspectives for an Old Problem
- Visualizing Electronic Correlations in Quantum Materials

Plenary Talks

Magic-Angle Graphene: Superconductivity, Correlations, and Beyond

Pablo Jarillo Herrero

Department of Physics, Massachusetts Institute of Technology, USA

Strongly interacting electrons in solid-state systems often display tendency towards multiple broken symmetries in the ground state. The complex interplay between different order parameters can give rise to a rich phase diagram. Here, we report on the identification of intertwined phases with broken rotational symmetry in magic-angle twisted bilayer graphene (TBG). Using transverse resistance measurements, we find a strongly anisotropic phase located in a 'wedge' above the underdoped region of the superconducting dome. Upon crossing the superconducting dome, a reduction of the critical temperature is observed, similar to the behavior of certain cuprate superconductors. Furthermore, the superconducting state exhibits a anisotropic response to an directional-dependent in-plane magnetic field, revealing a nematic pairing state across the entire superconducting dome. These results indicate that nematic fluctuations might play an important role in the low-temperature phases of magic-angle TBG, and pave the way for using highly-tunable moiré superlattices to investigate intertwined phases in quantum materials.

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Why is everyone talking about hafnia-based ferroelectric devices?

Beatriz Noheda[1], Yingfen Wei[1], Pavan Nukala[1], Sylvia Matzen[2]

1. Zernike Institute for Advanced Materials, University of Groningen
2. Center for Nanoscience and Nanotechnology, CNRS-Université Paris-Saclay, Palaiseau, France

Ferroelectric memories have been around for a few decades and their advantages in terms of low power consumption and switching speed are broadly recognized but, so far, their industrial presence was limited to low density niche applications due to issues with scalability. This has drastically changed recently with the discovery of ferroelectricity in nanoscaled hafnia-based films. A decade ago, HfO_2 as high-k gate oxide in MOSFETs gave rise to the 22nm microchip technology, expedited by its ALD growth and facile CMOS integration. Short after, the unexpected discovery of ferroelectricity in ultra-thin layers of doped-HfO_2 upon crystallization [1,2] started puzzling the ferroelectrics community, which needed some time to recognize the many advantages of this new class of ferroelectrics and has brought HfO_2-based ferroelectrics into the spotlight: reduction of energy consumption per bit write by a factor of 1000 or switching times of 5ns are some of the assets that are driving the integration of ferroelectric memories into the 28 nm technology. However, in order to further optimize these materials (i.e. reduction of coercive field, enhancement of polarization and cyclability) we need a better knowledge of the materials characteristics that distinguish hafnia-based ferroelectrics from the classical perovskites and other better studied ferroelectrics. Here, after a general introduction into this wonder material, I will present our quest in this direction by investigating the behavior of epitaxial rhombohedral single phase $Hf_{0.5}Zr_{0.5}O_2$ [3,4] and its evolution during device operation in tunnel junctions and memristors, highlighting the interdependence of the ferroelectric properties from other physical mechanisms, as well as the projection of these devices for future applications.

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4. P. Nukala et al. ACS Applied Electronic Materials. 1, 12, p. 2585 (2019); https://arxiv.org/abs/2005.01809 (to appear in the 50th Golden Anniversary Volume of Ferroelectrics);

Engineering quantum systems atom by atom

J. Wrachtrup[1,2]

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The dedicated engineering of highly coherent quantum systems for application in quantum technologies is one of the most demanding challenges in current solid-state physics. Various systems, from superconducting qubits to quantum dots, have been identified as promising platforms. Atomic dopants in wide-band gap semiconductors have proven to be among the most versatile quantum systems [1]. Their coherence times can be several minutes, they are easily addressed optically and manipulation of their spin states is routinely achieved with very high fidelity. These dopants have been shown to constitute small quantum registers, which are used in quantum networks or small-scale quantum computing [2]. Quite surprisingly, dopants in diamond turn out to be very good quantum sensors [3]. They retain their quantum properties over a wide range of environmental conditions, e.g. from room temperature to a few mK and ambient to a few ten GPa pressure. In my talk, I will describe the physics of these quantum dopants and highlight their application in quantum computing as well as sensing.

References

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Deviation from Brownian diffusion in living cell compartments: physical and biological implications

Maria Garcia-Parajo[1,2], Nicolas Mateos[1], Juan Torreno-Pina[1], Gorka Munoz-Gil[1], Carlo Manzo[3] and Maciej Lewenstein[1,2]

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Organization by compartmentalization is a general property of natural systems that efficiently facilitates and orchestrates biological events in space and time. In the last decade, compartmentalization of the plasma membrane of living cells has emerged as a dominant feature present at different spatiotemporal scales and regulating key cell functions [1]. In parallel, recent experimental evidence points to the notion that the nucleus of living cells is highly compartmentalized. The advent of super-resolution microscopy and single molecule dynamic approaches has allowed the study of living cell membranes and intact nuclei with unprecedented levels of details [2,3]. In particular, single particle tracking (SPT) approaches have revealed that most cell membrane receptors and/or molecules inside the cell nucleus exhibit anomalous diffusion and weak ergodicity breaking [4]. The manifestation of such behavior is directly linked to molecular function and result from the nano- and meso-scale interaction of molecules with their surrounding environment [4,5]. In this talk, I will discuss evidence for anomalous diffusion on prototypical membrane receptors and in the cell nucleus and will show a direct correlation between these phenomena and biological function. Moreover, I will describe the combination of SPT at different labelling densities. Low density conditions allow us to reconstruct the mobility of individual molecules and their transient interaction with other molecular partners, while high density labeling conditions provide complementary information on the spatial and temporal length scales of cellular regions re-visited (or forbidden) for molecules. We find that both molecular diffusion and dynamic re-modelling of the environment play key roles regulating biological function.

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A New Visual Quantum World is Discovered to the Understanding

J.C. Séamus Davis [1,2,3,4]

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"*There is a new visual world discovered to the understanding*" ***Micrographia*** (1665). This is how Robert Hooke described the experience of seeing the previously unknown microbial world, by using an optical microscope that he had created. In this talk, we will explore the new quantum world visible at atomic-scale to a ***Scanned Josephson Tunneling Microscope*** (SJTM). This quantum microscope images, not the conventional single-electron quasiparticles of metals and superconductors, but a macroscopically quantum coherent state of electron-pairs. One of the most remarkable things we detect is the electron-pair density wave (PDW) state[1]. Heuristically, one can think of this state as a quantum crystal of electron-pairs. It exhibits periodic modulations at wavevector $\boldsymbol{Q_P}$ of the electron-pair density[1], of the single-electron response to the electron-pair crystal[2], and of the associated electron-pairing energy gap[3]. Increasingly sophisticated SJTM techniques now reveal the atomic-scale interplay of a PDW with other ordered electronic states, such as superconductivity[2,4] and charge density wave[4], and presage abundant new avenues for PDW and SJTM research.

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Semiplenary Talks

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Photon-assisted tunneling at the atomic scale: Probing resonant Andreev reflections from Yu-Shiba-Rusinov states

Olof Peters[1], Nils Bogdanoff[1], Sergio Acero Gonzalez[2], Larissa Melischek[2], J. Rika Simon[1], Gaël Reecht[1], Clemens B. Winkelmann[3], Felix von Oppen[2], Katharina J. Franke[1]

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Exchange coupling of magnetic adsorbates to a superconducting substrate leads to Yu-Shiba-Rusinov (YSR) states within the superconducting energy gap. These can be probed by scanning tunneling spectroscopy as a pair of resonances at positive and negative bias voltage and over a wide range of tunnel conductances. At low tunneling rates, the current is carried by single-electron processes, where each excitation is sufficiently quickly followed by a relaxation into the energetic continuum. Upon increasing the junction conductance, the relaxation rates suppress single-electron tunneling and resonant Andreev processes start to dominate the transport process. The cross-over of these processes is expressed in the variation of the ratio of YSR peak height at positive and negative bias voltage [1].
Here, we investigate these transport processes by photon-assisted tunneling. While applying high-frequency radiation to the tunneling junction, we record the differential conductance spectra in the low and high-conductance regime. At low conductance, the YSR states exhibit symmetrically spaced sidebands with their spacing directly evidencing single-electron tunneling. Surprisingly, at large junction conductance, the spacing remains the same while the patterns become asymmetric. We show that this asymmetry is direct evidence of a resonant Andreev reflection with tunneling threshold conditions imposed on its electron and hole component [2]. We suggest that photon-assisted tunneling can be a powerful tool for the determination of the nature of the charge carriers in a single tunneling event.

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Manipulating matter by coupling to vacuum fields

Francisco J. Garcia-Vidal

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Excitons are bound pairs of excited electrons and holes and play a crucial role in many photophysics processes occurring in Nature, such as photosynthesis and light absorption in organic and inorganic semiconductor materials. On the other hand, one of the most important phenomena in Quantum Electro-Dynamics (QED) is the so-called "Strong Coupling" regime, which appears when the interaction between light and excitons in matter is so strong that the photon and matter components mix to create hybrid light/matter states, called polaritons. Traditionally, this hybrid character has been used to achieve new functionalities in which polaritons are thought of as *dressed* photons, e.g. by exploiting exciton-exciton coupling to construct interacting photons.

However, over the last years, it has become clear that the strong coupling regime can be used with an alternative purpose: to significantly modify internal material properties and dynamics by *dressing* the excitons. In this talk I plan to illustrate how the merging of these two fields of research (Excitons and QED) allows managing excitons to enhance energy transport in organic materials [1-5] by taking advantage of the delocalized character of the polaritons and to alter the energy landscape of the organic molecules in such a way that photochemical reactions [6-9] and even ground-state chemical reactions [10,11] can be altered.

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Two-dimensional melting of colloidal hard spheres

Alice L. Thorneywork, Joshua L. Abbott, Dirk G.A.L. Aarts, Roel P.A. Dullens

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Despite the recent interest in the novel and unique properties of two-dimensional materials, the melting behaviour of the simplest two-dimensional material, hard disks, is still intensely disputed. Crucially, until now – more than half a century after the first simulations of hard-disk freezing were published – no reliable experimental observations of the phase diagram of two-dimensional hard spheres have been reported.

In this talk, I will describe how we determine the full phase behaviour of quasi-twodimensional colloidal hard spheres [1, 2] by considering a tilted monolayer of particles in sedimentation-diffusion equilibrium [3]. In particular, we measure the equation of state from the density profiles and use time-dependent and height-resolved correlation functions to identify the liquid, hexatic and crystal phases. We find that the liquidhexatic transition is first order and that the hexatic-crystal transition is continuous. Furthermore, we directly measure the width of the liquid-hexatic coexistence gap from the fluctuations of the corresponding interface, and thereby experimentally establish the full phase behaviour of hard disks [3].

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Antiferromagnetic spintronics: from memories to ultra-fast optics, neuromorphics, and topological phenomena

Tomas Jungwirth[1,2]

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Fifty years ago, Louis Néel pointed out in his Nobel lecture that while interesting from theoretical viewpoint, antiferromagnets did not seem to have any applications. Indeed, the alternating directions of magnetic moments on individual atoms and the resulting zero net magnetization have made antiferromagnets hard to control by the magneto-recording tools common in ferromagnets. This has hindered both the research and utility of these abundant magnetic materials. Replacing magnetic fields with modern spintronic tools has recently prompted renewed research interest in antiferromagnets. Experimental studies in antiferromagnets have successfully adapted concepts from ferromagnetic spintronics for storing, writing, and reading information. Besides electronic memory devices, antiferromagnetic spintronics has also demonstrated its utility in the research of ultra-fast optical manipulation of magnets, analog neuromorphic memory-logic elements, or topological phenomena. In the talk we will give an overview of these diverse areas of the emerging field of antiferromagnetic spintronics.

Revealing the topological nature of transport at mesoscopic scales with quantum interferences

A. Bernard, A. Murani, B. Dassonneville, A. Kasumov, M. Ferrier, R. Deblock, S. Guéron, and H. Bouchiat

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We show that basic fundamental properties of mesoscopic quantum interferences can be used to reveal the existence and the physical location of 1d protected states in topological insulators. This method is illustrated in the case of crystalline bismuth nanowires which were found to belong to a class of newly discovered higher order topological insulators with helical ballistic hinge states coexisting with trivial bulk and surface diffusive states. In particular we discuss SQUID like periodic magnetic oscillations observed in Bi based Josephson junctions.

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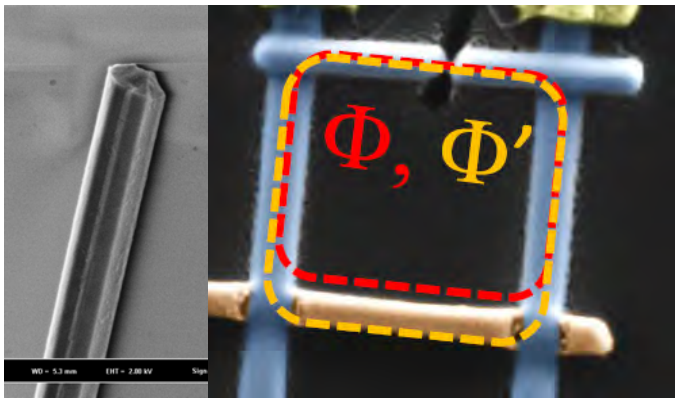

Figure 1. Bismuth cristalline nanowire inserted into a SQUID interferometer, revealing ballistic conducting 1D states along its edges

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Quantum topological effects on the transport properties of ionic conductors

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According to the Green-Kubo linear-response theory of transport, the electric conductivity of an extended system equals the product of the equilibrium mean square fluctuation of the charge current, times the time it takes for these fluctuations to fade. In this talk I will provide a serious answer to the following silly question: *how come that a vanishing conductivity results from non-vanishing current fluctuations in insulating fluids*? The answer is rooted in a recently discovered gauge-invariance principle of transport coefficients, combined with a newly devised definition of the atomic oxidation states (a ubiquitous chemical concept that had so far eluded a rigorous quantum-mechanical interpretation) in terms of quantum topological charges. More generally, I will show that these topological charges fully determine the transport properties of ionic conductors. In the last part of my talk I will also show that when the topological conditions that determine the additivity and position-independence of the oxidation numbers break, an anomalous transport regime takes place, whereby charge transport can occur without any associated ionic displacement. These concepts will be illustrated with computer experiments performed on molten alkali halides, stoichiometric and non-stoichiometric alike.

The results described in this talk have been obtained in collaboration with Federico Grasselli and Paolo Pegolo and reported in Refs. 1 and 2.

1. Federico Grasselli and Stefano Baroni, *Topological quantization and gauge invariance of charge transport in liquid insulators*, Nature Physics **15**, 809 (2019) https://doi.org/10.1038/s41567-019-0562-0
2. P. Pegolo, F. Grasselli, and S. Baroni, *Oxidation states, Thouless' pumps, and anomalous transport in non-stoichiometric ionic conductors*, http://arxiv.org/abs/2006.1674

European Physical Society
Condensed Matter Division
División de Física de la Materia Condensada
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Self-folding Kirigami at the microscale

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Three-dimensional shells can be synthesized from the spontaneous self-folding of two-dimensional templates of interconnected panels, called nets. To design self-folding, one first needs to identify what are the nets that fold into the desired structure. In principle, different nets can fold into the same three-dimensional structure. However, recent experiments and numerical simulations show that the stochastic nature of folding might lead to misfolding and so, the probability for a given net to fold into the desired structure (yield) depends strongly on the topology of the net and experimental conditions. Thus, the focus has been on identifying what are the optimal nets that maximize the yield [1]. But, what about the folding time? For practical applications, it is not only critical to reduce misfolding but also to guarantee that folding occurs in due time. Here, we consider as a prototype the spontaneous folding of a pyramid. We find that the total folding time is a non-monotonic function of the number of faces, with a minimum for five faces. The motion of each face is consistent with a Brownian process and folding occurs through a sequence of irreversible binding events that close edges between pairs of faces [2]. The first edge closing is well-described by a first-passage process in 2D, with a characteristic time that decays with the number of faces. By contrast, the subsequent edge closings are all first-passage processes in 1D and so the time of the last one grows logarithmically with the number of faces. It is the interplay between these two different sets of events that explains the non-monotonic behavior. Implications in the self-folding of more complex structures are discussed.

References

[1] N. A. M. Araújo, R. A. da Costa, S. N. Dorogovtsev, J. F. F. Mendes, *Physical Review Letters* **120**, 188001 (2018).
[2] H. P. M. Melo, C. S. Dias, N. A. M. Araújo, *arXiv:2005.08202*

Mini-Colloquia

CMD2020GEFES mini-colloquium

Advances in Magnetic Imaging

Agustina Asenjo, Etienne Snoeck, Miriam Jaafar, Carmen Munuera

The reduction of dimensions down to the nanometric scale triggered the emergence of novel states and fascinating properties in condensed matter physics, but also the experimental challenge to characterize them. The mini-colloquia on “Advances in Magnetic Imaging” aims to gather the community working on advanced magnetic techniques to present and discuss the state-of-the art of different topics covering high resolution magnetic imaging, high sensitivity magnetometry techniques, time-resolved methods and its applications to interdisciplinary areas as materials science, biology, medicine or engineering.

The scope of the program will cover the beam-based techniques that involves a broad spectrum of physical principles of operation and includes both well-established and novel techniques such as magneto-optical microscopy based on Kerr and Faraday effects, Lorentz force microscopy, scanning electron microscopy (SEM) with polarization analysis, and photoemission electron microscopy, specifically including x-ray magnetic linear and circular dichroism microscopy. On the other hand, this mini-colloquia will focus on the actual trends in magnetically sensitive SPM-based techniques as the recently developed integration of nitrogen vacancy (NV) defect centres with high-Q diamond mechanical oscillators, magnetic resonance force microscopy, magnetic force microscopy, Hall probe microscopy and superconducting quantum interference device (SQUID) microscopy. We want to made a special call to the research groups working on Atom-sized magnetic field sensor using NV defect in Diamond tip, Femtosecond magnetization dynamics induced by light, Spin polarized STM, Time-resolved Kerr Microscopy, Electron Holography, Electron holographic tomography and Advanced MFM imaging.

Thursday, 03 September 2020

Zoom host, Agustina Asenjo.

9:30-10:10 *Nanoscale magnetic studies by electron holography.* Gatel Christophe (invited), I.-M. Andersen, D. Reyes, N. Biziere, L.-A. Rodriguez, T. Blon, E. Snoeck.

10:10-10:50 *X-rays and functional sample environments for 2D and 3D magnetic imaging.* Lucia Aballe (invited), S. Ferrer, M. Foerster, E. Pereiro, A. Sorrentino.

10:50-11:30 *Imaging non-collinear textures in antiferromagnets with NV-center magnetometry.* Aurore Finco (invited).

11:30-11:50 *Direct imaging of antiferromagnetic domains using magnetic x-ray diffraction phase contrast.* Valery Kiryukhin, Min Gyu Kim, Hu Miao, Bin Gao, S.-W. Cheong, C. Mazzoli, A. Barbour, Wen Hu, S. B. Wilkins, I. K. Robinson, M. P. M. Dean.

11:50-12:10 *Direct observation of multi-domain structures in compositionally modulated cylindrical nanowires.* Cristina Bran, J.A. Fernandez-Roldan, R.P. Del Real, A. Asenjo, A. Fraile Rodríguez, M. Foerster, L. Aballe, O. Chubykalo-Fesenko and M. Vazquez.

12:10-12:30 *Magnetic X-ray Tomography for the exploration of Magnetic Singularities and Topological Charge.* Aurelio Hierro-Rodriguez, C. Quirós, A. Sorrentino, L. M. Álvarez-Prado, J. I. Martín, J. M. Alameda, S. McVitie, E. Pereiro, M. Vélez and S. Ferrer.

Special sessions Thursday Afternoon

Zoom host, Agustina Asenjo. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Imaging and stabilizing half hedgehog spin-textures in soft magnetic nanodots.* **Eider Berganza**, M. Jaafar, J. A. Fernandez- Roldan, M. Goiriena-Goikoetxea, J. Pablo-Navarro, A. García-Arribas, K. Guslienko, C. Magén, J. M. De Teresa, O. Chubykalo-Fesenko and A. Asenjo.
2. *Controlling the magnetic bubbles configuration in CoPt nanostructures.* **Jorge Marqués Marchán**, M.C. Pérez Carmona, J.L. Prieto and A. Asenjo.
3. *Understanding the magnetic behavior of a combined magnetically hard and soft layer system.* **Guiomar Delgado Soria**, C. Granados Miralles, A. Mandziak, J. F. Marco, J.E. Prieto, M. Foerster, L. Aballe, J. de la Figuera and A. Quesada.

Posters

1. *Vertical localization of magnetic singularities in ferro/ferrimagnetic multilayers studied by X-ray tomography.* **María Vélez**, J. Hermosa, A. Hierro-Rodríguez, C. Quirós, L. M. Álvarez-Prado, A. Sorrentino, R. Valcárcel, E. Pereiro, J. I. Martín and S. Ferrer.
2. *The effect of trapped Helium atoms on spin polarized tunneling in an STM tunnel junction.* **Christopher Trainer**, C. Ming Yim, C. Heil, P. Wahl.
3. *Probing Charged and Neutral Fermi Surfaces using NV Noise Magnetometry.* **Falko Pientka**, J. Yong Khoo, S. Hegde, I. Sodemann.

Friday, 04 September 2020

Zoom host, Agustina Asenjo.

9:30-10:10 *Magnetic Force Microscopy – a quantitative method for probing magnetic textures on the nanoscale.* **Neu Volker (invited)**.

10:10-10:50 *Squid-on-Tip Operating at Ultra-Low Temperature and at High Magnetic Field With Single Spin Sensitivity.* **Yonathan Anahory (invited)**, H.R. Naren, E.O. Lachman, S. Buhbut Sinai, A. Uri, L. Embon, E. Yaakobi, Y. Myasoedov, M.E. Huber, R. Klajn and E. Zeldov.

10:50-11:10 *Customized MFM probes based on magnetic nanorods.* **Miriam Jaafar Ruiz-Castellanos**, J. Pablo-Navarro, E. Berganza, P. Ares, C. Magén, J. Gómez-Herrero, A. Masseboeuf, C. Gatel, E. Snoeck, J.M. de Teresa and A. Asenjo .

11:10-11:30 *Exploring non-collinear magnetism in artificial mono-atomic wires by means of spin polarized STM.* **David Serrate Donoso**, M. Moro-Lagares.

11:30-11:50 *Direct observation of fractal ferromagnetic domains on single crystals of CrSiTe3 and CrGeTe3.* **Juan Jose Riquelme Ballesta**, V. Barrena, I. Guillamón, M. García-Hernández, H. Suderow, J. L. Martínez and C. Munuera.

11:50-12:10 *Unraveling the magnetic domain structure of nanopatterned hard/soft bilayer antidot arrays with long-range periodicity.* **Jose Miguel Garcia-Martin**, A. Kaidatzis, R. P. del Real, R. Alvaro, D. Niarchos, M. Vázquez.

12:10-12:30 *Exploring the domain wall pinning mechanism in ultrathin ferrites.* **Sandra Ruiz**, A. Mandziak, L. Martín-García, C. Munuera, A. Quesada, M. Foerster, L. Aballe and J. de la Figuera.

CMD2020GEFES mini-colloquium

Artificial Intelligence for Condensed Matter Physics

Jorge Bravo-Abad, Eliska Greplova

The unprecedented development of artificial intelligence techniques over the past decade has already impacted a broad range of industrial applications such as natural language translation and image classification. Stimulated by these advances, a number of AI algorithms have been successfully extended to a variety of scientific areas, ranging from statistical and quantum physics to high-energy physics and cosmology. In this context, and due to the intrinsic characteristics of the field, condensed matter physics is emerging as one of the most suitable areas to boost the cross-fertilization between AI and physics. On one hand, it is expected that AI could contribute to the next-generation of fundamental and applied condensed matter physics breakthroughs. On the other hand, new AI algorithms and techniques could be developed based on condensed matter physics insights. This session will present the latest advances in the application of AI to condensed matter physics, with a lineup of speakers that will cover the current most relevant and active areas of the topic.

Monday, 31 August 2020

Zoom host: David Navas.

9:30-10:10 *Learning by confusion*. **Evert van Nieuwenburg (invited)**.

10:10-10:30 *Inverse design in nanophotonics using deep-learning*. **Junsuk Rho**.

10:30-10:50 *Ab-initio machine learning potentials for phase transitions and phase diagrams using enhanced sampling methods*. **Luigi Bonati**, M. Parrinello.

10:50-11:10 *BREAK*

11:10-11:30 *Phase detection with neural networks: interpreting the black box*. **Anna Dawid**, Patrick Huembeli, Michał Tomza, Maciej Lewenstein, Alexandre Dauphin.

11:30-11:50 *Neural Simulated Classical and Quantum Annealing*. **Mohamed Hibat-Allah**, Estelle Inack, Juan Carrasquilla.

11:50-12:30 *Machine Learning Quantum Emergence*. **Eun-Ah Kim (invited)**.

Special sessions Monday Afternoon

Zoom host: David Navas Otero. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *A differentiable programming method for quantum control*. **Frank Schäfer**, Michal Kloc, Christoph Bruder, Niels Lörch.
2. *Machine learning for decoding of quantum information*. **Agnes Valenti**, Eliska Greplova, Sebastian D. Huber.
3. *Molecular Identification based on AFM with CO tips and Deep Learning*. **Jaime Carracedo Cosme**, Carlos Romero-Muñiz, Pablo Pou, Rubén Pérez.
4. *Modeling Study of Nanostructured Titanium Thin Films Obtained by DC Magnetron Sputtering*. **Lazhari-Ayoub Naas**, B. Bouaouina, S.E. Abaidia.

Posters

1. *A quantum model for an artificial neuron*. **George Alexandru Nemnes**.
2. *Automated exploration of bound states in bilayer graphene quantum dots*. **Jozef Bucko**, Frantisek Herman, Frank Schäfer, Annika Kurzmann, Klaus Ensslin, Thomas Ihn, Manfred Sigrist, Sebastian D. Huber, Eliska Greplova.
3. *Bayesian Parameter Estimation in Large Scale Quantum Systems*. **Guliuxin Jin**, Agnes Valenti, Julian Leonard, Sebastian D. Huber, Eliska Greplova.
4. *Deep learning the Hohenberg-Kohn maps of Density Functional Theory*. **Javier Robledo Moreno**, Giuseppe Carleo, Antoine Georges.
5. *Prediction of physical properties in CoCrFeNiAlx high entropy alloys using artificial neural networks*. **Nicolae Filipoiu**, Tudor Luca Mitran, George Alexandru Nemnes.
6. *Systematically tuning a 2xN array of quantum dots with machine learning*. **Giovanni Oakes**.

CMD2020GEFES mini-colloquium

Casimir Effect and Heat Transfer Advances

Victoria Esteso, Mathias Boström, Mauro Antezza

This mini-colloquium deals with recent advances in the field of quantum electrodynamics and light-matter interaction at the nano- and micro-scale, specially focusing on Casimir interactions, radiative Heat Transfer, and related topics. The aim of this mini-colloquium is to embrace multidisciplinary fields with common physical origin, providing a framework in which leading scientists with theoretical and experimental profiles, from apparently disparate fields, can share expertise and inspire cross-fertilization in these research fields towards deeper insight and application advances, interchanging ideas and promoting interdisciplinary collaborations.

Monday, 31 August 2020

Zoom host: Irene González.

9:30-10:10 *Casimir force-induced heat transfer across vacuum*. **King Yan Fong (invited)**, Hao-Kun Li, Rongkuo Zhao, Sui Yang, Yuan Wang, Xiang Zhang.

10:10-10:30 *Impact of nonreciprocity on electromagnetic fluctuation induced phenomena: the case of an atom near a Chern insulator*. **Bing-Sui Lu**, Khatee Zathul Arifa, Martial Ducloy.

10:30-11:10 *Spontaneous emission, superradiance and subradiance of atoms in dynamical environments*. **Lucia Rizzuto (invited)**, Roberto Passante.

11:10-11:50 *Energy transfer in a colloidal system using critical Casimir forces*. **Ignacio A. Martínez (invited)**.

11:50-12:10 *Radiative heat transfer and surface plasmons at rough metallic surfaces*. **Carsten Henkel**, M. Hannemann, G. Wegner.

12:10-12:50 *Dynamical dispersion interaction between an atom and a moving mirror*. **Roberto Passante (invited)**, Antonio Noto, Lucia Rizzuto.

Tuesday, 01 September 2020

Zoom host: Irene González.

9:30-9:40 *Recent advances in the measurement of Casimir forces and torques*. **Jeremy N. Munday** (Flash Talk).

9:40-9:50 *Near-field heat transfer between high TC superconductors*. **S. G. Castillo-López**, G. Pirruccio, C. Villarreal, R. Esquivel-Sirvent. (Flash Talk).

9:50-10:30 *The cross-over from London (non-retarded) to Casimir (retarded) van der Waals interactions in three and four layered media*. **Luis G. MacDowell (invited)**, Juan Luengo.

10:30-10:50 *Long-range Casimir-like force from a quasi-condensate of light*. **Nicolas Cherroret**.

10:50-11:30 *Casimir force measurements in complex systems*. **Zahra Babamahdi (invited)**, George Palasantzas, Vitaly Svetovoy.

11:30-11:50 *Casimir force between ideal metal plates with a chiral intervening medium*. **Iver Brevik**, Johan S. Høye.

11:50-12:10 *Measurement of the Casimir force in a gas and in a liquid*. **Sergio Ciliberto**, Anne Le Cunuder, Artyom Petrosyan, Georges Palasantzas, Vitaly Svetovoy.

12:10-12:30 *Van der Waals forces at the ice surface with an updated description of the dielectric responses based on the Drude model*. **Juan Luengo Márquez,** Luis G. MacDowell.

Pre-recorded talks. Pre-recorded talks on YouTube.

1. *Recent advances in the measurement of Casimir forces and torques*. **Jeremy N. Munday (invited)**.
2. *Near-field heat transfer between high TC superconductors*. **S. G. Castillo-López**, G. Pirruccio, C. Villarreal, R. Esquivel-Sirvent.

CMD2020GEFES mini-colloquium

Emergent Transport Phenomena in Functional Quantum Materials

Mariela Menghini, Claudio Giannetti, Jean-Yves Raty

Functional quantum materials are becoming extremely relevant due to their wide applications in sensing, computing, energy conversion, communication, quantum technologies, etc. In these materials, the macroscopic manifestation of quantum properties and collective electronic phases are governed by the interplay between different degrees of freedom. Therefore, tiny changes in the chemistry, lattice structure, band occupation can lead to major modifications of their unique structural, electrical and optical properties. The combination of multiple external control parameters opens the way to the manipulation of interesting emerging properties, which sometimes do not have any counterpart in equilibrium physics. The research in this topic ranges from fundamental questions aimed at addressing the origin of exotic and unconventional properties to the investigation of possible applications in novel devices. This colloquium aims at gathering experts in the field to share the most relevant advances and tackle the challenges related to the control of emerging transport phenomena in functional quantum materials via nano-engineering, non-equilibrium manipulation, coupling to cavity modes, quantum-coherent control, etc. The colloquium will also address the exploitation of these phenomena in a wealth of different fields, such as memories, neuromorphic applications and electro-optical devices.

Topics to be covered by this colloquium:

- Electronic properties of functional quantum materials such as strongly correlated materials, Mott insulators, unconventional superconductors, transition metal oxides and chalcogenides.
- Phase transitions: metal-insulator transitions, superconducting-normal and superconducting-insulator transitions, charge-density waves.
- Applications of functional materials: memories, neuromorphic applications and electro-optical devices.
- Theory of dissipative quantum systems and coupling to cavity modes.

Wednesday, 02 September 2020

Zoom host, Mariela Menghini.

Session 1: Superconductivity

9:30-10:10 *Tuning the electronic structure of High Temperature Superconducting films by field-induced oxygen diffusion.* **Anna Palau (invited)** , Alejandro Fernández-Rodríguez, Jordi Alcalà, Xavier Granados, Teresa Puig, Xavier Obradors, Jordi Suñé and Narcís Mestres.

10:10-10:30 *Discovering the connection between transport and charge order in cuprate high critical temperature superconductors.* **Riccardo Arpaia**, S. Caprara, E. Andersson, R. Fumagalli, M. Rossi, Y.Y. Peng, D. Betto, G. M. De Luca, N. B. Brookes, M. Salluzzo, U. Gran, T. Bauch, L. Braicovich, C. Di Castro, M. Grilli, G. Ghiringhelli and F. Lombardi.

10:30-10:50 *Direct Visualization of Current-Stimulated Oxygen Migration in YBa2Cu3O7−δ Thin Films.* **Stefan Marinkovic**, Alejandro Fernández-Rodríguez, Simon Collienne, Sylvain Blanco Alvarez, Sorin Melinte, Boris Maiorov, Gemma Ruis, Xavier Granados, Narcís Mestres, Anna Palau and Alejandro Silhanek.

10:50-11:10 *Holographic plasmons and Coulomb drag.* **Enea Mauri** and H.T.C. Stoof.

11:10-11:30 *Optimization of lumped element superconducting resonators for quantum computing with molecular spin qubits.* **Marina Calero**, Marcos Rubín, Ignacio Gimeno, Víctor Rollano, María Teresa Magaz, David Zueco, María José Martínez-Pérez, Daniel Granados, Fernando Luis and Alicia Gómez.

Session 2: Metal-insulator transitions -1

11:30-12:10 *Designing metal – insulator transitions in heavy chalcogenides.* **Matthias Wuttig (invited)**, J. Reindl, C. Teichrib, H. Volker and N. Breznay.

12:10-12:30 *Room temperature Mott metal-insulator transition in V2O3 compounds.* **Jean Pierre Locquet**, Pía Homm, Mariela Menghini, Jin Won Seo and Sven Peters.

Special sessions Wednesday Afternoon.

Zoom host, Mariela Menghini. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Many-body localized systems with power-law interactions.* Xiaolong Deng, **Guido Masella**, Guido Pupillo and Luis Santos.

Posters

1. *Development of nano-devices based on few-layer transition metal dichalcogenides (TMDCs).* **Celia González**, Jorge Cuadra Véliz and Eduardo J.H. Lee.
2. *The effect of synthesis conditions and additional oxidative calcining on the local structure of BaFe1/2Sn1/2O3-δ.* **Mikhail Mayorov**, V.A.Shuvaeva , E.A. Bikyashev, A.V.Popov.
3. *Structural transformations in NaNbO3 - NaTaO3 solid solution system.* **Victoria Shuvaeva**, I.P. Raevski, A.M. Glazer, S.I. Raevskaya, V.V. Titov and M.A. Malitskaya.

4. *Low-cost and facile fabrication of plasmonic Au nanoislands for enhanced confocal fluorescence*. **Alejandro Vidal**, G. Mata , M. Pérez, D. Megías, M.U. González, A. García and P.A. Postigo.

Thursday, 03 September 2020

Zoom host, Mariela Menghini.

Session 1: Emergent states in quantum matter

9:30-10:10 *Transient cooling low-frequency excitations by impulse perturbations*. Michele Fabrizio (invited).

10:10-10:30 *Robust Weak-Antilocalization effect in Bi2Se3 thin films*. Rubén Gracia, Chiara Bigi, Soraya Sangiao, Pasquale Orgiani and José María de Teresa.

10:30-10:50 *Transport of Neutral Optical Excitations Using Electric Fields*. Falko Pientka, Ovidiu Cotleţ, Richard Schmidt, Gergely Zarand,Eugene Demler and Atac Imamoglu.

10:50-11:10 *Dispersion and damping of collective excitations in condensed Fermi gases at finite momentum and temperature*. Serghei Klimin, H. Kurkjian and J. Tempere.

11:10-11:30 *Quantized nonlinear transport phenomena in Weyl semimetals*. Rafael Flores Calderón, Alberto Martín Ruiz.

Session 2: Metal-insulator transitions -2

11:30-12:10 *Correlated oxides for neuromorphic computing*. Javier del Valle (invited), Pavel Salev, Yoav Kalcheim, Nicolás M. Vargas, Claribel Dominguez, Jean-Marc Triscone and Ivan K. Schuller.

12:10-12:30 *Toward coherent optical control of the insulator-to-metal transition in V2O3*. Paolo Franceschini, Andrea Ronchi, Andrea De Poli, Mariela Menghini, Jean-Pierre Locquet, Stefano Dal Conte, Giulio Cerullo and Claudio Giannetti.

Friday, 04 September 2020

Zoom host, Mariela Menghini.

Session 1: 2D materials

9:30-9:50 *Quantum nanoconstrictions fabricated by cryo-etching in encapsulated graphene*. **Vito Clericò**, J. A. Delgado-Notario, M. Saiz-Bretín, A. V. Malyshev, M. Meziani, P. Hidalgo, B. Méndez, M. Amado, F. Domínguez-Adame and E. Diez.

9:50-10:10 *A Mechanically Tunable Quantum Dot in a Graphene Break Junctions*. **Amador García Fuente** and Jaime Ferrer.

10:10-10:30 *Vacancy-induced Fano resonances in graphene nanoribbons*. **Irián Sánchez Ramírez**, Leonor Chico, Elena Díaz and Francisco Domínguez-Adame.

Session 2: Dissipative quantum systems and coupling to cavity modes

10:30-11:10 *Cavity-enhanced superconductivity*. **Guido Pupillo (invited)**.

11:10-11:30 *Charge-photon transport statistics and short-time correlations in a single quantum dot–resonator system with an arbitrarily large coupling parameter.* **Tineke Van den Berg** and Peter Samuelsson.

11:30-11:50 *Atomistic simulation of current-induced forces and atom dynamics in molecular junctions.* **Susanne Leitherer**, Nick R. Papior, Jing-Tao L and Mads Brandbyge.

11:50-12:10 *Disorder-independent transport in nanostructures: application to molecular chains in optical cavities.* **Francesco Mattiotti**, Nahum C. Chávez, J. A. Méndez-Bermúdez, Fausto Borgonovi and G. Luca Celardo.

12:10-12:30 *Cooperative effects and long range interactions: from Superradiance to Cooperative Shielding.* **Giuseppe Celardo**.

CMD2020GEFES mini-colloquium

Exploring Molecular Interactions: from Sorption in (non-)Porous Media to Surface Effects

Ionut Tranca, Silvia Gaastra Nedea, Sofia Calero, Bartlomiej Szyja, Diana Tranca-Bergmann

Virtually all chemical and physical processes occurring at the interfaces are resulting from the interactions of atoms / molecules with materials. These phenomena are present in materials science, physics, chemistry, engineering and many others. Examples include heterogeneous catalysis (e.g. water splitting), material or energy storage (e.g. hydrogen storage, heat storage), heat and mass flow, corrosion, lubrication, coatings deposition, nano-/micro-structures design (e.g. NEMS), etc. Within the present colloquium, we aim at exploring the interactions of atoms/molecules with complex materials – surfaces, porous media, bulk materials – at both theoretical and experimental level.

From the theoretical standpoint, understanding and predicting of materials properties often require insight from different levels and methods: DFT, DFTB, MD, MD/ReaxFF, MC, DSMC, machine learning, etc. From the experimental point of view, scattering, spectroscopy and microscopy techniques allow nowadays an unprecedented insight into the complex world of nano-structures and their dynamics.

We invite both experimental and theoretical/computational researchers working in the field of molecular interactions with surfaces, porous media and bulk systems, to present their work by submitting abstracts for both oral and poster presentations in the framework of this colloquium.

Monday, 31 August 2020

Zoom host: Juan Aragonés.

9:30-10:10 *Confinement in Porous Carbons: the key towards efficient metal-free solar energy conversion and nanoenergetic materials*. **Conchi O. Ania (invited)**, Eder Amayuelas, Cristina Ruiz-García, Romuald Van Riet, Peter Lodewyckx, Michel H. Lefebvre.

10:10-10:30 *Nanoscale Field Heterogeneities in Photocatalysis: Combining Optical and Kinetic Monte Carlo Simulations*. **Sebastian Matera**, Martin Hammerschmidt, Sandra Döpking, Sven Burger.

10:30-10:50 *Probing adsorption of small molecules on MOF-74 with vibrational spectroscopy.* **Carlos Romero-Muñiz**, Sofia Calero.

10:50-11:30 *Breaking linear scaling relationships in catalysts with secondary interactions in confined space: a case study of methane oxofunctionalization by MOF- and zeolite-based catalysts*. **Evgeny A. Pidko (invited)**, Elena Khramenkova, Maria Mikhailenko, gnes Sz cs nyi, Guanna Li, Chong Liu, Ivan Chernyshov.

11:30-11:50 *S ···S chalcogen bond enables targeted photoreduction chemistry with hydrogen sulfide* **Mikołaj J. Janicki**, Rafał Szabla, Robert W. Góra.

11:50-12:10 *Water vapor adsorption on CAU-10-X: effect of functional groups on adsorption equilibrium and mechanisms*. **Shkatulov A. I.**, Solovyeva M. V., Gordeeva L.G., Aristov Y.I.

12:10-12:30 *Physical insights in the ice phase diagram: the novel ice XVII as a porous material*. **Leonardo del Rosso**, Milva Celli, Lorenzo Ulivi.

Special sessions Monday Afternoon.

Zoom host: Juan Aragonés. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Oxalate intermediates in the electrocatalytic CO2 conversion on Cu/Ni alloys from DFT simulations*. **E. Dziadyk**, M. Jędrysiak, B. M. Szyja.
2. *Modeling of Exciton Hopping in Gas Molecule Decorated MoSe2: A Kinetic Monte-Carlo Study*. **Maik Schwuchow**, Christian Wagner, Tommaso Venanzi, Harald Schneider, Stephan Winnerl, and Angela Thränhardt.
3. *Mass extraction efficiency in a porous medium with swelling and erosion*. **Matias, André F.V.**, Coelho, Rodrigo C.V., and Araújo, Nuno A.M.
4. *Low-dimensional projections of high-dimensional kinetic phase diagram*. **Sina Dortaj**, Sebastian Matera.
5. *Theoretical Study of Charge Transfer Dynamics in Droplet-based Electricity Generator Device with High Power Density*. **Cui Wang**, Antoine Riaud.

Posters

1. *Probing N2 Interactions with Acid Sites and Cu+ Ions in Zeolites: IR and DFT Studies*. **Dorota Rutkowska-Zbik**, Łukasz Kuterasiński, Jerzy Podobiński, Mariusz Gackowski, Paweł Rejmak, Jerzy Datka.

2. *Direct measurement of charge recombination losses in organic solar cells by transient absorption spectroscopy*. **Florian Günther**, Roberto M. Faria, Paulo B. Miranda.

3. *Thermographic control of heating water suspensions of solid solid nanoparticles under electromagnetic radiation of optical and radio-frequency range for biomedical applications*. **Egor Bobkov**, Vladimir Belov, Vladislav Oleschenko, Victor Timoshenko.

Tuesday, 01 September 2020

Zoom host: Juan Aragonés.

9:30-10:10 *Characterization of Amorphous Silica Based Materials Using DFT Computational Methods*. **Frederik Tielens (invited)**.

10:10-10:30 *Understanding the cooperative self-assembly adsorption of organic (Corrosion Inhibitor) molecules at the Iron-Water Interface under different environments through molecular simulations*. **Lourdes F. Vega**, Seba Alareeqi, Daniel Bahamon, Ricardo P. Nogueira.

10:30-10:50 *Topological Defects Involved Single-Atom Catalysts for Carbon Dioxide Conversion and Oxygen Reduction*. **Senhe Huang**, Junjie Ding, Kaiyue Jiang, Chenbao Lu, Zhenying Chen, Diana Tranca, Xiaodong Zhuang.

10:50-11:30 *Machine learning models for estimating molecular properties*. **Eldhose Iype (invited)**.

11:30-11:50 *Mineral hydration and dissolution simulation with ReaxFF molecular dynamics: application to cement.* **Hegoi Manzano**.

11:50-12:10 *Microscale modeling of doped thermochemical energy storage materials*. **Koen Heijmans**, Ionut Tranca, Silvia Nedea, David Smeulders.

12:10-12:30 *Self-assembly of Bottlebrushes with Polyfluoropolyether Sidechains: Focus on Molecular Organization at Interfaces*. **Sidong Tu**, Chandan Kumar Choudhury, Michaela Giltner, Liying Wei, Igor Luzinov, Olga Kuksenok.

Special sessions Tuesday Afternoon

Zoom host: Juan Aragonés. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *First Principle Simulation of Crystal Hydrate Dehydration*. **Stefano Sansotta**, Ionut Tranca, Henk Huinink.

2. *Charge transfer analysis in graphene – Ru-pincer complex – CO2 system in context of CO2 reduction*. **Joanna Zasada**, Bartłomiej Szyja.

3. *Imprinting chirality and doping in graphene nanopores*. **María Tenorio**, C.Moreno, P. Febrer, J. Castro-Esteban, M. Pruneda, D.Peña, A.Mugarza.

4. *Adsorption site dependent gating of C60 on h-BN/Rh(111)*. **Max Bommert**, Gino Günzburger, R. Widmer, Oliver Gröning.

5. *Reorganization of Hydrogen Adsorbed Phase in Siliceous Chabazite Enhance Isotopic Selectivity*. **J. M. Salazar**, I. Bezverkhyy, B. Radola, J-M Simon, M. Macaud, J. P. Bellat.

Posters

1. *High-throughput computational screening of oxides for high-temperature energy storage*. **Genc, A. E.**, Shkatulov, A. I, Tranca, I. C. Download Poster.
2. *Reconstruction of Metastable Induced Electron Spectra of Molecules on Solid Surfaces*. **W.J.D. Beenken**, T.B. Gäbler, S. Krischok and E. Runge.
3. *Computational study of silica and graphene as protective coatings for 5-fluorouracil administration*. **S. Simonetti**, E. Noseda Grau, G. Roman, S. Ulacco, A. Díaz Compañy.
4. *Atomic hydrogen permeation through graphene: an insertion mechanism via chemisorption*. **Massimiliano Bartolomei**, Marta I. Hernández, José Campos-Martínez, Ramón Hernández-Lamoneda, Giacomo Giorgi.

Wednesday, 02 September 2020

Zoom host: Juan Aragonés.

9:30-10:10 *Multiscale Theory of Operando Energy Conversion Systems*. **Karsten Reuter (invited)**.

10:10-10:30 *Interactions of Ions across Carbon Nanotubes and the Apparent Violation of Coulomb's Law*. **W. Schmickler**, F. Juarez, F. Dominguez-Flores, P.Quaino, E. Santos.

10:30-10:50 *Proton dynamics in the hydrogen bonds of "proton sponges" - in the light of Car-Parrinello molecular dynamics*. **Aneta Jezierska**, Jarosław J. Panek.

10:50-11:10 *Separation of 3He/4He isotopes by Nanoporous Graphene*. **J . Campos-Martínez**, M. Bartolomei, M. I. Hernández, C. Moreno, A. Mugarza.

11:10-11:30 *Theoretical studies and simulations of electronic properties in functionalized donor-acceptor polymers*. **Florian Günther**, Sibylle Gemming.

11:30-11:50 *Hydrogen Evolution Reaction Mechanism on Ru(101)Mo/Graphene*. **Kaiyue Jiang**, Kejun Tu, Diana Tranca, Fermín Rodríguez-Hernández, Senhe Huang, Ming-Xi Chen, Qi Zheng, Chenbao Lu, Yuezeng Su, Zhenying Chen, Haiyan Mao, Chongqing Yang, Jinyang Jiang, Haimei Zheng, Hai-Wei Liang, Jeffrey A. Reimer, Xiaodong Zhuang.

11:50-12:10 *An overview of atomic scale simulations of oxygen evolution reaction*. **Isabela-Costinela Man**, Spyridon Divanis, Tugce Kultusoy, Ida Marie Ingmer Boye, Jan Rossmeisl, Ionut Tranca.

12:10-12:30 *Novel carbon-based membrane materials for water purification*. **Daniel Bahamon**, Ki Ryuk Bang, Eun Seon Cho, Lourdes F. Vega.

CMD2020GEFES mini-colloquium

Fermi surface topological transitions: classification and effects on correlated systems

Joseph Betouras, Pablo Rodriguez-Lopez

In the last ten years there have been many important developments on our understanding of the fundamental role of Fermi surface topological transitions in correlated systems. Unconventional effects of the usual Lifshitz transitions and van Hove singularities in correlated systems were studied. Basic models such as the Hubbard model were analyzed at fillings where a Lifshitz transition exists. The attention turned recently to more complicated systems such as ruthenates, twisted bilayer graphene and other moire' lattices where higher order singularities come into play and long-standing puzzles have been understood in the framework of the Fermi surface topological transitions, either common (Lifshitz) or higher order. As a result, there are many recent studies that (i) classify the singularities in the density of states due to possible Fermi surface topological transitions at the high symmetry points of all possible Brillouin zones in 2D and (ii) start to investigate the interaction effect in a general theoretical framework.

The field is growing and the experimental interest is rather high given that many unresolved puzzles can be attributed to this kind of topological transitions. This mini-colloquium will focus on the general theory of Fermi surface topological transitions and on their experimental consequences on correlated systems such as Sr3Ru2O7, Sr2RuO4, heavy fermions, FeSe, ferromagnetic superconductors (URhGe and the newly discovered UTe2), moire' superlattices, cobaltates etc.

The aim of the mini-colloquium is to bring together all researchers interested in these developments in an effort to promote the communication of new results and to initiate further collaborations.

Wednesday, 02 September 2020

Zoom host: Edwin Herrera Vasco.

9:30-10:10 *Electronic signatures of the nematic electronic phases in superconducting FeSe1-x Sx*. **Amalia Coldea (invited)**.

10:10-10:50 *The Uniaxial-Stress-Induced Lifshitz transition in Sr2RuO4*. **Clifford Hicks (invited)**.

10:50-11:10 *s+is superconductivity triggered by topological changes of the Fermi surface in Ba1-xKxFe2As2*. **Vadim Grinenko**, et. al.

11:10-11:30 *Manipulation of time reversal symmetry breaking superconductivity in Sr2RuO4 by uniaxial strain*. **Hans-Henning Klauss**, et. al.

11:30-11:50 *The role of the dxy orbital in the nematic and superconducting state of FeSe* **Luke Rhodes**, et. al.

11:50-12:10 *Gapped Dirac cones and spin texture in thin film topological insulator*. **Alireza Akbari**, and Peter Thalmeier.

12:10-12:50 *High-order Van Hove singularity and correlation effects toward a supermetal*. **Hiroki Isobe (invited)**.

Special sessions Wednesday Afternoon.

Zoom host: Edwin Herrera Vasco. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Electron-phonon coupling in superconducting 1T-PdTe2*. **Gloria Anemone**, et. al.
2. *Nematic phase in a two-dimensional Hubbard model at weak coupling and finite temperature*. **Pablo Rodriguez-Lopez**, Sergey Slizovskiy and Joseph J. Betouras.
3. *Uniaxial pressure induces Lifshitz phase transition in BaSn2. A route to increase the number of topological nodal lines in semimetals*. **Adolfo Fumega**, Victor Pardo and Alberto Cortijo.
4. *Classification of composite Weyl nodes according to its Fermi surface geometry and Lifshitz transitions*. **Daniel Gosálbez-Martínez**, and Oleg V. Yazyev.
5. *Cascade of Lifshitz transitions in surface states of graphite aligned with hBN*. **Sergey Slizovskiy**
6. *Direct observation of 1D-Moiré charge density wave and heavy fermion quantization in URu2Si2*. **Edwin Herrera**, et. al.
7. *Fermi Surface of LixCoO2 as a function of hole doping*. **Elena Salagre**, et. al.
8. *Direct observation of a uniaxial stress-driven Lifshitz transition in Sr2RuO4*. **Edgar Abarca Morales**, et. al.
9. *Piezoelectric-driven uniaxial pressure cell for muon spin relaxation experiments*. **Shreenanda Ghosh**, et. al.

Posters

1. Ab-initio studies on NbO2. **Kathrin Kulmus**, Sibylle Gemming and Michael Schreiber.

Thursday, 03 September 2020

Zoom host: Edwin Herrera Vasco.

9:30-10:10 *Field-induced Lifshitz transitions: Probe of heavy fermion band structure.* **Gertrud Zwicknagl (invited)**.

10:10-10:50 *Comparison of two Superconducting phases induced by a magnetic field in UTe2.* **William Knafo (invited)**, et. al.

10:50-11:30 *Quantum phase formation driven by multicritical Lifshitz transitions.* **Andreas Rost (invited)**, et al.

11:30-11:50 *Transport Spectroscopy of the Field Induced Cascade of Lifshitz Transitions in YbRh2Si.* **Andrey Varlamov**, et. al.

11:50-12:10 *Fermi Surface Instabilities in the Strongly Correlated Superconductor UTe2.* **Alexandre Pourret**, et. al.

12:10-12:50 *Catastrophe theory classification of Fermi surface topological transitions in 2D.* **Anirudh Chandrasekaran (invited)**, Alex Shtyk, Joseph J. Betouras, Claudio Chamon.

CMD2020GEFES mini-colloquium

Flat Band Moires

Leni Bascones, Dmitri Efetov, Johannes Lischner

The recent discovery of superconductivity emerging from correlated insulating states in twisted bilayer graphene has shaken up the condensed matter community. The narrow bands formed for twist angles close to the so-called magic angle are believed to be behind these properties as they make the system strongly responsive to interactions. The small mismatch between the two layers created by the twist angle produces a moiré pattern with unit cells containing several thousand atoms.

Moiré systems displaying flat bands have emerged as a novel platform to study correlated electron physics. Moiré patterns with narrow bands are not restricted to twisted bilayer graphene and similar insulating and superconducting states have been found in other systems, such as trilayer graphene on hBN, twisted double bilayer graphene or twisted heterostructures based on transition metal dichalcogenides.

The resemblance of the phase diagrams of these systems to those found in many unconventional superconductors, including high-Tc cuprates, suggests that similar physics could be at play. The large doping levels induced with gate voltages and the variety of systems open many new possibilities to explore and tune different correlated states, including states with non-trivial topological properties or nematicity. This new area of condensed matter physics brings together researchers working on graphene and other 2D systems, electronic correlations and topology, experimentalists and theorists.

The symposium will cover both experimental and theoretical aspects of flat band moirés: synthesis, transport, spectroscopy, modeling and simulation. It will mostly focus on the correlated and superconducting states but properties of the metallic phases will also be discussed.

Wednesday, 02 September 2020

Zoom host: Maria José Cladерón.

9:30-10:10 *Correlated, insulating and superconducting States in twisted bilayer graphene Below the Magic Angle*. **Jeanie Lau (invited)**.

10:10-10:30 *Flat band moires and superconductivity in twisted bilayer graphene*. **Tero Heikkilä**, T. Peltonen, A. Julku, R. Ojajärvi, L. Long, P. Törmä.

10:30-10:50 *Band structure and insulating states driven by the Coulomb interactions in twisted bilayer graphene*. **Tommaso Cea**, F. Guinea.

10:50-11:10 *Interactions in magic-angle twisted bilayer graphene*. **María José Calderón**, E. Bascones.

11:10-11:30 *Evidence of weakly dispersive bands in twisted bilayer graphene from nano-ARPES*. **Simone Lisi**, X. Lu, T. Benschop, T. A. de Jong, P. Stepanov, J. R. Duran, Fl. Margot, I. Cucchi, E. Cappelli, A. Hunter, A. Tamai, V. Kandyba, A. Giampietri, A. Barinov, Johannes Jobst, Vincent Stalman, M. Leeuwenhoek, K. Watanabe, T. Taniguchi, L. Rademaker, S. J. van der Molen, M. Allan, D. K. Efetov, F. Baumberger.

11:30-11:50 *Marginal Fermi liquid in twisted bilayer graphene* **José González**, T. Stauber.

11:50-12:10 *Inconmensurability induced sub-ballistic states in twisted bilayer graphene*. **Miguel de Jesús Mestre Gonçalves**, H. Z. Olyaei1, B. Amorim, R. Mondaini, P. Ribeiro, E. V. Castro.

12:10-12:30 *Strain induced excitonic instability in twisted bilayer graphene*. **Héctor Ochoa**.

Special sessions Wednesday Afternoon.

Zoom host: Maria José Cladерón.

Posters

1. *Electronic compressibility of Magic Angle Twisted Bilayer Graphene*. **Alejandro Jimeno**, F. Guinea.
2. *Normal and Andreev transport in Magic Angle Graphene Junctions*. **Miguel Alvarado Herrero**, A. Levy-Yeyati.
3. *Valley spirals in magnetically encapsulated twisted bilayer graphene*. **Tobías Wolf**, O. Zilberberg, G. Blatter, J. L. Lado.
4. *Conductivity of twisted bilayer graphene nanotubes with disorder*. **Héctor Sainz Cruz**, T. Cea, F. Guinea.
5. *Spin polarization in Twisted Transition Metal Dichalcogenides*. **Ignacio Vicent**, J. A. Silva-Guillén, F. Guinea.

Thursday, 03 September 2020

Zoom host: Maria José Cladерón.

9:30-10:10 *Moiré physics and symmetry breaking in magnetically encapsulated van der Waals structures*. **José Lado (invited)**.

10:10-10:30 *Twist angle homogeneity in twisted bilayer graphene devices studied with STM.* **Tjerk Benschop**, T. A. de Jong, V. Stalman, M. Leeuwenhoek, P. Stepanov, X. Lu, S. J. van der Molen, D. K. Efetov, M. P. Allan.

10:30-10:50 *Chirality in twisted bilayer graphene.* **Tobias Stauber**, J. González, G. Gómez-Santos.

10:50-11:10 *Topological excitons and bosonic fractional quantum Hall liquids in twisted bilayer graphene.* **Yves Kwan**, Y. Hu, S. H. Simon, and S. A. Parameswaran.

11:10-11:30 *Topological flat bands and correlated states in twisted monolayer-bilayer graphene.* **Louk Rademaker**, I. Protopopov, D. Abanin.

11:30-11:50 *Double superlattices and supercurrent measurements in graphene/hBN superlattices.* **Peter Makk**, D. Indolese, L. Wang, S. Zihlmann, R. Delangrange, A. Baumgartner and Ch. Schönenberger.

11:50-12:10 *Atomic scale structure and broken symmetries in twisted double bilayer graphene.* **Carmen Rubio Verdú**, S. Turkel, L. Song, L. Klebl, D. M. Kennes, L. Xian, H. Ochoa, K. Watanabe, T. Taniguchi, Á. Rubio, A. N. Pasupathy.

12:10-12:30 *Floquet engineering of twisted double bilayer graphene.* **Martín Rodríguez Vega**, M. Vogl, G.A. Fiete.

Friday, 04 September 2020

Zoom host: Maria José Cladérón.

9:30-10:10 *Correlated electrons in a moiré superlattice probed with optical spectroscopy.* Yuya Shimazaki (invited), I. Schwartz, K. Watanabe, T. Taniguchi, M. Kroner, A. Imamoglu.

10:10-10:30 *Flatbands in twisted transition metal dichalcogenides.* José Ángel Silva Guillén, Z. Zhan, Y. Zhang, G. Yu, F. Guinea, S. Yuan.

10:30-10:50 *Flatbands in transition metal dichalcogenides –when and why do we have them.* Priya Mahadevan, S. Patra, P. Kumari.

10:50-11:10 *Twisted nano-optics: Manipulating light at the Nanoscale with Twisted Polaritonics Slabs.* Jiahua Duan, N. Capote-Robayna, J. Taboada-Gutiérrez, G. Álvarez-Pérez, I. Prieto, J. Martín-Sánchez, A. Y. Nikitin, P. Alonso-González.

11:10-11:30 *Simulating twistronics with ultra-cold atoms.* Alejandro González Tudela, J.I. Cirac.

11:30-11:50 *Dirac node engineering and flat bands in doped Dirac materials.* Anna Pertsova, S P. Johnson, D. Arovas, A. V. Balatsky.

11:50-12:10 *Domain walls in twisted bilayer graphene.* Glenn Wagner, Y. Kwan, N. Chakraborty, S. Simon, S. Parameswaran

12:10-12:30 *Deconfinement of Mott Localized Electrons into Topological and Spin-Orbit Coupled Dirac Fermions.* José Pizarro, S. Adler, K. Zantout, T. Mertz, P. Barone, R. Valenti, G. Sangiovanni, T.O. Wehling.

CMD2020GEFES mini-colloquium

Focused Ion Beam Induced Processing

Rosa Cordoba, Patrick Philipp, Gregor Hlawacek

Focused ion beam technologies have revolutionized the material science research and technology. It has offered novel possibilities for material imaging, analysis, modification and fabrication with high spatial resolution by mainly using gallium, neon and helium ions.
For decades focused ion beam induced processing was focused on conventionally utilized Ga+ liquid ion source, and since the last decade it got much attention with the higher resolution gas field ion sources such as Ne+ and He+ and the high -current plasma FIB operated with Xe+ or other gases. In the last few years, several experimental and theoretical approaches have been developed and implemented in the area, such as deposition, etching and sputtering to broaden the applications of focused ion beam induced processing.

This mini-colloquium aims to provide an in-depth overview on the current status of Focused Ion Beam Induced Processing, which includes experimental and theoretical contributions on FIB imaging, analysis through mass spectroscopy and, modification and nanofabrication through FIB-induced irradiation, milling, sputtering or deposition.

Some examples of its applications are:
- Imaging: for high-quality imaging of small objects, for obtaining crystallographic information, for high resolution and chemical contrasts, for imaging biological samples.
- Analysis: elemental composition on the nm scale through backscattering spectrometry, high resolution and sensitivity through secondary ion mass spectrometry.
- Modification and nanofabrication: the material modification by focused ion beam such as the tuning of material properties by irradiation, material removal by milling and sputtering and, material addition by deposition. Particularly, they include the modification of materials properties by low ion fluences, the nanolithography of metals, superconductors and magnets, fabrication of nanopore devices for biomolecule analysis, the deposition of in-plane and out-of-plane nanostructures with metallic, magnetic or superconducting properties, etc.

Monday, 31 August 2020

Zoom host: Jose María De Teresa.

9:30-10:10 *Focused Ion Beam Induced Deposition using Helium, Neon and Gallium Ions*. **Frances I. Allen (invited)**.

10:10-10:30 *Superconducting properties of in-plane W-C nanowires grown by He+ Focused Ion Beam Induced Deposition*. **Pablo Orús**, Rosa Córdoba, Gregor Hlawacek and José María De Teresa.

10:30-10:50 *Detailed simulations of the focused beam induced deposition process obtained by combining Monte Carlo and molecular dynamics techniques.* **P. de Vera**, M.Azzolini, M. Dapor, G. Sushko, I. A. Solov'yov, A. V. Solov'yov, I. Abril, and R. Garcia-Molina.

10:50-11:10 *Layer-by-layer printing of Three-dimensional Nanostructures with Focused Electron Beams*. **L. Skoric**, D. Sanz-Hernández, F. Meng, C. Donnelly, A. Fernández-Pacheco.

11:10-11:30 *Advanced analytical capabilities on FIB instruments using SIMS: current instrumentation development and prospects*. **H.Q. Hoang**, O. De Castro, A. Biesemeie, J.-N. Audinot, T. Wirtz.

11:30-11:50 *Secondary ion mass spectrometry on focused ion beam instruments: analysis of materials for energy conversion applications*. **J. –N. Audinot**, J. Usiobo, O. De Castro, H.Q. Hoang and T. Wirtz.

11:50-12:10 *Spatial resolution of FIB SIMS: The influence of primary ion beam type and analytical settings*. **Lex Pillatsch**, James A Whitby, Ivo Utke, Johann Michler.

12:10-12:30 *Scanning transmission imaging in the helium ion microscope with a position sensitive detector*. **E. Serralta**, N. Klingner, O. De Castro, M. Mousley, A. Biesemeier, C. Bebeacua, S. Eswara, S. Duarte Pinto, T. Wirtz, G. Hlawacek.

Tuesday, 01 September 2020.

Zoom host: Jose María De Teresa.

9:30-10:10 *Fabrication of nano- and mesoscopic plasmonic structures using a He-ion microscope-based sketch and peel technique*. **Martin Silies (invited)**, Moritz Gittinger, Sven Stephan, Vladimir Smirnov, Katja Höflich, Michael Westphal, Andre Beyer, Armin Gölzhäuser, Christoph Lienau.

10:10-10:30 *In-situ characterization of MoS2 based field effect transistors during ion irradiation*. **Gregor Hlawacek**, Zahra Fekri, Panish Chava, Artur Erbe.

10:30-10:50 *Automated patterning of two-dimensional materials with He ions*. **Victor Deinhart**, Jan N. Kirchhof, Lisa-Marie Kern, Oisin Garrity, Sabrina Jürgensen, Enno Krauss, Thorsten Feichtner, Dieter Engel, Joris Sturm, Sviatislav Kovalchuk, Bert Hecht, Kirill Bolotin, Bastian Pfau, Stephanie Reich, Katja Höflich.

10:50-11:10 *Nanoscale vortex pinning structures created in thin films of YBa2Cu3O7-δ using a helium ion microscope*. **B. Aichner**, B. Müller, M. Karrer, V. R. Misko, F. Limberger, K. L. Mletschnig, M. Dosmailov, J. D. Pedarnig, F. Nori, R. Kleiner, D. Koelle, W. Lang.

11:10-11:30 *Basic Approaches for 3D-FIB Processing and Nano-analysis of Rubber Compounds*. **Meltem Sezen**, Güralp Özkoç.

11:30-11:50 *Application of FIB for isolation of defects in monocrystalline solar cells*. Pavel Škarvada, Adam Gajdoš, Nikola Papež, **Dinara Sobola**.

11:50-12:10 *Nanoparticle shape modification with low energy ion irradiation*.**Shiva Choupanian**, Alessandro Nagel, Claudia Pacholski, Carsten Ronning.

12:10-12:30 *Nanofabrication by means of focused helium ion beam based on defect engineering*. **Yu.V. Petrov**, E.A. Grigoyev, T.V. Sharov, E.V. Ubiyvovk, A.P. Baraban, O.F. Vyvenko.

Special sessions Tuesday Afternoon

Zoom host: Jose María De Teresa. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Hybrid Superconducting Nanowires Single-Photon Detectors*. **Cristina García-Pérez,** Víctor Marzoa, Marina C. De Ory, María Acebrón, Julia García-Pérez, María Teresa Magaz, Fernando J Urbanos, Alicia Gómez, Ramón Bernardo-Gavito, Daniel Granados.

Posters

1. *Reactive Force field simulations on the influence of contaminations on silicon surfaces under argon irradiation*. **Grégoire Defoort**, Patrick Philipp, Alan Bahm.
2. *Fabrication of ordered magnetic nanostructures with focused helium ion beam*. **Yu.V. Petrov**, S.A. Gusev, A.L. Chuvilin,D.A. Tatarskiy, M.V. Sapozhnikov, V.Yu. Mikhailovskii.
3. *Focused Focused ion beam using a rubidium cold-atom ion source ion beam using a rubidium cold-atom ion source*. Sheng Xu, Yang Li, Peter Mutsaers, and **Edgar Vredenbregt**
4. *Cryo and room temperature Focused Ion Beam nanoprocessing of topological insulators*. **Rubén Gracia-Abad**, Chiara Bigi, Soraya Sangiao, Pasquale Orgiani, José María de Teresa.
5. *Nanofabrication by means of selective chemical etching enhanced by irradiation with a focused helium ion beam*. **E. A. Grigoryev**, Yu. V. Petrov, A. P. Baraban.

CMD2020GEFES mini-colloquium

High Resolution SPM on Low Dimensional Materials

Antonio Javier Martínez Galera, José María Gómez Rodríguez,
Bruno de la Torre Cerdeño, Martin Svec

The advent of Nanotechnology and its establishment as a top priority research area, implied an increasingly growing interest in the production, characterization and modification of low dimensional systems. Nanomaterials as molecular systems, nanoparticles, 1D structures, as well as, the members of the 2D materials family provide a platform for the study of new intriguing physical and chemical phenomena and are proposed for future applications in a broad range of fields, being some of these low dimensional elements already present in available products. The origin of Nanoscience and Nanotechnology, which, in turn, implied the starting point of the current huge interest in the study of low dimensional systems, was linked to the invention, in the 1980's, of the Scanning Probe Microscopies, which allow the characterization of nanoscale systems with unprecedented resolution, as well as, their manipulation with an exceptional level of accuracy. Today, the development of Nanoscience and Nanotechnology is linked, to a great extent, to the extensive use of Scanning Probe Microscopies.

The study of the underlying physics and chemistry behind the adsorption and/or formation of nanostructures on surfaces is, currently, one of the major research lines in the field of nanoscience. Characterizing and understanding the physical and chemical properties of these nanostructures is also crucial for a successful future application in nanoscale devices. This mini-colloquium is focused on the most recent advances achieved by high resolution Scanning Probe Microscopes on nanostructures on surfaces. Adsorption of atoms and molecules as well as the formation of clusters, supramolecular networks and 1D structures on metal surfaces and on 2D materials will be discussed from both experimental and first-principles simulation points of view.

Tuesday, 01 September 2020

Zoom host: Agustina Asenjo.

9:30-10:10 *Advanced scanning probe microscopy of low-dimensional molecular systems revealing exotic quantum states*. **Pavel Jelínek (invited)**.

10:10-10:50 *Quantitative determination of atomic buckling of silicene by atomic force microscopy*. Rémy Pawlak, Carl Dreschler, Philipp D'Astolfo, Marcin Kisiel, Ernst Meyer and **Jorge Iribas Cerdá (invited)**.

10:50-11:10 *Two Dimensional Sublattice Melting and Charge-Order Transition in K/Sn/Si(111)*. Tyler S. Smith, Fangfei Ming, Daniel G. Trabada, César González, Diego Soler-Polo, Fernando Flores, **José Ortega** and Hanno H. Weitering.

11:10-11:30 *Mechano-optical switching of a single molecule with doublet emission*. Jiří Doležal, Pingo Mutombo, Dana Nachtigallová, Pavel Jelínek, **Pablo Merino** and Martin Švec.

11:30-11:50 *Engineering carbon magnetism in nanographenes*. **Shantanu Mishra**, Doreen Beyer, Kristjan Eimre, Ricardo Ortiz, Shawulienu Kezilebieke, Joaquín Fernández-Rossier, Peter Liljeroth, Reinhard Berger, Xinliang Feng, Oliver Gröning, Carlo A. Pignedoli, Pascal Ruffieux and Roman Fasel.

11:50-12:10 *Utilising alkyne and halogen-based coupling strategies to study pyrene linkages at surfaces*. **James Lawrence**, Mohammed S. G. Mohammed, Alejandro Berdonces-Layunta, Dulce Rey, Diego Peña, Dimas G. de Oteyza.

12:10-12:30 *Chemical Identification with nc-AFM of Xenon on Graphene*. **Mariano D. Jiménez-Sánchez,** Nicoleta Nicoara and José M. Gómez-Rodríguez.

Special sessions Tuesday Afternoon

Zoom host: Agustina Asenjo. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Length dependent symmetry in narrow chevron-like graphene nanoribbons*. **Koen Houtsma,** Mihaela Enache, Remco Havenith and Meike Stöhr.
2. *Fusion of alkyl groups into phenyl rings: a new on-surface reaction*. **Amogh Kinikar,** Marco Di Giovannantonio, Carlo Pignedoli, Josè Ignacio Urgel, Kristjan Eimre, Xiao-Ye Wang, Zijie Qiu, Akimitsu Narita, Klaus Müllen, Pascal Ruffieux and Roman Fasel.
3. *Molecular recognition in C60 on h-BN*. **Haojie Guo,** Antonio J. Martínez-Galera, José M. Gómez-Rodríguez.

Posters

1. *Ultra-thin NiBr2 films on Au(111)*. **Djuro Bikaljevic,** Maxim Ilyn, Niklas Friedrich, Jingcheng Li, Celia Rogero and Nacho Pascual.
2. *A study on topological order and π-conjugation in 1D quasi-metallic polymers*. Borja Cirera, Ana Sánchez-Grande, Bruno de la Torre, José Santos, **Shayan Edalatmanesh**, Eider Rodríguez-Sánchez, Koen Lauwaet, Benjamin Mallada, Radek Zbořil, Rodolfo Miranda, Oliver Gröning, Pavel Jelínek, Nazario Martín and David Écija.

CMD2020GEFES mini-colloquium

High-Order Harmonic Generation in Solids

Fernando Sols, Marcelo Ciappina, Dieter Bauer

In recent years, high-order harmonic in solids has been studied intensively. Different from gas-based HHG, which can be well described by the classical three-step model (electron ejection, acceleration, and recombination), the generation mechanism of HHG in solids becomes much more complex involving inter- and intra-band electronic dynamics. Therefore, the classical three-step model is no longer well-suited since both the electron and hole dynamics within the entire Brillouin zone of the crystal needs to be considered. Practically, HHG in solids exhibits distinct features compared to that in gases. For instance, the HHG spectrum is sensitive to the crystal symmetry and band structure, which allows the appearance of even-order harmonic emission and permits the reconstruction of the band structure from the measured results. And since the bandgap of solids is much smaller than the ionization potential in noble gas atoms, HHG can be observed at lower laser pulse energies. Another important feature of solids is the presence of electron interactions, whose effect has begun to be studied only recently and which is expected to yield interesting connections with the field of plasmonics. Thus, HHG in solids is a vibrant emerging field where new concepts and techniques converge from areas as different as atomic physics, condensed matter and nonlinear dynamics.

Monday, 31 August 2020

Zoom host: Mariela Menghini.

9:30-10:10 *Probing and generating high harmonics with electron beams*. **Javier Garc a de Abajo (invited)**.

10:10-10:50 *High harmonic spectroscopy of strongly correlated and topological materials*. **Rui Emanuel Ferreira da Silva (invited)**.

10:50-11:10 *Macroscopic high harmonic generation in single-layer graphene dominated by a phase-matched ring*. **Roberto Boyero-García**, Óscar Zurrón-Cifuentes, Luis Plaja, Carlos Hernández-García.

11:10-11:30 *Strong-field-driven dynamics and high-harmonic generation in interacting one dimensional systems*. **Joel D. Cox**, Sandra de Vega, Fernando Sols, F. Javier García de Abajo.

11:30-11:50 *Lightwave topology for strong-field valleytronics: inducing, controlling and reading the valley pseudospin on a sub-laser-cycle timescale*. **Á. Jiménez-Galán**, Rui E.F. Silva, O. Smirnova, M. Ivanov.

11:50-12:10 *Helicity flip of harmonics from finite and infinite topological nanoribbons*. **Christoph Jürß**, Daniel Moos, Dieter Bauer.

12:10-12:30 *Cluster approach to attosecond photoelectron emission from dichalcogenides*. **Marcelo J. Ambrosio**, Etienne Plesiat, Piero Decleva, Pedro M. Echenique, Ricardo Díez Muiño, Fernando Martín.

Special sessions Monday Afternoon

Zoom host: Pablo Molina. Poster videos on YouTube.

Posters

1. *A comprehensive study of momentum matrix elements for Bloch states using a local orbital basis*. **J. J. Esteve-Paredes**, J. J. Palacios.
2. *Low order harmonics of an organic polymer*. **Franziska Fennel,** Stefan Lochbrunner.
3. *Beyond-Fröhlich theory of large polarons in anharmonic solids*. **Matthew Houtput**, Jacques Tempere.
4. *Effects of tunnel ionization on non-linear response of solids*. **Benjamin Liewehr**, Steven Lormuß, Thomas Fennel.
5. *Theory of high-harmonic generation in topological insulators*. **Daniel Moos**, Christoph Jürß, Dieter Bauer.
6. *High-energy mid-IR strong-field source for high-order harmonic generation in solids*. **Aditya Pusala**, Prabhash Prasannan Geetha, Davide Faccialà, Mikayel Musheghyan, Gabriele Crippa, Anna G. Ciriolo, Michele Devetta, Andreas Assion, Eugenio Cinquanta, Salvatore Stagira, Caterina Vozzi.
7. *Frequency Upconversion of Quadruple-Gaussian Laser Beams by Excitation of Overtones in InSb with Linearly Increasing Doping Profile*. **Naveen Gupta**.

Tuesday, 01 September 2020

Zoom host: Mariela Menghini.

9:30-10:10 *Attosecond metrology of phase-coherent multi-PHz currents in bulk solid.* **Manish Garg (invited)**, M. Zhan, H.Y. Kim, H. Lakhotia, E. Goulielmakis.

10:10-10:30 *Origin of strong-field-induced low-order harmonic generation in amorphous quartz.* P. Jürgens, B. Liewehr, B. Kruse, C. Peltz, D. Engel, A. Husakou, T. Witting, M. Ivanov, M. J. J. Vrakking, **T. Fennel**, A. Mermillod-Blondin.

10:30-10:50 *Attosecond transient absorption spectroscopy in condensed matter systems.* **G. Cistaro**, L. Plaja, F. Martín, A. Picón.

10:50-11:10 *High order harmonic generation spectroscopy of ZnTe.* **Davide Faccialà**, Aditya Pusala, Prabhash Prasannan Geetha, Mikayel Musheghyan, Gabriele Crippa, Anna G. Ciriolo, Michele Devetta, Andreas Assion, Eugenio Cinquanta, Caterina Vozzi, Salvatore Stagira.

11:10-11:30 *Signatures of electronic Talbot revivals in HHG from a one-dimensional crystal.* **Ana García-Cabrera**, Carlos Hernández-García, Luis Plaja.

11:30-11:50 *Following Phonon Dynamics in Solids Using High-Harmonic Spectroscopy.* **T. T. Luu**, F. Lengers, M. Molitor, D. Wigger, D. E. Reiter, T. Kuhn, H. J. Wörner.

11:50-12:10 *Ab initio study of high-order harmonics and isolated attosecond pulses from a solid target.* **Zahra Nourbakhsh**, Nicolas Tancogne-Dejean, Oliver D. Mücke, Hamed, Merdji, Angel Rubio.

12:10-12:30 *Mechanism for high-order harmonic generation in graphene and carbon nanotubes.* **Óscar Zurrón-Cifuentes**, Roberto Boyero-García, Carlos Hernández-García, Antonio Picón, Luis Plaja.

CMD2020GEFES mini-colloquium

Hybrid Semiconductor-Superconducting Nanostructures: From Andreev to Majorana Bound States

Ramón Aguado, Attila Geresdi, Alfredo Levy-Yeyati, Elsa Prada

In superconducting materials, electrons form Cooper pairs, whose condensate can be described by a single order parameter, also called pair potential. The amplitude of this complex order parameter, the superconducting gap Δ, determines the lowest energy level that a single electron can occupy in a bulk, homogeneous superconductor, whereas the phase plays an important role when describing the transport of Cooper pairs through weak links, where the pairing potential changes, or even vanishes. In this case, single electron states can develop below the gap that are localized to the weak link. Collectively, these subgap states are called Andreev bound states (ABSs) and are in the focus of theoretical and experimental efforts owing to their fundamental importance in describing nanoscale superconductivity, and to their technical relevance as the basis of emerging quantum technologies.

Because ABSs host single, unpaired electrons, both the charge and the spin degree of freedom can store quantum information while strongly couple to the embedding superconducting circuit, providing new avenues for quantum information processing. This interplay can also be investigated in quantum dots embedded in superconducting circuits, where Yu-Shiba-Rusinov states emerge and lead to a flexible platform of analog quantum simulations.

Furthermore, a new kind of ABS with exotic properties has been recently discovered in engineered topological superconductors consisting of semiconductor channels proximitized with superconducting contacts. These states are known as Majorana bound states (MBSs) and their first experimental signatures were reported in 2012. The MBSs are localized zero-energy excitations protected by the topology of a superconducting bulk. Owing to this protection, together with their non-Abelian braiding statistics, they form the basis of topologically protected quantum computing. This prospect has spurred a great deal of efforts in recent years towards their creation and manipulation in various solid-state platforms, including semiconductor nanowires, planar heterostructures and quantum dot chains.

In this Mini-colloquium we will bring together key international players in the field and engage in a synergetic discussion on theoretical developments, experimental efforts and materials science. The focus of the colloquium will be on hybrid semiconductor-superconducting nanostructures, which is the most investigated platform for ABSs and MBSs. We will discuss recent advances on different relevant aspects, future challenges, etc.

Monday, 31 August 2020

Zoom host: Ramón Aguado.

9:30-10:10 *Epitaxy of hybrid quantum crystals*. **Peter Krogstrup (invited)**.

10:10-10:30 *Fabless semiconducting-superconducting nanowire devices*. **Francesco Borsoi**, Grzegorz P. Mazur, Nick van Loo, Michał P. Nowak, Léo Bourdet, Kongyi Li, Svetlana Korneychuk, Alexandra Fursina, Elvedin Memisevic, Ghada Badawy, Sasa Gazibegovic, Kevin van Hoogdalem, Erik P. A. M. Bakkers, Leo P. Kouwenhoven, Sebastian Heedt, and Marina Quintero-Pérez.

10:30-10:50 *Shadow Epitaxy for In Situ Growth of Generic Semiconductor/Superconductor Hybrids* **Damon J. Carrad**, Martin Bjergfelt, Thomas Kanne, Martin Aagesen, Filip Krizek, Elisabetta M. Fiordaliso, Erik Johnson, Jesper Nygård, and Thomas Sand Jespersen.

10:50-11:10 *Hybrid devices made of epitaxial Pb on InAs nanowires*.

Kasper Grove-Rasmussen, Thomas Kanne, Mikelis Marnauza , Dags Olsteins , Damon J. Carrad, Joachim E. Sestoft , Joeri de Bruijckere , Lunjie Zeng , Erik Johnson, Eva Olsson , Kasper Grove-Rasmussen, and Jesper Nygård.

11:10-11:30 *A gate-tunable, field-compatible fluxonium*. **Marta Pita-Vidal,** Arno Bargerbos, Chung-Kai Yang, David J. van Woerkom, Wolfgang Pfaff, Nadia Haide, Peter Krogstrup, Leo P. Kouwenhoven, Gijs de Lange, and Angela Kou.

11:30-11:50 *Implementation of an Inhomogeneous Large Spin-orbit Interaction at the Nanoscale* **M. R. Delbecq**, L. C. Contamin , T. Cubaynes , M. M. Desjardins , M. C. Dartialh , S. Rohart , A. Thiaville, Z. Legthas , A. Cottet , and T. Kontos.

11:50-12:10 *Anisotropic vortex inductance as a probe of unconventional Cooper pairing in epitaxial two-dimensional Al/InAs heterostructures* **L. Fuchs,** C. Baumgartner, Simon Reinhardt, S. Gronin, G. Gardner, M. J. Manfra , N. Paradiso and C. Strunk.

12:10-12:30 *Magneto conductance of topological junctions based on two-dimensional electron gases reveals Majorana phases* **Llorens Serra** and Kaveh Delfanazari.

12:30-13:10 *Progress in realizing topological superconductivity in planar Josephson junctions* **Javad Shabani (invited)**.

Tuesday, 01 September 2020

Zoom host: Ramón Aguado.

9:30-10:10 *Flux-tunable Andreev bound states in hybrid full-shell nanowires*. **Giorgos Katsaros (invited)**, Marco Valentini, Fernando Peñaranda, Andrea Hofmann, Matthias Brauns, Robert Hauschild, Peter Krogstrup, Pablo San-Jose, Elsa Prada, Ramón Aguado.

10:10-10:30 *Flux-tunable Andreev bound states in hybrid full-shell nanowires: Theory*. **Fernando Peñaranda,** Marco Valentini, Fernando Peñaranda, Andrea Hofmann, Matthias Brauns, Robert Hauschild, Peter Krogstrup, Pablo San-Jose, Elsa Prada, Ramón Aguado and Giorgos Katsaros.

10:30-10:50 *Spectroscopy of the superconducting proximity effect in semiconducting nanowires using deterministic integrated quantum dots.* **C. Schönenberger,** C. Jünger, S. F. Thomas, R. Delagrange, D. Chevallier, L. Gubser, G. Fülöp, M. Nilsson, S. Lehmann, K.A. Dick, C. Thelander, F. Rossi, V. Zannier, L. Sorba, J. Klinovaja, D. Loss, and A. Baumgartner.

10:50-11:10 *Temperature induced shifts of Yu-Shiba-Rusinov resonances in nanowire- based hybrid quantum dots.* **Juan Carlos Estrada Saldaña**, Alexandros Vekris, Victoria Sosnovtseva, Thomas Kanne, Peter Krogstrup, Kasper Grove-Rasmussen, and Jesper Nygård.

11:10-11:30 *Topologically nontrivial Andreev bound states*. **Pasquale Marra**, Muneto Nitta

11:30-11:50 *Non-Abelian dynamics in the presence of a quantum cavity field.* **Mircea Trif,** Pascal Simon , Marcin Wysokinski , Marcin Plodzien.

11:50-12:10 *Circuit QED beyond the Jaynes-Cummings model.* **S. Park**, C. Metzger, L. Tosi, M. F. Goffman, C. Urbina, H. Pothier, A. Levy Yeyati.

12:10-12:30 *Circuit-QED with phase-biased Josephson weak links*. **C. Metzger,** S. Park, L. Tosi, M. F. Goffman, C. Urbina, H. Pothier, and A. Levy Yeyati.

12:30-12:50 *Realization of an Andreev spin qubit 1*. **M. Hays,** V. Fatemi, K. Serniak, D. Bouman, S. Diamond, G. de Lange, P. Krogstrup, J. Nygård, A. Geresdi, M. H. Devoret.

12:50-13:10 *Realization of an Andreev spin qubit 2*. **V. Fatemi**, M. Hays, K. Serniak, D. Bouman, S. Diamond, G. de Lange, P. Krogstrup, J. Nygård, A. Geresdi, M. H. Devoret.

Special sessions Tuesday Afternoon

Zoom host: Ramón Aguado. Pre-recorded talks and posters on YouTube.

Pre-recorded talks

1. Vanishing charge dispersions in nanowire-based transmons **Angela Kou (invited, Department of Physics, University of Illinois at Urbana-Champaign)**, Arno Bargerbos, Willemijn, Uilhoorn, Chung-Kai Yang, Peter Krogstrup, Leo P. Kouwenhoven, Gijs de Lange, Bernard van Heck.
2. From Andreev to Majorana bound states in hybrid superconductor- semiconductor nanowires, **Elsa Prada**, Pablo San-Jose , Michiel W. A. de Moor, Attila Geresdi, Eduardo J. H. Lee , Jelena Klinovaja, Daniel Loss, Jesper Nyg˚ard, Ram n Aguado, Leo P. Kouwenhoven.
3. Nonequilibrium interplay between Andreev bound states and Kondo effect. **Fanming Qu** Jiangbo He, Dong Pan , Guang Yang , Mingli Liu , Jianghua Ying , Zhaozheng Lyu , Jie Fan, Xiunian Jing , Guangtong Liu , Bo Lu , Dong E. Liu , Jianhua Zhao, Li Lu , Fanming Qu.
4. Differentiating Majorana from Andreev Bound States in a superconducting Circuit, **Konstantin Yavilberg**, Eytan Grosfeld and Eran Ginossar.
5. Majorana oscillations and parity crossings in semiconductor-nanowire-based transmon qubits, **J. Ávila**, E. Prada, P. San-Jose, R. Aguado.
6. Josephson inductance of highly ballistic semiconductor-superconductor weak links, **C. Baumgartner**, L. Fuchs, Linus Frész, Simon Reinhardt, S. Gronin, G. Gardner, M. J. Manfra, N. Paradiso and C. Strunk.

Wednesday, 02 September 2020

Zoom host: Ramón Aguado.

9:30-10:10 *Topological superconductivity in carbon nanotubes with a small magnetic flux.* **Yuval Oreg (invited)**, Omri Lesser, Gal Shavit.

10:10-10:30 *Majorana Bound States in Semiconductor/Ferromagnetic insulator/Superconductor nanowire heterostructures*. **Samuel D. Escribano,** Alfredo Levy Yeyati, Yuval Oreg , and Elsa Prada.

10:30-10:50 *Probing Majorana bound states with an optical quantum dot.* **Lena Bittermann,** Daniel Frombach, Christophe De Beule, Patrik Recher.

10:50-11:10 *Revealing non-abelian statistics of Majorana bound states using charge- transfer based operations*. **R. Seoane Souto ,** Karsten Flensberg and M. Leijnse.

11:10-11:30 *Parity-to-charge conversion for readout of topological Majorana qubits*. **Gábor Széchenyi**, András Pályi.

11:30-11:50 *Giant Shot Noise from Majorana Zero Modes in Topological Trijunctions.* **T. Jonckheere,** J. Rech, A. Zazunov, R. Egger, A. Levy Yeyati, and T. Martin.

11:50-12:10 *Josephson current via an isolated Majorana zero mode.* **Chun-Xiao Liu,** Bernard van Heck , Michael Wimmer.

12:10-12:30 *Gap inversion in 1D Andreev crystals*. **Mikel Rouco**, Ilya V. Tokatly, and F. Sebastian Bergeret.

12:30-13:10 *Physics, Materials Science and Engineering of Majorana Circuits*. **Sergey Frolov (invited).**

Special sessions Wednesday Afternoon

Zoom host: Ramón Aguado. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Microwave response of a graphene Josephson junction,* **Roy Haller**, David Indolese, Rainer Kraft, Gergő Fülöp, Romain Danneau, Christian Schönenberger.
2. *1/f critical current noise in short ballistic graphene Josephson junctions* **Elisabetta Paladino**, Francesco M.D. Pellegrino, Giuseppe Falci.
3. *Dynamically Induced Topology and Quantum Monodromies in a Proximity Quenched Gapless Wire*, **D. Dahan**, E. Grosfeld, and B. Seradjeh.
4. *Charge noise and overdrive errors in reflectometry-based Majorana qubit readout*, **Vahid Derakhshan Maman,** M. F. Gonzalez-Zalba, Andras Palyi.
5. *Long-ranged propagation and interference of d-wave superconducting pairs in graphene* D. Perconte, K. Seurre, V. Humbert, C. Ulysse, A. Sander, J. Trastoy, V. Zatko, F. Godel, P. R. Kidambi, S. Hofmann, X. P. Zhang, D. Bercioux, F. S. Bergeret, B. Dlubak, P. Seneor and Javier E. Villegas.
6. *Triplet blockade in a Josephson junction with a double quantum dot,* **Dávid Pataki**, Gorm Steffensen , Daniël Bouman, Péter Boross, Jens Paaske, Attila Geresdi, András Pályi.

Posters

1. *Boundary Green functions for spinful and multichannel Majorana nanowires,* **M. Alvarado**, A. Iks, A. Zazunov, R. Egger and A. Levy Yeyati.
2. *Even-odd effect and Majorana states in full-shell nanowires,* **Fernando Peñaranda**, Ramón Aguado, Pablo San-Jose, Elsa Prada.
3. *Josephson junctions in in-situ grown superconductor-double-nanowires*, **Alexandros Vekris**, Juan Carlos Estrada Saldaña, Thor Hvid-Olsen,Thomas Kanne, Mi elis Marnauza , Dags Olsteins , Jesper Nygård, Kasper Grove-Rasmussen.
4. *Vortices in Odd-Frequency Superconducting Condensates*, **Eirik Holm Fyhn**, Jacob Linder.
5. *Yu-Shiba-Rusinov states of single magnetic molecule in an s−wave superconductor*, **Saurabh Pradhan**, Jonas Fransson.
6. *Self-consistent solution for the magnetic exchange interaction mediated by a superconductor,* **Atousa Ghanbari,** Vetle Risinggård , Jacob Linder.

CMD2020GEFES mini-colloquium

Iontronics and the Field Effect Control of Semiconductor Nanodevices

Francesco Rossella, Carlos León

The electrostatic control of semiconductor nanodevices by exploiting the field effect is ubiquitous in nanoscience and technology and traditionally follows the metal-oxide-semiconductor approach. A novel route implies a true paradigm change and envisions the use of soft-matter as the gate medium for applying impressively high static electric fields to semiconductors. This method exploits the way of iontronics to electrostatic gating, using the movement and spatial organization of ions to build up an electric double layer that is the ultimate responsible for the gating action.

Iontronics targets the control of electrical properties and functionality of electronic devices by exploiting ionic motion and arrangement, and represents an interdisciplinary field encompassing electrochemistry, solid-state physics, energy storage, electronics, and biological sciences. A key element driving the functionality of iontronic devices is the electric double layer formed at the interface between an (electronically insulating) ionic conductor and an electronic conductor, e.g., an inorganic semiconductor.

In this context, the use of ionic liquids (ILs, salts in the liquid state at 300 K) for the realization of EDL transistors (EDLTs) was shown to yield very high local electric fields and efficient carrier-density modulation, and was recently applied to nanomaterials including 2D systems (graphene, layered TMDs) as well as quasi-1D systems (nanowires, nanotubes). Unprecedented gating efficiency and gate-induced change of the temperature behavior in semiconductor nanodevices have been reported; the IL dynamics in nanodevices has been investigated with atomistic simulations, correlating the transport features to the microscopic parameters of the soft-matter system. Innovative device architectures were envisioned, exploiting the electric double layer gating for thermal management and energy harvesting at the nanoscale. This mini-colloquium aims at presenting the most recent results achieved by the interdisciplinary community working on nanoscale EDLTs.

Monday, 31 August 2020

Zoom host: Dolores Martín.

9:30-10:10 *Integrated Proton-gated Bioelectronic Circuits using Nanowires and Nanoscale Patterned Ion-gating Elements*. **Adam P. Micolich (invited)**, J.G. Gluschke, J. Seidl, R.W. Lyttleton, K. Nguyen, M. Lagier, F. Meyer, A.R. Ullah, D. Carrad, P. Krogstrup, J. Nygård, S. Lehmann, A.B. Mostert, P. Meredith

10:10-10:50 *Flexible, stretchable and healable electronics*.

Fabio Cicoira (invited).

10:50-11:10 *Mobility and carrier concentration in electrostatically doped InAs nanowires*. **Domenic Prete**, Valeria Demontis, Valentina Zannier, Maria Jesus Rodriguez-Douton, Lorenzo Guazzelli, Fabio Beltram, Lucia Sorba, Francesco Rossella.

11:10-11:50 *Development of iontronics: application for energy harvesters*. **Shimpei Ono (invited)**.

11:50-12:10 *Electrolyte gated nanowire field-effect transistors for advanced control of thermoelectric functionalities*. **Giovanni Pennelli**, Domenic Prete, Elisabetta Dimaggio, Valentina Zannier, Maria Jesus Rodriguez-Douton, Lorenzo Guazzelli, Fabio Beltram, Lucia Sorba, Francesco Rossella.

Tuesday, 01 September 2020

Zoom host: Dolores Martín.

09:30-10:10 *Quantum phase transition and Ising superconductivity in transition metal dichalcogenides*. **Jianting Ye (invited)**.

10:10-10:50 *Superconducting constrictions in ionic liquid-gated SrTiO_3*. **Evgeny Mikheev (invited)**, Ilan Rosen, David Goldhaber-Gordon.

10:50-11:10 *On the origin of emergent magnetism at the metal insulator transition in SrIrO_3 ultrathin films*. **Juan I. Beltrán**, F. Gallego, J. Tornos, A. Peralta, F. Mompean, Mar Garcia Hernandez, Carlos León, Jacobo Santamaría, Carmen Muñoz.

11:10-11:50 *Ionic-gate spectroscopy of 2D semiconductors*. **Ignacio Gutiérrez-Lezama (invited)**, Nicolas Ubrig, E. Ponomarev and Alberto F. Morpurgo.

11:50-12:10 *Gate-tunable ultrafast response of single-layer graphene with ionic liquid gating*. **E. A. A. Pogna**, A. Tomadin, O. Balci, G. Soavi, M. Guizzardi, P. Pedrinazzi, M. Polini, A.C. Ferrari, G. Cerullo.

12:10-12:30 *Development of high mobility graphene based field effect transistor for terahertz detection*. **Y.M. Meziani**, J. A. Delgado-Notario, V. Clericò, E. Diez, J. E. Velázquez-Pérez, T. Taniguchi, K. Watanabe, T. Otsuji.

CMD2020GEFES mini-colloquium

Magnetism and Correlations in 2D Materials in and out of Equilibrium

José J. Baldoví, Michael A. Sentef, Juan José Palacios

The recent discoveries of magnetism, superconductivity and correlated insulating states in 2D materials has spurred gigantic interest in the condensed matter community. Conversely, time-resolved spectroscopies have by now advanced to the point where ultrafast measurements and control of 2D materials properties are within reach. In this mini-colloquium, we will bring together a new generation of scientists bridging the two fields -2D materials and ultrafast phenomena- in order to highlight the fantastic potential that emanates from the combination of both research fields.

We will start with an invited overview talk on prospects of 2D materials, followed by invited talks on the light induced anomalous Hall effect in graphene measured by a cutting-edge ultrafast transport technique; on correlated states in Moiré systems investigated by scanning tunneling spectroscopy and theory; and on time-resolved band structures and dynamical correlations in 2D materials. These longer talks presenting recent research highlights, which have been published in high-profile journals, will be complemented by contributed talks and posters. This mini-colloquium is of interest for scientists working on 2D magnetism and quantum anomalous Hall effects, Floquet-engineered topological phases and non-equilibrium dynamics in atomically-thin materials, as well as correlated insulators and superconductors.

Everyone is aware of 2D magnetism and correlated 2D materials. Not everyone is aware of recent progress in ultrafast dynamics of correlations. The latter harbors such great potential (e.g., ultrafast memory devices, programmable quantum gates for quantum computing) that it would be a waste not to connect these fields and encourage especially PhD students to join the fun.

Monday, 31 August 2020

Zoom host: Jose Luis Fernández Cuñado.

9:30-10:10 *Magnetism in 2D materials: a long history with an attractive future*. **Efrén Navarro-Moratalla (invited)**.

10:10-10:50 *Light-induced anomalous Hall effect in graphene*. **James W. McIver (invited)**, B. Schulte, F.-U. Stein, T. Matsuyama, G. Jotzu, G. Meier and A. Cavalleri.

10:50-11:10 *Intrinsic 2D-XY ferromagnetism in a van der Waals monolayer*. **Amilcar Bedoya-Pinto**, J.-R. Ji, A. Pandeya, P. Gargiani, M. Valvidares, P. Sessi, F. Radu, K. Chang and S. Parkin.

11:10-11:30 *2D antiferromagnets: exploring inorganic and molecular thin-layers*. **Samuel Mañas-Valero** and E. Coronado.

11:30-11:50 *Exploring the quantum spin liquid 1T-TaS2 by van der Waals heterostructures*. **Carla Boix-Constant**, S. Mañas-Valero, R. Córdoba and E. Coronado.

11:50-12:10 *Magnetic correlations and time fluctuations in assemblies of Fe3O4 nanoparticles*. **Karine Chesnel**, J. Rackham, D. McPhearson, B. Newbold, D. Griner, D. Smith, M. Transtrum, R. Harrison, A. Reid and J. Kortright.

12:10-12:30 *Attosecond transient absorption in graphene*. **Antonio Picón**.

Tuesday, 01 September 2020

Zoom host: Jose Luis Fernández Cuñado.

9:30-10:10 *Non-equilibrium quantum matter on demand*. **Dante Kennes (invited)**.

10:10-10:50 *Ultrafast Light-Induced Lifshitz Transition.* **Ralph Ernstorfer (invited)**.

10:50-11:10 *Nonthermal interacting-magnon dynamics in an optically driven 2D Heisenberg antiferromagnet*. **Mona Kalthoff**, D. Kennes, A. Millis, M. Sentef.

11:10-11:30 *Collective modes in pumped unconventional superconductors with competing ground states*. **Marvin Müller**, P. A. Volkov, I. Paul and I. M. Eremin.

11:30-11:50 *Spectroscopic evidence for tuneable electon-magnon coupling in the surface ferromagnetic layer of Pd-terminated PdCoO2*. **Federico Mazzola**, V. Sunko, S. Khim, H. Rosner, P. Kushwaha, O. J. Clark, L. Bawden, I. Marković, T. K. Kim, M. Hoesch, A. P. MacKenzie and P. D. C. King.

11:50-12:10 *2D Materials in Strong Magnetic Fields: Hofstadter physics from first-principles*. **Vasil Rokaj**, M. Penz, M. Sentef, M. Ruggenthaler and A. Rubio.

12:10-12:30 *Crescent states in charge-imbalanced polariton condensates*. **Artem Strashko**, F. M. Marchetti, A. H. MacDonald, and J. M. J. Keeling.

Special sessions Tuesday Afternoon

Zoom host: Jose Luis Fernández Cuñado. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Chromium triiodide: The multiple magnetic phase ferromagnet*. **Jaume Meseguer-Sánchez**, D. A. Wahab, E. Navarro-Moratalla, G. Zurab and E. J. G. Santos.
2. *Charge density wave in monolayer 1T-TiTe2*. **Tommaso Antonelli**, W. Rahim, M. D. Watson, A. Rajan, D. O. Scanlon and P.D.C. King.
3. *Extremely imbalanced two-dimensional electron-hole-photon systems*. **Antonio Tiene**, J. Levinsen, M. M. Parish, A. H. MacDonald, J. Keeling and F. M. Marchetti.
4. *Excitons in 2D Topological Insulators: Study of Bi(111) bilayers*. **Alejandro José Uría Álvarez** and J. J. Palacios.
5. *Magnetic anisotropy and spin dynamics in the kagome magnet Fe4Si2Sn7O16: An NMR and magnetic-susceptibility study on oriented powder*. **Shanu Dengre**, R. Sarkar, L. Opherden, T. Herrmannsdörfer, T. Söhnel, M. Allison, C. D. Ling, J. S. Gardner and H.-H. Klauss.
6. *Theory of Photon Condensation in a Spatially-Varying Electromagnetic Field*. **Francesco Pellegrino**, G.M. Andolina, V. Giovannetti, A.H. MacDonald and M. Polini.

Posters

1. *Effect of the cations distribution on the magnetic properties of SnFe2O4: First-principles study*. **Mohamed Tadout**, R. Lamouri, M. Hamedoun, A. Benyoussef, H. Ez-zahraouy, M. Benaissa, O. Mounkachi.
2. *Modeling magnetic correlations in magnetite nanoparticle assemblies using x-ray magnetic scattering data*. **Johnathon Rackham**, B. Newbold, S. Kotter, D. Smith, D. Griner, R. Harrison, A. H. Reid, M. Transtrum and K. Chesnel.
3. *The Analysis of Magnetite Nanoparticles Allowed to Warm through Superparamagnetic Transition*. **Daniel McPherson** and K. Chesnel.
4. *First Principle Investigation of Magnetic Properties for Ni/Co adsorbed Sb/h-BN van-der Waals heterostructure*. **Anup Shrivastava**, S. Saini and S. Sing.

CMD2020GEFES mini-colloquium

Modern Trends in Topological Quantum Matter

Laszlo Oroszlany, Alberto Cortijo

In recent years, ideas borrowed from topology have permeated all areas of condensed matter physics. Some well-established concepts like the quantized electric response of time reversal breaking and time reversal conserving topological insulators have already found their way in textbooks. On the other hand, new theories and platforms still rear their heads frequently, expanding this already vibrant field ever further. In this symposium we will focus on recently proposed and explored avenues were topological notions are realized in a condensed matter setting: next generation of topological insulators, topological semimetals, magnetic systems elucidating topological concepts, synthetic systems like metamaterials and synthetic dimensions, and non-hermitian systems.

We aim to bring leading experts in these new platforms to discuss the current status of the field and to discern the new physics to come.

Wednesday, 02 September 2020

Zoom host: Alberto Cortijo.

9:30-10:10 *Nuclear magnetic resonance signal of Weyl semimetals*. **Balazs Dora (invited)**, Zoltán Okvátovity, Ferenc Simon.

10:10-10:30 *Competition of trivial and topological phases in graphene based hybrid systems*. János Koltai, László Oroszlány, József Cserti, **Zoltán Tajkov.**

10:30-10:50 *Emergent Bose metal in an algebraic quantum liquid*. **Yizhi You**, Zhen Bi, Michael Pretko.

10:50-11:10 *Angular-dependent magnetoresistance in topological semimetals PtBi2 and Ru2Sn3*. ***Beilun Wu**, Victor Barrena, Federico Mompeán et al.*

11:10-11:30 *Tunable and robust long-range coherent interactions between quantum emitters mediated by Weyl bound states*. **Iñaki García-Elcano**, Alejandro González-Tudela, Jorge Bravo-Abad.

11:30-11:50 *Topologically protected ground state degeneracies in an interacting two-spin system*. **György Frank**, Zoltán Scherübl, Szabolcs Csonka, Gergely Zaránd, András Pályi.

11:50-12:10 *Weyl-fermions, Fermi-arcs, and minority-spin carriers in ferromagnetic CoS2*. Niels B. M. Schröter, **Iñigo Robredo,** Sebastian Klemenz, et al.

12:10-12:30 *Geometrical quench and dynamical quantum phase transition in the α-T3 lattice*. **Balazs Gulácsi**, Markus Heyl, Balázs Dora.

Special sessions Wednesday Afternoon

Zoom host: Alberto Cortijo. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Volkov-Pankratov states in topological graphene nanoribbons*. T. L. Van Der Berg **A. De Martino**, M. R. Calvo, D. Bercioux.
2. *Topological delocalization in the completely disordered two-dimensional quantum walk*. **Janosh K. Asboth**, Arindam Mallick.
3. *Chiral anomaly induced Veselago lensing in Weyl semimetals*. **S. Tchoumakov**, B. Bujnowski, J. Cayssol, A. G. Grushin.

Posters

1. *Bandstructure and end states in InAs/GaSb core-shell nanowires*. **Florinda Viñas Boström**, Athanasios Tsintzis, Michael Hell, Martin Leinse.
2. *Effect of geometric frustration in Kitaev chains*. **Alfonso Meiellaro**, Francesco Romeo, Roberta Citro.
3. *Inducing anisotropies in Dirac fermions by periodic driving*. **A. Díaz-Fernández.**
4. *Meta-magnetism of weakly-coupled antiferromagnetic topological insulators*. **Aoyu Tan**, Valentin Labracherie, Narayan Kunchur et al.

Thursday, 03 September 2020
Zoom host: Alberto Cortijo.

9:30-10:10 *Instability and sensing in nonreciprocal non-Hermitian topological media*. **Henning Schomerus (invited).**

10:10-10:30 *Dynamics of the non-Hermitian Kitaev chain*. **Sharareh Sayyad**, Adolfo G. Grushin, Jinlong Yu, Lukas Sieberer.

10:30-10:50 *Harnessing light to control spin, charge and valley currents in two-dimensional topological honeycomb materials*. **Esteban Rodriguez-Mena**, Matías Berdakin, Luis E. F. Foa Torres.

10:50-11:10 *Many-body effects in nodal-line semimetals: Correction to the optical conductivity*. **Daniel Muñoz-Segovia**, Alberto Cortijo.

11:10-11:30 *Density of states of 3D Dirac semimetals in the presence of extended impurities*. **J. P. Santos Pires**, B. Amorim, A. Ferreira et al.

11:30-11:50 *Topological bulk states and their currents: theory and observation*. **Alvaro Rubio-García**, Chris N. Self, Juan José García-Ripoll, Jiannis Pachos.

11:50-12:10 *Disorder driven multifractality transition in Weyl nodal loops*. **Miguel de Jesus Mestre Gonçalves,** Pedro Ribeiro, Eduardo V. Castro, Miguel A. N. Araújo.

12:10-12:30 *High magnetic field scanning tunneling spectroscopy in the type-II Weyl semimetal WTe2*. **Francisco Martín-Vega**, R. Sánchez-Barquilla. E. Herrera et al.

Special sessions Thursday Afternoon
Zoom host: Alberto Cortijo. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Obtaining edge modes and surface Green's functions from the metamorphosis of impurity-induced states: exact solutions via T-matrix*. *Sarah Pinon, Vardan Kaladzhyan,* ***Cristina Bena****.*
2. *Disorded induced Weyl-nodes coupling in WTe2*. **Valentin Labracherie**, Steffen Sykora, Joseph Dufouleur.

Posters

1. *Optical conductivity of the multifold semimetal RhSi*. **Miguel-Ángel Sánchez-Martínez**, Fernando de Juan, Jörn W. F. Venderbos, et al.
2. *Topological phases of a dimerized Fermi-Hubbard model for semiconductor nano-lattices*. **Nguyen H. Le**, Andrew J. Fisher, Neil J. Curson, Eran Ginossar.
3. *Topological Wearie-Thorpe model of amorphous matter*. **Qentin Marsal**, D. Varjas, A. G. Grushin.
4. *Topology and interactions in the Creutz and Creutz-Hubbard ladders*. **Juan Zurita**, Charles Creffield, Gloria Platero.
5. *Magnetic field dependence of the tunneling density of states in the type II Weyl semimetal WTe2*. **Raquel Sánchez-Barquilla**, F. Martin-Vega, H. Suderow, J. Guillamón, S. L. Bud'ko, P. C. Canfield.

Friday, 04 September 2020
Zoom host: Alberto Cortijo.

9:30-10:10 *Honeycomb lattice of heavy metals: evidence for topological edge states in the layered mineral jacutingaite*. **Peter Nemes-Incze (invited)**, Konrád Kandrai, Péter Vancsó et al.

10:10-10:30 *Electrical Transport Properties of Vanadium-Doped Bi2Te2.4Se0.6*. Christian Riha, Birkan Düzel, **Olivio Chiatti**, et al.

10:30-10:50 *Interacting Su-Schrieffer-Heeger Chains* **Helena Drueeke**, Dieter Bauer.

10:50-11:10 *Synthetic Flux Attachment* **Gerard Valentí-Rojas**, Niclas Westerberg, Patrik Öhberg.

11:10-11:30 *Anomalous levitation and annihilation in Floquet topological insulators*. **Hui Liu**, Ion Cosma Fulga, János Asbóth.

11:30-11:50 *Landau levels and Hall effect in topological semimetal* Enrique Benito Matías, José González, **Rafael Molina.**

11:50-12:10 *2D-superconductivity and topology in the Weyl semi-metal trigonal-PtBi2*. **A. Veyrat**, V. Labracherie, J. Dufouleur.

12:10-12:30 *Surface Green's functions and quasiparticle interference in Weyl semimetals*. **Sarah Pinon**, Vardan Kaladzhyan, Cristina Bena.

CMD2020GEFES mini-colloquium

Molecularly Functionalized Low-Dimensional Systems

Antonio Setaro, Carola Meyer, Zeila Zanolli

This mini-colloquium aims at bringing together all the researchers active in the physics of low dimensional systems that work at the edge between physics, chemistry, and material science. It provides a platform for experts of different fields that have not many opportunities for exchange. When scaling down materials to the nanometric world, they acquire novel amazing properties. Quantum effects stem out and promise to revolutionize several fields, such as optoelectronics, sensing, computing, bioimaging and diagnostics, and so on.

Functionalization serves a double role: It safeguards the properties of low-dimensional systems from environmental effects while customizing them for targeted applications. A strong connection between experimental and theoretical physics ensures to comprehend and master the underlying physical mechanisms, while chemistry is required to synthesize and attach the functional groups to the systems, and engineering ability is required to embed them into devices. This mini-colloquium aspires at establishing a convergent platform between synthesis, microscopy, spectroscopy, electronics, and engineering of low-dimensional systems in theory as well as in experiment.

In collaboration with Wiley, we will offer the opportunity to publish the results presented in the Colloquium within a special topical section in the peer-reviewed Journal Physica Status Solidi B.

Thursday, 03 September 2020

Zoom host: Eduardo Lee.

9:30-10:10 *Carbon nanotubes functionalization for antiferromagnetic spintronic*. **Simona Achilli (invited)**, Zeila Zanolli, Claire Besson, Michael Schnee, Robert Frielinghaus, Carola Meyer

10:10-10:50 *Polymer-Sorted Semiconducting Carbon Nanotubes with Luminescent Defects for Optical and Electronic Applications*. **Jana Zaumseil (invited)**, Felix J. Berger, Nicolas F. Zorn, Simon Settele, Sebastian Lindenthal.

10:50-11:10 *Spin injection enhancement via ultra-thin oxide barriers into molecularly functionalized graphene*. **Jesús Toscano**, N. Natera, D. Bandurin, C.R. Anderson, V. Guarochico, I.V. Grigorieva1, I.J. Vera-Marun.

11:10-11:30 *Hybrid Graphene-on-Silicon Field-Effect Transistors for Biosensing*. **Mykola Fomin**, D. Kireev, I. Zadorozhnyi, F. Brings, L. Jorde, C. You, J. Piehler, C. Meyer, S. Vitusevich, A. Offenhaeusser.

11:30-11:50 *A fast, scalable, and affordable way to increase graphene's mechanical stability, hydrophobicity, and charge carrier density*. **Lukas Madauß**, Erik Pollmann, Tobias Foller, Jens Schumacher, Ulrich Hagemann, Tobias Heckhoff, Matthias Herder, Lucia Skopinski, Lars Breuer, Anke Hierzenberger, Alexandra Wittmar, Henning Lebius, Abdenacer Benyagoub, Mathias Ulbricht, Rakesh Joshi, and Marika Schleberger.

11:50-12:10 *Towards field-effect controlled graphene-enhanced Raman spectroscopy of cobalt octaethylporphyrine molecules*. **Stephan Sleziona**, Simon Rauls, Tobias Heckhoff, Lukas Madauß, Axel Lorke, Heiko Wende, Marika Schleberger.

12:10-12:30 *Development of a sensor array based on tetrazole-functionalized graphene for ammonia detection*. **Sonia Freddi**, Luca Vaghi, Mauro Monti, Stefania Pagliara, Giovanni Drera, Antonio Papagni, Luigi Sangaletti.

Special sessions Thursday Afternoon

Zoom host: Eduardo Lee. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Modification of the physical and chemical properties of single-walled carbon nanotubes by filling their channels with electron acceptors and donors*. **Marianna V. Kharlamova**, Christian Kramberger, Dominik Eder.
2. *Click functionalization of carbon nanotubes*. **Gririraj Manoharan**, Petra Bösel, Jannis Thien, Qaiser Ali Khan, Laura Meingast, Mercedes Schmidt, Martin Steinhart, Janina Maultzsch, Joachim Wollschläger, Carola Meyer.
3. *Tailoring superconductivity in large-area monolayer $NbSe_2$ via self-assembled molecular adlayers*. **Francesco Calavalle**, Paul Dreher, Ananthu P. Surdendran, Wen Wan, Melanie Timpel, Roberto Verucchi, Celia Rogero, Thilo Bauch, Floriana Lombardi, Fèlix Casanova, Marco Vittorio Nardi, Miguel M. Ugeda, Luis E. Hueso, Marco Gobbi.

Posters

1. *Catalytic properties toward the Oxygen Reduction Reaction of 2D metal-organic frameworks: metalloporphyrins on Au(111).* **J. M. Lombardi**, D. Grumelli, R.Grutzler, K.Kern, H.G. Busnengo, P.Abugager.
2. *Specific and reversible protein immobilization on conductive carbon nanomaterials.* **Lara Jorde**, Zehao Li, Zhaoxin Geng, Cunlin Zhang, Changjiang You, Jacob Piehler, Carola Meyer.
3. *Elucidating topological electronic properties of width-modulated graphene nanoribbons.* **R. E. Menchón**, P. Brandimarte, D. Sánchez-Portal, A. Garcia-Lekue.
4. *Carbon nanodot based microcavities: Influence of the excitation conditions on the emission behavior.* **L. Trefflich**, F. Dissinge2, C. Sturm, R. Schmidt-Grund, S. R. Waldvogel, M. Grundmann.
5. *Assessing structure and stability of supported lipid bilayers on graphene oxides and silica using all atom molecular dynamics simulations.* **Mariia Savenko**, Timothée Rivel, Semen Yesylevskyy, Christophe Ramseyer.
6. *Spin injection enhancement via ultra-thin oxide barriers on molecularly functionalized graphene.* **N. Natera-Cordero**, J. Toscano, D. Bandurin, C.R. Anderson, V. Guarochico, I.V. Grigorieva, I.J. Vera-Marun.
7. *Spin-state dependent electrical conductivity in single-wall carbon nanotubes encapsulating spin crossover molecules.* **Aysegul Develioglu**, Julia Villalva, Arturo Gamonal, Eduardo Rial, José Sánchez Costa, Emilio M. Pérez, Enrique Burzurí.
8. *Reversible electro-optical readout of volatile acetonitrile molecules with a switchable 1D Fe-based coordination polymer.* **Aysegul Develioglu**, Esther Resines-Urien, Estefanía Fernandez-Bartolme, Roberta Poloni, Jose Sánchez Costa, Enrique Burzurí.
9. *An optimizing method using a sulfonation-degree function for the performance improvement of sPEEK ion exchange membrane.* **Deokhee Yun**, Woon Cho, Jihoon Kim, Joonhyeon Jeon.
10. *Advanced few Layers Graphene Nanoplatelets-Based Electrodes with Enhanced Electrocatalytic Activity for Oxygen Reduction Reaction.* **Mayra Briones**, G. Suppan, E. Pazmino, C. Zamora-Ledezma.

Friday, 04 September 2020

Zoom host: Eduardo Lee.

9:30-10:10 *1D heterostructures based on confined dyes inside boron nitride nanotubes: photo-stability and aggregation effects.* **Etienne Gaufrès (invited)**.

10:10-10:50 *Effect of potassium addition on the segregation and degradation of MAPb(Br0.6I0.4)3 mixed halide perovskites.* **Áron Pekker (invited)**, Derya Mehmet Özeren, Bea Botka, Katalin Kamarás.

10:50-11:10 *Controlling the inner dielectric environment of carbon nanotubes to tune their optical properties.* **Sofie Cambré**, J. Campo, B. Botka, W. Wenseleers, J. Obrzut, J.A. Fagan.

11:10-11:30 *Spectroscopic Characterization of the Ultrasonication-Induced Inner Shell Extraction of Density Gradient Ultracentrifugation Purified Double-Wall Carbon Nanotubes*. **Maksiem Erkens**, Sofie Cambré, Emmanuel Flahaut, Wim Wenseleers.

11:30-11:50 *Two-Dimensional Polyols: Functional Platforms for Biomedical Applications*. **Mohsen Adeli**, Ehsan Mohamadifar, Vahid Ahmadi, Fardin Gholami, Rainer Haag.

11:50-12:10 *Towards molecular hybrid spintronic devices: Novel ferrocene- and pyrenebased cyclophane chemisorbed on ferromagnetic Co(111) nanoislands*. **Daniel Bürgler**, M. Metzelaars, S. Schleicher, T. Hattori, F. Matthes, J. Rawson,S. Sanz, P. Kögerler, C.M. Schneider

12:10-12:30 *Magnetism of FePc/Ag(110) Monolayer Phases under Oxygen Dosing*. **E. Bartolomé**, J. Bartolomé, F. Sedona, J. Lobo-Checa, D. Forrer, J. Herrero-Albillos, M. Piantek, J. Herrero-Martín, D. Betto, E. Velez-Fort, L.M. García, M. Panighel, A. Mugarza, M. Sambi, F. Bartolomé.

CMD2020GEFES mini-colloquium

Nanomagnetism: Permanent Magnets, Applications and Sustainability

Alberto Bollero, Thomas G. Woodcock, Daniel Salazar

Present and emerging technologies (electromobility, renewable energy technologies…) require the use of permanent magnets, which is resulting in an increasing yearly demand for rare-earth elements as constituents of the strongest technological magnets (namely Nd2Fe14B- and Sm2Co17-based). Economical and environmental considerations have attracted the interest of research groups and industry in the search for rare earth-free alternatives, which should result in a diversification of the permanent magnet sector. In addition, new technological applications are requiring novel fabrication methods. All these considerations make permanent magnets a very active and attractive research field. We are convinced that to achieve sustainable development goals, innovative approaches to the circular economy must also be considered and discussed in the frame of this mini-colloquium.

This mini-colloquium will cover aspects of relevance from scientific and technological points of view:

* Optimization of rare earth-based permanent magnets with an improved microstructure making possible a reduction in the use of critical raw elements.
* Recycling of Nd-Fe-B magnets from end-of-life products as a promising circular economy route.
* Recent results on rare earth-free alternatives to evaluate how far we are from a practical (partial) substitution of rare earth-based magnets.
* Novel fabrication and characterization methodologies (e.g., micromagnets fabrication) and techniques (e.g., additive manufacturing) opening the path to a next generation of permanent magnet applications going from microsurgery to automotive and aerospace.

The different sessions will combine theoretical and experimental approaches in order to offer an overview of the main achievements in the establishment of a proper correlation between morphology, microstructure and magnetic properties. On this basis, the aim of this mini-colloquium will be to stimulate the dialogue to address three main issues:

* Assessment of improved and novel permanent magnet materials.
* Looking at the future of permanent magnets with micro- and nano-magnetism as key drivers.
* Sustainability from the materials to the complete production chain and beyond (life cycle assessment).

Wednesday, 02 September 2020

Zoom host: Irene González.

9:30-10:10 *Hysteresis design of magnetic materials for efficient energy conversion.* **Oliver Gutfleisch (invited).**

10:10-10:50 *Finding weak spots in permanent magnets through micromagnetism and machine learning.* Alexander Kovacs, Johann Fischbacher, Panpan Zhao, Harald Oezelt, Markus Gusenbauer, Thomas G. Woodcock, **Thomas Schrefl (invited)**.

10:50-11:30 *Synthesis of nanostructed R-Fe-B permanent magnetic materials using the Electron Beam Exposure technique*. **Jinbo Yang (invited)**.

11:30-11:50 *In-situ nitrogenation of (Nd,Ce)Fe10CoTi alloys*. **C. Echevarria-Bonet**, D. Salazar, I. Puente Orench, G.C. Hadjipanayis.

11:50-12:10 *High throughput studies of hard magnetic films.* **Yuan Hong,** Isabelle de Moraes, Fumiya Higashi, Gabriel Ricardo Gomez Eslava, Stéphane Grenier, Edith Bellet-Amalric, Thibaut Devillers, Nora M. Dempsey.

12:10-12:30 *Neodymium-Iron-Boron/polyurethane acrylate (NFB/PUA) magnetic composite films obtained by photopolymerization.* **Cristian Mendes-Felipe**, Ander García-Díez, Daniel Salazar, Jose Luis Vilas-Vilela, Senentxu Lanceros-Mendez.

Thursday, 03 September 2020

Zoom host: Jose Luis Fernández Cuñado.

9:30-10:10 *High-throughput and data-mining search for rare-earth free permanent magnets*. **Alena Vishina (invited)**, Olga Yu. Vekilova, Heike C. Herper, Olle Eriksson.

10:10-10:50 *Mechanical processing of powders for rare-earth-free permanent magnets*. **Stefano Deledda (invited).**

10:50-11:30 *From rare earth-free permanent magnet filament by solution casting and extrusion to 3D-printed magnets*. **Ester M. Palmero (invited)**, Daniel Casaleiz, Javier de Vicente, Alberto Bollero.

11:30-11:50 *The mechanical and magnetic properties of MnAl-C-Cu alloys.* **F. Jürries**, J. Freudenberger, K. Nielsch, T.G. Woodcock.

11:50-12:10 *A composite bonded magnet with improved energy product based on FeCo nanowires and strontium ferrite*. **J.C. Guzmán-Mínguez**, S. Ruiz-Gómez, L.M. Vicente-Arche, C. Granados-Miralles, C. Fernández-González, F. Mompeán, M. García-Hernández, S. Erohkin, D. Berkov, D. Mishra, C. de Julián Fernández, J.F. Fernández, L. Pérez, A. Quesada.

12:10-12:30 *Formation of pure τ-MnAlC by Spark Plasma Sintering*. F. Maccari, **A. Aubert**, S. Ener, I. Radulov, K. Skokov, O. Gutfleisch.

Special sessions Thursday Afternoon

Zoom host: Jose Luis Fernández Cuñado. Pre-recorded talks and poster videos on YouTube.

16:45-17:00 Flash Talks (3 min duration) of Pre-recorded presentations

17:00-17:30 Flash Talks (2 min duration) of Posters

17:30-18:15 General turn of *Questions and Answers*

18:15-19:30 Individual virtual visits to Poster Session

Pre-recorded talks

1. *Optimization of a simple route for the fabrication of MnAlC permanent magnets*. **J.D. Gamez** H. Martinez-Sanchez, J.L. Valenzuela, L. Marín, L.A. Rodriguez, E. Snoeck, L.E. Zamora, G.A. Pérez Alcázar, J.A. Tabares.

2. *Improving the permanent magnetic properties of cobalt ferrite nanoparticles by a controlled solvent-mediated annealing process*. **A. López-Ortega**, B. Muzzi, E. Lottini, D. Peddis, G. Bertoni, C. de Julián Fernández, C. Sangregorio.

3. *One single step from ε-phase gas-atomized to L10-phase MnAlC bulk magnet by hot-pressing*. **C. Muñoz-Rodríguez**, E.M. Palmero, J. Rial, L. Feng, T. Mix, T.G. Woodcock, A. Bollero.

4. *Characterization of the magnetic anisotropy of hard magnetic nanoparticles by singular point detection technique*. **C. de Julián Fernández**, D. Mishra, R. Cabassi, F. Bolzoni, M. Petrecca, M. Albino, M. Saura-Múzquiz, P. Jenus, A. Quesada, M. Christensen, T. Schliesch, B. Belec, C. Sangregorio, F. Albertini.

5. *Nitrided ThMn12-type compounds for novel magnetic inks based on a water soluble cellulose derivative*. **M. Rincón-Iglesias**, S. Gulzar, A. Aubert, S. Lanceros, D. Salazar.

Posters

1. *A novel strategy for the fabrication of high-performance nanostructured Ce-Fe-B magnetic materials via Electron-Beam Exposure*. **Liang Zha**, Cholsong Kim, Wenyun Yang, Shunquan Liu, Jingzhi Han, Changsheng Wang, Honglin Du, Yingchang Yang, Weixing Xia, Alberto Bollero, and Jinbo Yang.

2. *Magnetic refrigeration and permanent magnets*. J. Daza, A. Deltell, E. Fanals, M.L. Escoda, V. Salvadó, **J.J. Suñol**.

3. *Stripe domain patterns in MnBi micro-islands with perpendicular anisotropy*. **M. Villanueva**, E.H. Sánchez, P. Pedraz, P. Olleros-Rodríguez, L. Zha, P. Perna, J. Camarero, J.B. Yang, P.S. Normile, J.A. De Toro, C. Navío, A. Bollero.

4. *Characterization of defects in as-transformed and hot-deformed τ-MnAl-C alloys using TEM*. **P. Zhao**, L. Feng, K. Nielsch, T.G. Woodcock.

5. *Correlation between microstructure and magnetic properties of core/shell nanoparticles: (Co-, Ni-) ferrite/(CoFe, NiFe)*. **D. Casaleiz**, M. Villanueva, E.M. Palmero, Y. Luengo, J. Camarero, A. Espinosa, G. Salas, A. Bollero.

6. *Remanence improvement in exchange-decoupled composites owing to dipolar interactions*. **C. Granados-Miralles**, J.C. Guzmán-Mínguez, P. Kuntschke, C. de Julián Fernández, S. Erokhin, D. Berkov, T. Schliesch, J.F. Fernández, A. Quesada.

7. *Effect of chrome on the magnetic and structural properties of Mn57-xAl43Crx (x = 0.51, 0.91, 1.51) and Mn53,3-xAl45C1,7Crx (x = 0.5, 1.0, 1.5, 2.0, 2.5) alloys*. **Marisela Benitez Barahona**, German Antonio Perez, Juan Sebastian Trujillo.

8. *Magnetization reversal in round and square nanodots*. **Andrea Ehrmann**, Tomasz Blachowicz.

9. *Strains and magnetic properties of Fe/Cr tri-layers and multilayers*. **G. Magnifouet**, M. Vallet, E. Meslin, C. Bouillet, J. Arabski, V. Pierron-Bohnes.

10. *Unraveling the mechanism of the one-pot synthesis of exchange coupled Co-based nano-heterostructures with high energy product*. **Beatrice Muzzi**, Martin Albino, Claudia Innocenti, Michele Petrecca, Brunetto Cortigiani, César de Julián Fernández, Giovanni Bertoni, Rodrigo Fernandez-Pacheco, Alfonso Ibarra, Clara Marquina, M. Ricardo Ibarra, Claudio Sangregorio.

11. *Shape-related effects on ferromagnetic nanoparticles: A micromagnetic approach for highly diluted and highly ordered systems*. **Rafael Delgado-Garcia**, Gabriel Rodriguez-Rodriguez, Alberto López-Ortega, Jose M. Colino.

12. *3D-printable reconfigurable magnets based on wax/cobalt ferrite composite*. R. Brito-Pereira, C. Ribeiro, **N. Peřinka**, P. Martins, S. Lanceros-Mendez.

Friday, 04 September 2020

Zoom host: Jose Luis Fernández Cuñado.

9:30-10:10 *European Initiatives for a green economy in a circular economy context answering to the societal challenges*. **Santiago Cuesta Lopez (invited).**

10:10-10:50 *Electrochemical approaches in recycling and reprocessing of rare earth-based permanent magnets*. **Kristina Zuzek Rozman (invited)**, X. Xu, J. Zavasnik, Z. Samardzija, J. Scancar, K. Markovic, S. Sturm.

10:50-11:30 *3D printing of locally aligned magnetic anisotropic hard magnetic particles*. C. Huber, K. Sonnleitner, S. Cano, S. Schuschnigg, M. Groenefeld, I. Teliban, S. Kobe, B. Saje, **Dieter Suess (invited)**.

11:30-11:50 *An approach towards a new generation of environmentally friendly magnets: silk as suitable alternative for advanced manufacturing*. **Ander Reizabal**, Daniel Salazar, Leyre Perez-Alvarez, Senentxu Lanceros.

11:50-12:10 *Towards advanced micro magneto-mechanical components*. Gabriel Villalba-Alumbreros, Miguel Fernández-Muñoz, Carlos Morón Alguacil, **Ignacio Valiente-Blanco**, Efrén Díez Jiménez.

12:10-12:30 *Improving the magnetic hardness of the Fe3Sn permanent magnet by Si doping*. **Yovany Hernandez**, Carlos A. Palchucan, Luis A. Rodríguez, Daniel Salazar, Ligia E. Zamora, Germán A. Pérez Alcázara.

CMD2020GEFES mini-colloquium

Novel Functionalities in Nano- to Mesoscale Magnetism

Naëmi Leo

This session aims to bring together experimentalists and theoreticians to present and discuss recent advances in nanomagnetic and spintronic systems, including thin films, nanostructures, as well as spin textures. A particular emphasis is placed on novel functionalities by enabling manipulation of magnetic properties via electric fields and currents, heat, light, and mechanical deformations. In addition to their intriguing underlying microscopic origins, such cross-couplings allow for faster, smaller, and more energy-efficient future devices, such as for information transfer and processing.

Wednesday, 02 September 2020

Zoom host: David Navas.

9:30-10:10 *X-ray imaging of three-dimensional magnetic systems and their dynamics*. **Claire Donnelly (invited)**.

10:10-10:30 *Chiral control of magnetic spin textures using 3D printed geometries*. **Dédalo Sanz-Hernández**, Aurelio Hierro-Rodriguez, Claire Donnelly, Javier Pablo-Navarro, Andrea Sorrentino, Eva Pereiro, César Magén, Stephen McVitie, José María de Teresa, Salvador Ferrer, Peter Fischer, and Amalio Fernández-Pacheco.

10:30-10:50 *Magnetization dynamics in nanofiber networks*. **Tomasz Blachowicz**, Pawel Steblinski, Jacek Grzybowski, and Andrea Ehrmann.

10:50-11:30 *Anti-Skyrmions and Bloch Skyrmions in inverse tetragonal Heusler compounds*. **Stuart Parkin (invited)**.

11:30-12:10 *Manipulating Skyrmions by laser light as a route to ultrafast data storage*. **Alexey Sapozhnik (invited)**, B. Truc, I. Madan, P. Tengdin, G. Berruto, and F. Carbone.

12:10-12:30 *Magnetic whirls for unconventional computing*. **Karin Everschor-Sitte**.

Special sessions Wednesday Afternoon

Zoom host: David Navas. Poster videos on YouTube.

Posters

1. *Oriented and isotropic electrospun magnetic nanofibers – experiment and simulation*. **Timo Grothe**, Jan Lukas Storck, Al Mamun, Marah Trabelsi, Michaela Klöcker, Christoph Döpke, Lilia Sabantina, Tomasz Blachowicz, and Andrea Ehrmann.
2. *Crucial role of the Co cations in the destabilistation of collinear ferrimagnetism in Co-ferrite nanoparticles with tunable structural defects*. **Carlos Moya**, Arantxa Fraile Rodríguez, Mariona Escoda-Torroella, Montserrat García del Muro, Sridhar R.V. Avula, Cinthia Piamonteze, Xavier Batlle, and Amílcar Labarta.
3. *Spontaneous rotation of ferrimagnetism driven by antiferromagnetic spin canting*. **Anuradha Vibhakar**, D.D. Khalyavin, P. Manuel, J. Liu, A.A. Belik, and R.D. Johnson.
4. *Plasmon-induced magneto-optical enhancement in metallic Ag/FeCo core/shell nanoparticles synthesizes by colloidal chemistry*. **Alberto López Ortega**, Shinya Maenosono, and Paolo Vavassori.
5. *Exchange bias evolution in FeNi/FeMn/Gd-Co films under thermomagnetic treatment*.**Andrey Svalov**, Egor Kudyukov, Elena Stepanova, Vladimir Lepalovskij, and Vladimir Vas'kovsjiy.
6. *Structure and magnetic properties of epitaxial CaFe2O4 thin films*. **Silvia Damerio**, Pavan Nukala, Jean Juraszek, Pim Reith, Hans Hilgenkamp, and Beatriz Noheda.
7. *Electric current and field control of vertex structures in cylindrical nanowires*. **Jose Angel Fernandez-Roldan**, Rafael P. del Real, Cristina Bran, Manuel Vazquez, and Oksana Chubykalo-Fesenko.

Thursday, 03 September 2020

Zoom host: David Navas.

9:30-10:10 *Magnetoplasmonic nanostructures: A new route to achieve broadband active control of light-matter interactions*. **Nicolò Maccaferri (invited)**.

10:10-10:50 *Magnetoplasmonic nanodomes as a novel structure for biometrical applications*. **Alejandro Gómez Roca (invited)**, A. Aranda-Ramos, A. Lopez-Prtega, P. Guell-Grau, J.L. Tajada, L. Pou-Macoyo, F. Pi, S. Lope Piedrafita, M.D. Baro, J. Sort, P. Vavassori, C. Nogues, J. Nogues, and B. Sepulveda.

10:50-11:10 *Modelling of magneto-thermoelectric response from a domain wall*. **Elias Saugar**, T. Ostler, C. Barton, R. Puttock, P. Klapetek, O. Kazakova, and O. Chubykalo-Fesenko.

11:10-11:30 *Tunable magnetic anisotropy in 3D nanowire networks*. **Alejandra Ruiz-Clavijo**, Sandra Ruiz-Gómez, Olga Caballero-Calero, Lucas Pérez, and Marisol Martín-González.

11:30-11:50 *Magnetic phase diagrams and helicity control of reversal modes in ferromagnetic nanotubes*. **Oscar Iglesias**, Hernán Salinas, and Johans Restrepo.

11:50-12:10 *Reconfigurable magnetic properties induced by weak stripe domains*. D. Markó, D. Schmool, I. Lucas, P. Cavero, S. Sangiao, L. Morellón, S. Tacchi, K. Szulc, P. Gruszecki, M. Krawczyk, J. Díaz, C. Quirós, A. Hierro-Rodriguez, F. Valdes-Bango, M. Velez, J.I. Martín, and **Luis Manuel Álvarez-Prado**.

12:10-12:30 *Nanoscale manipulation of magnetic domains by strain-induced proximity*. **Arantxa Fraile Rodríguez**, Ilya Valmianski, Javier Rodriguez-Alvarez, Montserrat García del Muro, Christian Woloviec, Florian Kronast, Juan Gabriel Ramirez, Ivan K. Schuller, Amílcar Labarta, and Xavier Batlle.

CMD2020GEFES mini-colloquium

Out-of-equilibrium physics in biology

Juan L. Aragonés, Laura R. Arriaga, Timon Idema, Felix Ritort

Living systems provide the ultimate example of out-of-equilibrium physics. They also provide unique challenges, often strongly connected to their out-of-equilibrium nature. For example, living systems operate at temperatures where thermal fluctuations cannot be ignored, they have highly hierarchical structures that are nonetheless self-assembled, and are active in the sense that they continually generate and dissipate energy. In this mini-colloquium, we aim to bring together people working on various out of-equilibrium aspects from a physics perspective.

Specifically, we will focus on four sub-topics:

1. Active matter.
2. Self-assembly.
3. Stochastic thermodynamics.
4. Mechanobiology from the cell upwards.

Wednesday, 02 September 2020

Zoom host: Laura Arriaga.

9:30-10:10 *Discrete systems flowing through constrictions: from colloids to humans*. **Iker Zuriguel (invited).**

10:10-10:30 *Activity-driven topological glass*. **Iurii Chubak**, Jan Smrek, Kurt Kremer, Christos N. Likos.

10:30-10:50 *Apparent phototaxis enabled by Brownian motion*. **Juliane Simmchen**, Lukas Niese, Linlin Wang, Sayan Das.

10:50-11:10 *BREAK*

11:10-11:50 *Elasticity from entanglements in branched actin*. **Martin Lenz (invited).**

11:50-12:10 *The cell adaptation time sets a minimum length scale for patterned substrates*. **Diogo E. P. Pinto**, Gonca Erdemci-Tardogan, M. Lisa Manning and Nuno A. M. Araújo

12:10-12:30 *Collective dynamics and proliferation on flat substrate: from cells to tissues.* **H.P.M. Melo**, A. S. Nunes, N. A. M. Araújo.

Thursday, 03 September 2020

Zoom host: Juan Aragonés.

9:30-10:10 *Autonomous engines driven by active matter: Energetics and design principles*. **Patrick Pietzonka (invited)**.

10:10-10:30 *Shotcuts to adiabaticity: counterdiabatic driving in biophysical processes*. **Efe Ilker**, Özenç G ngör, B. Kuznets-Speck,Sebastian Deffner, Michael Hinczewski.

10:30-10:50 *Self-phoretic active colloids in confined geometries*. **M. Tasinkevych**, W. E. Uspal, M. N. Popescu, S. Dietrich.

10:50-11:10 *BREAK*

11:10-11:50 *The complexity of protein interactions unraveled from structural disorder*. **Beatriz Seoane (invited)**, Alessandra Carbone.

11:50-12:10 *Spontaneous hemodynamic fluctuations: the brain vasculature as an out-of-equilibrium flow network*. **Miguel Ruiz-García**, Eleni Katifori.

12:10-12:30 *Irreversibility and synchronization in reaction-diffusion oscillators*. **Daniel S. Seara**, Benjamin B. Machta, Michael P. Murrell.

Special sessions Thursday Afternoon

Zoom host: Laura Arriaga. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

17:00 – 17:02 *How to design cell-mediated self-assembled colloidal scaffolds*. **C. S. Dias**, C. A. Custódio, G. C. Antunes, M. M. Telo da Gama, J. F. Mano, N. A. M. Araújo.

17:02 – 17:04 *Discontinuous shear thinning of soft particles in a 2D microchannel* . **D. P. F. Silva**, R. C. V. Coehlo, M. M. Telo da Gama, N. A. M. Araújo.

17:04 – 17:06 *A new approach to the determination of the Tolman length.* **Brendan T. Deveney**, QHwan Kim, David A. Weitz, Wonho Jhe.

17:06 – 17:08 *Magnetically-actuated particles mimic cell motion.* **Berta Tinao**, Laura R. Arriaga, Juan L. Aragones.

Posters

17:08 – 17:10 *On optimizing energetic cost of noise reduction in systems with negative feedback.* **Amit Singh Vishen**.

17:10 – 17:12 *Model of wound formation in a viscoelastic tissue.* **G. M. Carvalho**, P. Patricio, N. A. M. Araújo.

17:12 – 17:14 *The influence of the pair potential hardness on the phase behavior of active Brownian particles.* **José Martín**, Raul Martinez, Angel Luis Diez, Lachlan C. Alexander, Dirk G. A. L. Aarts, Francisco Alarcon, Jorge Ramírez, Chantal Valeriani.

17:14 – 17:16 *Stochastic action for tubes: Connecting path probabilities to measurement.* **Julian Kappler**, Ranojoy Adhikari.

17:16 – 17:18 *Dynamical features of an active ring polymer under confinement.* **Juan Pablo Miranda**, Valentino Bianco, Emanuele Locatelli, Chantal Valeriani.

17:18 – 17:20 *Unveiling latent instabilities in the empty Satellite Tobacco Necrosis Virus capsid by performing a low-frequency normal modes analysis using a novel coarse-grained model.* **M. Martín-Bravo**, J. M. Gómez Llorente, J. Hernádez-Rojas.

17:20 – 17:22 *Collective self-trapping behavior of active rods in the presence of obstacles.* **Raúl Martínez**, Juan L. Aragones.

17:22 – 17:24 *Dynamical and structural changes in phase behavior of active Brownian particles with varying mechanical interaction.* **Monika Sanoria**, Raghunath Chelakkot, Amitabha Nandi.

17:24 – 17:26 *Proton transfer in Guanine-Cytosine base pairs in B-DNA.* **Diego Soler-Polo**, Jesús I. Mendieta-Moreno, Daniel G. Trabada, Jesús Mendieta, José Ortega.

17:26 – 17:28 *Dynamics of active polymers under confinement.* **Patricia J. Esteban-Infantes**, Irene Carbajo, Iris P. Gallardo, José Martín, Valentino Bianco, Emanuele Locatelli, Paolo Malgaretti, Chantal Valeriani.

17: 28 – 19:00 *Q & A*

Friday, 04 September 2020

Zoom host: Laura Arriaga.

9:30-10:10v *Active diffusiophoresis: Mechanisms controlling self-repulsion and collective response of chemically sensitive colloids*. **Ignacio Paganobarraga (invited)**.

10:10-10:30 *Dynamics of interfaces in active liquid crystals*. **Rodrigo C. V. Coelho**, Nuno A. Araújo, Margarida M. Telo da Gama.

10:30-10:50 *Directed motion of Twitching bacteria in ratchet geometries*. **Rahul Marathe**, Konark Bisht.

10:50-11:10 *BREAK*

11:10-11:30 *Generic symmetry-breaking motility of an object in active fluids*. **Yongjoo Baek**, Kiwon Kim, Yunsik Choe.

11:30-11:50 *Enhanced propagation of motile bacteria on surfaces due to forward scattering*. **Vasco C. Braz**, Stainslaw Makarchuk, Giorgio Volpe, Lena Ciric, Nuno A. M. Araújo.

11:50-12:30 *Title of invited talk.* **Alfredo Alexander-Katz (invited)**.

CMD2020GEFES mini-colloquium

Oxide Heterostructures and Interfaces: From Fundamentals to Applications

Ignasi Fina, Xavier Moya, Akash Bhatnagar, Harvey Amorín,
Jacobo Santamaría, Fabio Miletto Granozio, Nini Pryds

The semiconductor industry has experienced a revolution over the past 60 years, fuelled by the increase in the density of complementary metal-oxide-semiconductor (CMOS) transistors based on silicon. However, silicon technology is now reaching its limits, with Moore's law approaching the insurmountable size barrier set by the ultimate atomistic nature of matter. Attention is therefore turning towards a family of materials that is capable of replacing silicon-based CMOS semiconductor technology, and that is able to guarantee technological progress in the next decades. Amongst all possible candidates, oxide films and heterostructures are particularly appealing. Oxide heterostructures have played in recent decades an important role in the physical and chemical understanding of condensed matter. Due to the great sensitivity of the electronic properties to external stimuli in these systems, and because of their rich range of functional properties, the implications of their study for advances in fundamental understanding and practical applications are enormous.

This colloquium will promote discussion and cross-fertilisation between complementary communities of scientists and engineers. The topics covered range from electronic properties of oxide heterostructures, to ionic properties, to magnetoelectric and caloric properties. Special focus will be on oxide (or other) ferroelectrics and their applications.

Monday, 31 August 2020

Zoom host: Edwin Herrera.

9:30-10:10 *Freestyle crystalline oxide membranes and heterostructures*. **H. Y. Hwang (invited)**.

10:10-10:30 *Persistent Photocarrier Accumulation and Depletion in LaAlO3/SrTiO3 Quantum Wells*. **Gervasi Herranz**, Yu Chen, Yoann Lechaux, Blai Casals, Bruno Guillet, Albert Minj, Florencio Sanchez, Jaume Gazquez, Laurence Méchin.

10:30-10:50 *Growth and properties of metal/SrTiO3 two-dimensional electron gases for oxide spin-orbitronics*. **Luis M. Vicente-Arche**, Srijani Mallik, Anke Sander, Paul Noël, Maxen Cosset-Chéneau, Jean-Philippe Attané, Laurent Vila, Agnès Barthélémy and Manuel Bibes.

10:50-11:10 *Identifying ionic and electronic charge transfer at oxide heterointerfaces*. **Marc-André Rose**, B. Šmíd, M. Vorokhta, I. Slipukhina, M. Andrä, H. Bluhm, T. Duchoň, M. Ležaić, S. A. Chambers, R. Dittmann, D. N. Mueller and F. Gunkel.

11:10-11:50 *Probing unconventional superconductivity in the LaAlO3/SrTiO3 interface using transport in nanowires*. **Alexei Kalaboukhov (invited)**, G. Singh, E. Lesne, D. Winkler, T. Claeson, T. Bauch, F. Lombardi, A. Caviglia.

11:50-12:30 *Defect-free synthesis of Quantum Heterostructures via Chemical Pulsed Laser Deposition*. **Chang-beom Eom (invited)**.

Tuesday, 01 September 2020

Zoom host: Harvey Amorín.

9:30-10:10 *What is the level of theory needed to describe the basic ground state properties of common 'correlated materials*. **Alex Zunger (invited)**.

10:10-10:50 *Berry phase engineering at oxide interfaces*. **Mario Cuoco (invited)**, D. J. Groenendijk, C. Autieri, T. C. van Thiel, W. Brzezicki, J. R. Hortensius, D. Afanasiev, N. Gauquelin, P. Barone, K. H. W. van den Bos, S. van Aert, J. Verbeeck, A. Filippetti, S. Picozzi, M. Cuoco, and A. D. Caviglia.

10:50-11:10 *Proximate Quantum Spin Liquid on Designer Lattice*. **Xiaoran Liu**, Singh, V. Drouin-Touchette, T. Asaba, J. H. Brewer, Q. Zhang, Y. Cao, B. Pal, S. Middey8 P. S. Anil Kumar, M. Kareev, L. Gu, D. D. Sarma, P. Shafer, E. Arenholz, J. W. Freeland, Lu Li, D. Vanderbilt, and J. Chakhalian.

11:10-11:30 *Metal-insulator transitions in complex oxide heterostructures from DFT+DMFT*. **Sophie Beck**, Claude Ederer.

11:30-11:50 *Disentangling the electronic and structural phase transitions in VO2*. **Gauquelin Nicolas**, G. Guzzinati, M. Nord, G. Araizi-Kanoutas, A. Orekhov, P. T.P. Le, J.E. ten Elshof, G. Koster, M.S. Golden, J. Verbeeck.

11:50-12:30 *Quantum transport in oxide based mesoscopic devices*. **Thomas Jespersen (invited)**.

Special sessions Tuesday Afternoon

Zoom host: Irene González. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Ferromagnetism in ultrathin double perovskite La2NiMnO6 thin films.* **Gabriele De Luca**, J. Spring, M. Campanini, U. Bashir, C. Dominguez, A. Zakharova, M. Rossell, C. Piamonteze, M. Gibert.
2. *In-situ probing of the thickness-dependent electronic properties of BaBiO3.* **Rosa Luca Bouwmeester**, Alexander Brinkman, Kai Sotthewes.
3. *Defect states in LaAlO3/SrTiO3 heterostructure using Deep-Level Transient Fourier Spectroscopy.* **Yoann Lechaux**, Y. Chen, L. Méchin, A. Minj, G. Herranz and B. Guillet.
4. *Tunable 2D interfaces for novel electronic devices.* **Roberta Caruso**, M. D'Antuono, B. Jouault, E. Di Gennaro, D. Massarotti, F. Tafuri, M. Salluzzo, and D. Stornaiuolo.
5. *Epitaxially matched conductive cubic TiO coating on LiCoO2 cathode films for high performance lithium ion batteries.* **Deepak Singh**, Daniel M. Cunha, Thijs Dubbelink, Theodoor A. Hendriks, and Mark Huijben.
6. *Ferroionic induction of superconductivity in a non-superconducting cuprate.* **Fernando Gallego Toledo**, K. Seurre, M. Cabero, V. Rouco, A. Sander, F. Cuellar, J. Tornos, D. Hernandez-Martin, Z. Sefrioui, A. Rivera-Calzada, M. Varela, M. Garcia-Hernandez, F. Mompean, J. M. Gonzalez-Calbet, J. E. Villegas, C. Leon, and J. Santamaria.
7. *A new route for the fabrication of nanoscale LaAlO3/SrTiO3 based devices.* **Maria D'Antuono**, M. Karrer, R. Caruso, D. Massarotti, E. Di Gennaro, E. Goldobin, R. Kleiner, M. Salluzzo, D. Koelle, F. Tafuri and D. Stornaiuolo.
8. *Stoichiometry and Termination Control of LaAlO3-SrTiO3 Bilayer Interfaces.* **Hong Yan**, Jacqueline Marie Börgers, Marc-André Rose, Christoph Baeumer, Bongju Kim, Lei Jin, Regina Dittmann, and Felix Gunkel.
9. *Towards modulation of spin accumulation in oxide heterostructures thanks to interface engineering.* **Victor Haspot**, M. Cosset-Chenau, P. Noël, J-P. Attané, L. Vila, A. Anane, M. Bibes and A. Barthélémy.

Posters

1. *Multiferroism Induced by Spontaneous Structural Ordering in Antiferromagnetic Iron Perovskites.* **Susana García Martín**, Xabier Martínez de Irujo-Labalde, Masato Goto, Esteban Urones-Garrote, Ulises Amador, Clemens Ritter, Midori Amano, Anucha Koedtruad, Zhenhong Tan, Yuichi Shimakawa.
2. *Thermoelectric Properties of Epitaxial ß-Ga2O3 Thin Films.* **Johannes Boy**, Martin Handwerg, Robin Ahrling, Rüdiger Mitdank, Günter Wagner, Zbigniew Galazka and Saskia F. Fischer.
3. *Magnetization control in Cr2O3-based exchange-coupled systems.* **Rocio Ranchal**, I. Hontecillas.
4. *Surface investigation of a TiO2 lepidocrocite-like structure growth on Cu(001).* **Andrea Luigi Sorrentino**, Khaled E. El-Kelany, Giulia Serrano, Lorenzo Poggini, Brunetto Cortigiani, Andrea Atrei, Anna Maria Ferrari, Roberta Sessoli and Matteo Mannini.

5. *Inclusion of a perovskite ferroelectric thin film as an efficient pathway to enhance the photovoltaic characteristics of Si/SnOx heterojunctions*. **José Silva**, E. M. F. Vieira, K. Gwozdz, F. G. Figueiras, K. Veltruská, V. Matolín, M. C. Istrate, C. Ghica, K. C. Sekhar, A. L. Kholkin, L. M. Goncalves, A. Chahboun, M. Pereira.

6. *Orbital engineering of Yttrium vanadate superlattices*. **Padma Radhakrishnan**, Benjamin Geisler, Daniel Putzky, Katrin Fürsich, Sven Ilse, Georg Christiani, Peter Wochner, Yi Wang, Peter van Aken, Eberhard Goering, Rossitza Pentcheva, Bernhard Keimer, and Eva Benckiser.

Wednesday, 02 September 2020

Zoom host: Harvey Amorín.

9:30-10:10 *"Ferroelectric" two-dimensional electron gases for spin-orbitronics*. **Manuel Bibes (invited)**, Felix Trier, Paul Noël, Luis M. Vicente Arche, Julien Bréhin, Diogo C. Vaz, Vincent Garcia, Stéphane Fusil, Agnès Barthélémy, Laurent Vila, Jean-Philippe Attané.

10:10-10:30 *AFM Electric Field-Induced Local Topotactic Transformation between Perovskite and Brownmillerite SrFeO3-delta*. **Elias Ferreiro Vila**, S. Blanco-Canosa, I. Lucas del Pozo, Hari Babu Vasili, C. Magén, J. Rubio-Zuazo, R. G. Castro, L. Morellón, F. Rivadulla.

10:30-10:50 *Mapping unit-cell thickness variations in thin films by post-deposition reflection high-energy electron diffraction*. **Sander Smink**, Y.A. Birkhölzer, J. van Dam, F.J.G. Roesthuis, G. Rijnders, H. Hilgenkamp, and G. Koster.

10:50-11:10 *Mapping metallic and insulating regions in rare-earth nickelate superlattices using monochromated electron energy-loss spectroscopy*. **Bernat Mundet**, Duncan T.L. Alexander, Claribel Domínguez, Alexandru B. Georgescu, Yajun Zhang, Jennifer Fowlie, Alain Mercy, Adrien Waelchli, Sara Catalano, Philippe Ghosez, Antoine Georges, Andrew J. Millis, Marta Gibert, and Jean-Marc Triscone.

11:10-11:30 *Atomically interface engineered all-oxide thin-film ferroelectric varactors with micrometer-thick SrMoO3*. **Philipp Komissinskiy**, P. Salg, L. Zeinar, D. Walk, A. Radetinac, A. Zintler, R. Jakoby, H. Maune, L. Molina-Luna, L. Alff.

11:30-11:50 *Strain-induced ferroelectricity in ferromagnetic EuO/BaO superlattices*. **Stanislav Kamba**, V. Goian, R. Held, D.G. Schlom, E. Bousquet, P. Ghosez, N.A. Spaldin.

11:50-12:30 *Achieving Enhanced Functionalities in Oxide Heterostructures Using Lateral and Vertical Interfaces*. **Judith L. MacManus-Driscoll (invited)**.

Special sessions Wednesday Afternoon

Zoom host: Irene González. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Enhanced magnetization of ultrathin NiFe2O4 films on SrTiO3(001) related to cationdisorder and anomalous strain*. **Joachim Wollschläger**.

2. *Transport Properties and Finite Size Effects in beta-Ga2O3 Thin Films*. **Robin Ahrling**, Johannes Boy, Martin Handwerg, Rüdiger Mitdank, Günter Wagner, Zbigniew Galazka, Saskia F. Fischer.

3. *Interface and surface stabilization of the polarization in ferroelectric thin films*. **Chiara Gattinoni**, N. Strkalj, M. Fiebig, M. Trassin, N. A. Spaldin.
4. *Polarization enhancement and interface design at multiferroic/ferroelectric BiFeO3/PbTiO3 heterointerfaces*. **Ying LIU**, Yin-Lian Zhu, Yi-Xiao Jiang, Yun-Long Tang, Yu-Jia Wang, Xiu-Liang Ma.
5. *Metallic Diluted Dimerization in VO2 Tweeds*. **Felip Sandiumenge**, Laura Rodríguez, Miguel Pruneda, César Magén, José Santiso, Gustau Catalan.
6. *Interface and surface stabilization of the polarization in ferroelectric thin films*. **Chiara Gattinoni**, N. Strkalj, M. Fiebig, M. Trassin, N. A. Spaldin.
7. *Integration of lead-free piezoelectric (KxNa1-x)NbO3 on silicon for microactuator technology applications*. **Chiara Groppi**, M. Asa, R. Bertacco.
8. *Switchable two-dimensional electron gas based on ferroelectric Ca:SrTiO3*. **Julien Bréhin**, F. Trier, L. M. Vicente-Arche, P. Hemme, P. Noël , M. Cosset-Chéneau, J.P. Attané, L. Vila, A. Sander, Y. Gallais, A. Sacuto, B. Dkhil, V. Garcia, S. Fusil, A. Barthélémy, M. Cazayous and M. Bibes.
9. *Effect of grain interfaces on ferroelectric and dielectric properties of K0.5Na0.5NbO3 ceramics processed by different routes*. **Mariana Gomes**, R. Vilarinho, R. Pinho, A. Almeida, M. Elisabete Costa, P. Vilarinho, J. Agostinho Moreira.

Posters

1. *Temperature-dependent impedance spectroscopy: a powerful tool for investigating electrical transport in nanostructured electrodes for solar cells*. **Arijeta Bafti**, Ivana Panžić, Lucija Višić, Luka Pavić, Vilko Mandić.
2. *Strain relaxation of GaN grown on Mica through the formation of telephone cord buckles*. **Ana Cros Stotter**, S. Garcia-Orrit, N. Garro, M. J. Recio-Carretero, F. Donatini, C. Bougerol, B. Gayral, E. Bellet-Amalric, J. L. Rouvière, R. Vermeersch, N. Feldberg, and B. Daudin.
3. *Resonant tunneling in GaAs/AlGaAs quantum well system for solar photovoltaics*. **Pavel Klemmer**, Yu.A. Mityagin, M.P. Telenkov.
4. *Structure-electrical properties relationship in polaronic WO3-P2O5 and MoO3-P2O5 glasses*. **Sanja Renka**, Luka Pavić, Petr Kalenda, Petr Mošner, Ladislav Koudelka, Ana Šantić.
5. *Manipulation of sperm microdroplets on iron doped lithium niobate plates*. **Andrés Puerto Vivar**, J. L. Bella, C. López-Fernández, A. García-Cabañes, M. Carrascosa.
6. *Potassium mobility_transport in niobium phosphate glasses – the influence of structure*. **Marta Razum**, Luka Pavić, Luciana Ghussn, Andrea Moguš-Milanković, Ana Šantić.

Thursday, 03 September 2020

Zoom host: Harvey Amorín.

9:30-10:10 *Antiferroelectric Electrocalorics*. **Gustau Catalan (invited)**, Pablo Vales-Castro, Amador Perez-Tomás, Krystian Roleder, Xavier Perpiñà, Miquel Vellvehí, Romain Faye, Emmanuel Defay.

10:10-10:50 *Large electrocaloric effects in PST multilayer capacitors over a wide range of temperatures including room.* **Neil Mathur (invited)**, B. Nair, T. Usui, S. Crossley, S. Kurdi, G. G. Guzmán-Verri, X. Moya, S. Hirose.

10:50-11:10 *Interface Piezoelectric and Pyroelectric Effect.* **Mingmin Yang**, Zheng-Dong Luo, Marin Alexe.

11:10-11:30 *Selective blocking of conducting ionic channels in Hf0.5Zr0.5O2 ferroelectric junctions.* **Milena Cervo Sulzbach**, Saúl Estandía, Jaume Gázquez, Florencio Sánchez, Ignasi Fina, Josep Fontcuberta.

11:30-11:50 *High ferroelectric polarization, endurance and retention in sub-5 nm Hf0.5Zr0.5O2 epitaxial films.* **Florencio Sánchez**, Jike Lyu, Tingfeng Song, Ignasi Fina.

11:50-12:30 *Tip-induced mechanical poling of P(VDF-TrFE) ferroelectric polymer films.* **Kathrin Dorr (invited)**, Robert Roth, Martin Koch, Thomas Thurn-Albrecht.

Special sessions Thursday Afternoon

Zoom host: Edwin Herrera. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Antiferroelectricity in pyroxene-like oxides.* **Hugo Aramberri**, Jorge Íñiguez.
2. *Ferroelectric 180-degree walls are mechanically softer than the domains they separate.* **Christina Stefani**, Neus Domingo, Gustau Catalan.
3. *Optically controlled ON/OFF operation in ferroelectric tunnel junction.* **Xiao Long**, Huan Tan, Florencio Sánchez, Ignasi Fina, Josep Fontcuberta.
4. *Nanolayering of PbTiO3-based Thin Films for Photoferroelectrics.* **Lutz Mühlenbein**, Chandra Bhal Singh, Andriy Lotnyk, Cameliu Himcinschi, Yeseul Yun, Niranjan Ramakrishnegowda, David Knoche, Xinye Li, Akash Bhatnagar.
5. *Circular Bulk Photovoltaic Effect in Bismuth Ferrite.* **David Knoche**, Yeseul Yun, Lutz Mühlenbein, Niranjan Ramakrishnegowda, Xinye Li, Akash Bhatnagar.
6. *Tracking ferroelectric domain formation during epitaxial growth of PbTiO3 films.* **Martin Sarott**, Manfred Fiebig, Morgan Trassin.
7. *Thriving Narrow Band Gap Ferroelectric Oxides for Photovoltaic Applications: Bi2ZnTiO6 Thin Films Deposited by RF Sputtering.* **Fábio Figueiras**, J.R. Fernandes, J.P.B. Silva, A.C. Lourenço, P.B. Tavares.
8. *Unconventional Ferroelectric Switching via Local Domain Wall Motion in Multiferroic ε-Fe2O3 Films.* **Martí Gich**, Lide Yao, Konstantin Z. Rushchanskii, Sampo Inkinen, Richeng Yu, Marjana, Ležaić, Florencio Sánchez, Martí Gich, and Sebastiaan van Dijken.
9. *Bulk controlled Photovoltaic effect in epitaxial PZT thin films.* **Niranjan Ramakrishnegowda**, Yeseul Yun, Xinye Li, David.S.Knoche, Lutz Mühlenbein, Akash Bhatnagar.

Posters

1. *Revealing the effect of silver on Ferroelectric, Dielectric properties of a Microwave-Sintered BaTiO3-Ag Nano composite for High Energy Capacitor*. **Mohsin Saleem**, Hamid Jabbar.
2. *Epitaxial Ferroelectric La-doped Hf0.5Zr0.5O2 Thin Films*. **Tingfeng Song**, Romain Bachelet, Guillaume Saint-Girons, Raul Solanas, Ignasi Fina, Florencio Sánchez.
3. *The synergistic effect of ferroelectric and light polarization on the photovoltaic response of hexagonal LuMnO3 single crystal*. **Yunwei Sheng**, Ignasi Fina, Josep Fontcuberta.
4. *At the origin of surface charge effect in piezoresponse force microscopy experiments*. **Huan Tan**, Florencio Sánchez, Mariona Coll, Ignasi Fina.
5. *Ferroelectric Hardening and Phase-Change Phenomena in Mn-Substituted BiFeO3-PbTiO3 Multiferroic Perovskites*. **Harvey Amorín**, Carmen M. Fernández-Posada, Miguel Algueró, Alicia Castro.
6. *Measuring Flexoelectric response of Free-standing beams by Nanoindentation*. **Emerson Coy**.
7. *The Electrocaloric Effect in Antiferroelectric PbZrO3 and Its Dynamics Characterized by High-Speed Infrared Imaging*. **Pablo Vales-Castro**, Romain Faye, Miquel Vellvehí, Xavier Perpinya, J.M. Caicedo, Xavier Jordà, Krystian Roleder, Dariusz Kajewski, Emmanuel Defay, Gustau Catalan.
8. *Impact of lanthanum doping on the photoelectronic processes in BaTiO3*. **Xinye Li**, Yeseul Yun, Niranjan Ramakrishnegowda, David Knoche, Lutz Mühlenbein, Stefan Ebbinghaus, Akash Bhatnagar.
9. *Structural and dielectric properties of sodium niobate in the NaNbO3/SrRuO3/(001)MgO heterostructure*. **Nikita Ter-Oganessian**, Anatoly Pavlenko, Daniil Stryukov, Sergey Guda.
10. *Photovoltaic effect in oxide superlattice structures*. **Yeseul Yun**, Lutz Mühlenbein, David S. Knoche, Andry Lotnyk, and Akash Bhatnagar.

Friday, 04 September 2020

Zoom host: Harvey Amorín.

9:30-10:10 *Domain clustering and polarization-dependent conductivity in BiFeO3 thin films* **Andrei Kholkin (invited)**, D. O. Alikin, A. S. Abramov, D. S. Chezganov, V. Ya. Shur, S. P. Reis, E. B. Araujo, E. E. Eliseev, A. N. Morozovska.

10:10-10:50 *Anomalous Motion of Charged Domain Walls and Associated Negative Capacitance in Copper-Chlorine Boracite* **Marty Gregg (invited)**, Joseph G. M. Guy, Charlotte Cochard, Pablo Aguado-Puente, Roger W. Whatmore, Michele Conroy, Kalani Moore, E. Courtney, Alan Harvey, Ursel Bangert, Amit Kumar, Raymond G. P. McQuaid.

10:50-11:10 *Physical Chemistry of Ferroelectric Oxides Surfaces: Pyrocatalysis and Ferrocatalysis* **Neus Domingo**, I. Spasojevic, E. Pach, K. Cordero-Edwards, V. Pérez-Dieste, C. Escudero, A.Verdaguer, M. Fernandez-Serra.

11:10-11:30 *Photoferroelectric oxide thin films for flexible self-powered devices*. **Jesús Ricote**, I. Bretos, R. Jiménez, M.L Calzada.

11:30-11:50 *Enhancement of phase stability and optoelectronic performance of BiFeO3 thin films via cation co-substitution*. **Mariona Coll Bau**, Pamela Machado, Carlos Escudero, Massimo Tallarida, César Menéndez, Claudio Cazorla.

11:50-12:30 *Ballistic Current From First Principles Calculations* **Andrew Rappe (invited)**, Zhenbang Dai, Aaron M. Schankler, Lingyuan Gao, Liang Z. Tan.

CMD2020GEFES mini-colloquium

Physics and Function of Protein Nanoshells: from Viruses to Biomimetic Nanocontainers

Pedro J de Pablo, Wouter Roos

The topic of this mini-colloquium is "Physics and function of protein nanoshells: from viruses to biomimetic nanocontainers", following up our proposal included in the CMD26. This burgeoning field in soft condensed matter combines various Physics approaches to study protein nanoparticles. Research on protein nanoshells has been traditionally linked with structural virology and related approaches that focus on finding the interplay between their function and structure. However, in recent years the application of Condensed Matter based techniques are unveiling new perspectives by studying and manipulating individual nanoparticles in real time. These novel approaches scrutinize the very physical mechanisms that determine the assembly, stability and disassembly of protein nanoshells that are key to understand the interplay of structure, property and function. These studies constitute a new paradigm not only for biological research, but also for investigating the use of nanoshells as containers with specific cargos for technological applications. This recent work includes extensive theory and simulation and a host of new experiments involving techniques such as fluorescence correlation spectroscopy, cryoelectron and super resolution microscopy, AFM force-spectroscopy, optical tweezers, etc. These studies connect the physics of nanoshells to classical biology/virology approaches and to materials science.

Beyond the common interaction within the protein nanoshells community members, CMD2020GEFES (CMD28) provides a unique environment to accomplish the interaction of a broad spectrum of attendants (physicists, biologists and chemists) that would not have registered for highly specialized conferences, such as Physical Virology. Therefore, our mini-colloquium will stimulate the further insertion of the protein nanoshells community into the European solid state physics family, fostering synergy and reciprocal scientific benefits derived from such multidisciplinary approaches.

Monday, 31 August 2020

Zoom host: Lidia Martínez.

9:30-10:10 *Flying viruses – from biophysical to structural characterisation.* **Charlotte Uetrecht (invited).**

10:10-10:30 *Thermodynamic and kinetic aspects of polymorphism in core controlled assembly of virus-like particles.* **Alireza Ramezani,** Orfeas-Agis Karachalios, Paul van der Schoot, Roya Zandi.

10:30-10:50 *Biological and Biomimetic lipid-based Nanocontainers.* **Melissa C. Piontek**, Sourav Maity, Daan Vorselen, Raya Sorkin1, Margherita Marchetti1, Susan M. van Dommelen, Emma Logtenberg, Emma Kerklingh, Guy Brand, Rashmi Voleti, Josep Rizo, Alexander J. Groffen, J rgen Schiller, Sander T. D pp, Sander Kooijmans, Brigitte van Oirschot, Birgitta Versluijs, Marc Bierings, Richard van Wijk, Raymond M. Schiffelers, Gijs Wuite and Wouter H. Roos.

10:50-11:10 *BREAK.*

11:10-11:30 *A genome condensing protein regulates adenovirus entry in the cell.* **Mercedes Hernando-Pérez**, Natalia Martín-González, Marta Pérez-Illana, Maarit Suomalainen, Gabriela. N. Condezo, Philomena Ostapchuk, José Gallardo, Margarita Menéndez, Urs Greber, Patrick Hearing, Pedro J. de Pablo and Carmen San Martín.

11:30-11:50 *Biophysical characterization of human picobirnavirus capsis.* **María J. Rodríguez-Espinosa**, Álvaro Ortega-Esteban, Javier M. Rodríguez, José R. Castón, Pedro J. de Pablo.

11:50-12:30 *Archaeal viruses: the dark matter of the virosphere.* **Mart Krupovic (invited)**.

Special sessions Monday Afternoon

Zoom host: Lidia Martínez. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *AFM Study on HPV Entry Intermediates.* **Y. Feng**, I. L. B. Munguira, M. Schelhaas, C. Uetrecht, W. H. Roos.
2. *Assessing the Binding Energy of Viral Capsid Proteins using Atomic Force Microscopy.* **M. Jiménez-Zaragoza**, S. Roca Bonet, Q. Yang, C. E. Catalano, D. Reguera P. J. De Pablo.
3. *Structure of a polinton-like virus, the missing link between bacteriophage eukaryotic viruses of the PRD1-like lineage.* **G. N. Condezo**, Bratbak G. and San Martín C.
4. *Single molecule study of real-time self-assembly of the HIV capsid lattice at sub-second resolution.* **Sourav Maity**, Alejandro Valbuena, Mauricio G. Mateu, Wouter H. Roos.
5. *The role of adenovirus core protein V revealed with atomic force microscopy.* **Natalia Martín González**, Alfonso Gómez-González, Urs Greber, Carmen San Martín, Pedro J. de Pablo.

Posters

1. *Atomic force microscopy characterization of lizard adenovirus type 2: a first glance at the physical properties of atadenoviruses*. **José Gallardo**, N. Martín-González, M. Laguna, C. San Martín, P. J. de Pablo.
2. *Automated analysis of AFM virus nanoindentation data*. **Z. Wang**, Y. Feng, A. Herrmann, W. H. Roos.
3. *Ions at the 5-fold axis of icosahedral virus capsids: Cricket Paralysis virus*. **Ayelen Digilio,** María M. Branda, Rodolfo Porasso and Diego M.A. Guérin.
4. *Life is plastic: AFM characterization of hyperthermophilic archaeal virus SMV1*. **Miguel Cantero**, Virginija Cvirkaite-Krupovic, Mart Krupovic Pedro J. de Pablo.
5. *Monitoring single nanoreactors by simultaneous AFM-TIRFM: study on GFP-cargo in bacteriophage nanocontainers*. **Klara Strobl**, E. Selivanovitch, T. Dougla, P. J. de Pablo.
6. *Studying viral dynamics in a label-free approach at the single molecule level*. **C. van Ewijk**, S. Maity, W.H. Roos.
7. *Visualization of HBV Capsid Disassembly and Intermediate Structures by High-Speed Atomic Force Microscopy*. **Martijn Middelkamp**, Sourav Maity, Pedro Buzón, Adam Zlotnic2, Wouter H. Roos.

Tuesday, 01 September 2020

Zoom host: Eduardo Lee.

9:30-10:10 *Probing virus binding to cell surfaces in physiologically relevant conditions using AFM*. **David Alsteens (invited).**

10:10-10:30 *Triggering mis-assembly in viral capsid formation by elastic frustration*. **David Reguera**, Carlos I. Mendoza.

10:30-10:50 *Uncovering the mechanisms of the early stages of Hepatitis B virus assembly by a novel single-molecule approach*. **Pedro Buzón**, Maity S, Christodoulis P, Wiertsema M1, Dunkelbarger S, Kim 2, Wuite GJ, Zlotnick A and Roos WH.

10:50-11:10 *BREAK*

11:10-11:30 *How a Donnan potential affects the ionic strength and acidity of water in viruses and virus-like particles*. **Paul van der Schoot**.

11:30-11:50 *Towards a framework unifying the replication strategy, capsid protein fold, and capsid icosahedral lattice of viruses*. **Antoni Luque**, Reidun Twarock, Diana Lee, James Mullinix.

11:50-12:30 *Coherent viromimetics*. **Bogdam Dragnea (invited).**

Wednesday, 02 September 2020

Zoom host: Eduardo Lee.

9:30-10:10 *Structure and mechanics in adenovirus assembly.* **Carmen San Martín (invited).**

10:10-10:30 *Survival analysis provides evidence of long-distance cooperative penton release during human adenovirus uncoating.* **Pablo Ibáñez Freire**, Natalia Martín-González, Álvaro Ortega-Esteban, Carmen San Martín, Alejandro Valbuena, Rafael Delgado Buscalioni, Pedro José de Pablo.

10:30-10:50 *A minimal smooth coarse-grained model of the interaction between rotationally symmetric capsomers.* **M. Martín-Bravo**, J. M. Gomez Llorente, J. Hernández-Rojas.

10:50-11:10 *BREAK*

11:10-11:30 *Properties of cavities in biological structures – a survey of the Protein Data Bank.* **Mateusz Chwastyk,** Ewa A. Panek, Jan Malinowski, Mariusz Jaskólski, Marek Cieplak.

11:30-11:50 *Cryo-EM structure of enteric adenovirus HAdV-F41 highlights structural divergence among human adenoviruses.* **Marta Pérez-Illana**, Marta Martínez, Gabriela N. Condezo, Mercedes Hernando-Pérez, Casandra Mangroo, Martha Brown, Roberto Marabini, Carmen San Martín,

11:50-12:30 *Single-molecule studies of virus self-assembly and viral genome uncoating.* **Mauricio G. Mateu (invited)**, Valbuena, A., Maity, S, Roos, W.H.

CMD2020GEFES mini-colloquium

Physics in 2D Nanoarchitectonics

César Moreno, Aran Garcia-Lekue, Aitor Mugarza, Mads Brandbyge

The manufacturing of 2D nanoarchitectures leads to materials with novel and highly tunable physicochemical properties. For instance, nanostructuring of bulk 2D materials such as graphene or transition metal dicalchogenides, or combining these in lateral heterostructures or stacks, can bring new and highly tunable functionalities, turning metals into semiconductors, inducing magnetism or superconductivity, or introducing tailored reactivity and permeability. The nanostructuring can also be employed to generate and control in-plane anisotropy in otherwise isotropic crystalline structures, which can be extremely attractive in order to tune physical properties for applications such as electron and plasmon wave guiding, opto-mechanics, 2D logic operations, or anisotropic thermoelectrics. Complementary to this “top-down” approach is the “bottom-up” 2D nanoarchitectonics where it is possible to design new molecular materials by the covalent or coordinative self-assembly of organic and hybrid building blocks. This can lead to 2D metal-organic (MOF) and covalent (COF) frameworks, for example with Kagome and honeycomb lattice structure that combine Dirac electrons with flat bands, and where exotic quantum phases such as topological or quantum anomalous Hall insulators can emerge. Both “top-down” and “bottom-up” approaches to generate novel nanostructures and devices are currently progressing very fast.

This symposium aims at facilitating discussions and exchange of ideas about the latest advances and challenges on the emerging physics on 2D materials with well-defined functional nanoarchitectures. All aspects of fundamental experimental and theoretical research related to nanoarchitectured 2D materials including synthesis and characterization of their electrical, optical, thermal, and mechanical properties will be covered in this symposium.

Monday, 31 August 2020

Zoom host: Pablo Molina.

9:30-10:10 *On-surface synthesis of π-conjugated polymers.* **D. Ecija (invited)**.

10:10-10:30 *5-armchair graphene nanoribbons: open-shell structures with magnetic end states.* **A. Berdonces**, J. Lawrence, P. Brandimarte, M. Sabri, D. Sánchez-Portal, D.G. de Oteyza.

10:30-10:50 *Boron-doping Induced Topological Boundary States Inside Graphene Nanoribbons.* **Niklas Friedrich**, P. Brandimarte, J. Li, S. Saito, S. Yamaguchi, I. Pozo, D. Peña, T. Frederiksen, A. Garcia-Lekue, D. Sánchez-Portal.

10:50-11:10 *Controlled 2D Ferromagnetism in 1T-CrTe2. The role of charge density wave and strain.* **Jan Phillips**, A.O. Fumega, V. Pardo.

11:10-11:30 *Tailoring the magnetic anisotropy of lanthanides on surface-supported metal-organic networks.* **Sofia O. Parreiras**, D. Moreno, B. Cirera, M.A. Valbuena, J.I. Urgel, M. Paradinas, M. Panighel, A. Niño, J.M. Gallego, M. Valvidares, P. Gargiani, R. Miranda, J.I. Martínez, A. Mugarza, J. Camarero, P. Perna, D. Ecija

11:30-11:50 *Fe nanodots formed on a metalorganic network: growth and magnetism.* **L. Hernández-López,** J. Lobo-Checa, I. Piquero-Zulaica, M. Piantek, D. Serrate, F. Bartolomé.

11:50-12:10 *Electronic properties of low-angle twisted bilayer graphene,* V.H. Nguyen, D. Paszko, B. van Troeye, M. Lamparski, V. Meunier, **J.-C. Charlier**.

12:10-12:30 *Moiré diamanes based on ~30o twisted bigraphenes: features of atomic and electronic structures.* **L.A. Chernozatonskii**,, V.A. Demin.

Tuesday, 01 September 2020

Zoom host: Pablo Molina.

9:30-10:10 *On-surface synthesis: A versatile bottom-up strategy to low-dimensional carbon based nanostructures.* **S. Maier (invited)**.

10:10-10:30 *Tuning Surface Confinement through the Morphology of Extended Organic Nanoporous Networks.* I. Piquero-Zulaica, Z.M. Abd El-Fattah, A. Sadeghi, A. Arnau, J.E. Ortega, M. Stöhr, N. Lin, **J. Lobo-Checa**.

10:30-10:50 *Designing Atomic Quantum Defects in 2D Semiconductors.* **B. Schuler**, K. Cochrane, J.-H. Lee, C. Kastl, A. Holleitner, J. Neaton, J. Lischner, F.J. García de Abajo, J. Robinson, M. Terrones, A. Weber-Bargioni.

10:50-11:10 *Enhancing the photoluminescence efficiency of CVD grown MoS2 via defect engineering.* **O. De Luca**, A. Syari'ati, M. Carlotti, S. Soni, R. C. Chiechi, P. Rudolf.

11:10-11:30 *Radiative Decay of Dark Exciton Related Emission in a Sandwiched Monolayer WSe2 Revealed by Room Temperature Micro and Nano Photoluminescence.* **M. Rahaman**, O. Selyshchev, Y. Pan, I. Milekhin, S. Gemming, D.R.T. Zahn.

11:30-11:50 *Flat band superconductivity and edge transport in WTe2.* **Artem Kononov**, M. Endres, G. Abulizi, K. Qu, J. Yan, D. Mandrus, K. Watanabe, T. Taniguchi, C. Schönenberger.

11:50-12:10 *Optical characterization of few-layer MoS2 mechanical resonators.* **Victor Marzoa**, C. García-Perez, F.J. Urbanos, M. Acebrón, M.R. Osorio, R. Bernardo-Gavito, D. Granados.

12:10-12:30 *Cathodoluminescence in Single- and Multi-Wall WS2 Nanotubes.* S. Ghosh, V. Brüser, I. Kaplan-Ashiri, R. Popovitz-Biro, **J.I. Martínez**, J.A. Alonso, A. Zak.

Special sessions Tuesday Afternoon

Zoom host: Pablo Molina. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Ferrocene-Graphene Molecular Junctions for Light Photodetection.* **Jorge Trasobares**, M. Calero, J.C. Martín, A. Gómez, M.A. Niño, R. Miranda, D. Granados.
2. *Explaining observed stability of excitons in highly excited CdSe nanoplatelets*. **F. García Florez**, L.D.A. Siebbeles, H.T.C. Stoof.
3. *UV-light assisted on-surface synthesis of poly-para-phenylene chains.* **K. Schneider**, H. Tang, J. Bonvoisin, V. Langlais.

Posters

1. *Electronics without bridging components.* **V. García-Suárez**.
2. *Boosting the reactivity of nanoporous graphene-based membranes.* **S. Lois**, A. Garcia-Lekue, A. Sarasola.
3. *Electronic and transport properties of Li-decorated nanoporous graphene.* **X. D. de Cerio**, R.E. Menchón, A. Garcia-Lekue
4. *Band depopulation of graphene nanoribbons induced by chemical gating with amino groups.* **M. Corso**, J. Li, A. Garcia-Lekue, P. Brandimarte, M. Vilas-Varela, N. Merino-Díez, C. Moreno, A. Mugarza, J. Sáez Mollejo, D.G. de Oteyza, D. Sánchez-Portal, D. Peña, J.I. Pascual
5. *Challenges for the synthesis of corannulene-based non-planar nanographenes on surfaces*. **T. Wang**, J. Lawrence, N. Sumi, R. Robles, D. Peña, M. Corso, D.G. de Oteyza.
6. *Polymorph control of monolayer NbSe2 grown via MBE.* **K. Underwood**, F. Mazzola, L. Hart, A. Rajan, P.D.C. King.
7. *Study on preparation and gas sensing properties of Tin Diselenide.* **O.L. Camargo Moreira**, W. Cheng, H. Fuh, W. Chien, W. Yan, H. Fei, H. Xu, D. Zhang, Y. Chen, Y. Zhao, Y. Lv, G. Wu, C. Lv, S.K. Arora, C.O. Coileáin, C. Heng, C. Chang, H. Wu
8. *Ab-initio investigation of Raman and IR spectra of Moiré diamanes.* **V.A. Demin**, K.P. Katin, M.M. Maslov, L.A. Chernozatonskii
9. *Excitonic interlayer states in GaSe|MoS2 heterostacks.* **C. Wagner**, M. Rahaman, D.R.T. Zahn, S. Gemming
10. *Experimental and modelling results of Permalloy thin films in the undulated magnetic state.* **E.H. Sánchez**, G. Rodriguez-Rodriguez, R. Aragón, M.A. Arranz, E. Rebollar, M. Castillejo, J.M. Colino

Wednesday, 02 September 2020

Zoom host: Jose María De Teresa.

9:30-10:10 *Lithographic nanoporous graphene and bandgap engineering.* **P. Böggild (invited)**.

10:10-10:50 *Interfacing nanoscale materials in device architectures.* **M. Calame (invited).**

10:50-11:10 *Quantum Electronic Transport Across "Bite" Defects in Graphene Nanoribbons Screen reader support enabled.* **M. Pizzochero**, K. er evi s, G. B. Barín, S. Wang, P. Ruffieux, R. Fasel, O.V. Yazyev.

11:10-11:30 *Quantum Interference Engineering of Nanoporous Graphene for Carbon Nanocircuitry,* G. Calogero, **I. Alcon**,N. Papior, A.P. Jauho, M. Brandbyge.

11:30-11:50 *Compact SQUID realized in a double layer graphene heterostructure.* **D. I. Indolese**, P. Karnatak, A. Kononov, R. Delagrange, R. Haller, L. Wang, P. Makk, K. Watanabe, T. Taniguchi, C. Schönenberger.

11:50-12:10 *Novel device integration - combining bottom-up and top-down approach.* **A. Erbe**.

12:10-12:30 *Impact of mechanical folding on the electronic properties of 2D nanomaterials.* **A. Impellizzeri**, M. Amato, A. Zobelli, C.P. Ewels.

CMD2020GEFES mini-colloquium

Plasmonic metamaterials: from surfaces to 3D supercrystals

Arantxa Fraile Rodríguez, Jose A. Sánchez Gil, Jaime Gómez Rivas, Antonio García Martín

This minicolloquium is intended to gather researchers interested in the study and applications of plasmonic and/or dielectric/semiconductor metamaterials, from single nanostructures to 2D and 3D networks of bottom-up or top-down nanoelements and nanoparticles. Special attention will be given to applications in optical biosensors, antennas, enhanced imaging and spectroscopies, biology and medicine.

TOPICS will include:

1. Metasurfaces and 3D superlattices
2. Metamaterials for biosensing
3. Graphene-based plasmonic devices
4. Active chiral metamaterials
5. Hybrid magnetoplasmonic crystals
6. Nanophononic metamaterials
7. Nanoscale imaging and enhanced spectroscopies

Wednesday, 02 September 2020

Zoom host: Pablo Molina.

9:30-10:10 *Plasmonic-MOFs nanostructures: Fabrication and applications.* **Isabel Pastoriza-Santos.**

10:10-10:50 *Applications of nanocolumnar coatings with light localization properties.* **Maria Ujué González (invited)**, Antonio García-Martín, and José Miguel García-Martín.

10:50-11:10 *Collective plasmonic modes in hexagonal arrays of Au nanoelements.* **Amílcar Labarta**, A. Conde-Rubio, J. Rodriguez-Alvarez, P. Molet, A. Mihi, F. Pérez-Murano, A. Fraile Rodríguez, and X. Batlle.

11:10-11:30 *SERS in arrays of geometrically frustrated plasmonic nanoelements.* **Javier Rodriguez-Alvarez**, A. Conde-Rubio, M. Escoda-Torroella, I. Caritg, P. Molet, A. Mihi, F. Pérez-Murano, A. Fraile Rodríguez, A. Labarta, and X. Batlle.

11:30-12:10 *Excitations and Radiative properties of Plasmonic Nanoantennas.* **Angela Demetriadou (invited)**, Kalun Bedingfield, and Nuttawut Kongsuwan.

12:10-12:30 *Unveiling the radiative local density of optical states of a plasmonic nanocavity by STM.* **Roberto Otero**, Alberto Martín-Jiménez, Antonio I. Fernández-Domínguez, Koen Lauwaet, Daniel Granados, Rodolfo Miranda, and Francisco J. García-Vidal.

Thursday, 03 September 2020

Zoom host: Pablo Molina.

9:30-10:10 *Acousto-plasmonics: from acoustic metasurfaces to chirality in coherent phonon generation experiments*. **Daniel Lanzillotti- Kimura (invited),** K. O'Brien, J. Rho, H. Suchowski, X. Zhang, A. L. Jimenez, and A. García-Martín.

10:10-10:30 *Dynamical graphene metasurfaces.* **Emanuele Galiffi**, Paloma A. Huidobro, A. Alù, and J. B. Pendry.

10:30-11:10 *Topological plasmonics: protected localized modes, non-hermitian effects and chiral light-matter interactions.* **Paloma Arroyo Huidobro (invited)**.

11:10-11:30 *Bound states in the continuum in metasurfaces with dipolar meta-atoms.* **Diego Romero Abujetas**, J. J. Sáenz, and Jose A. Sánchez-Gil.

11:30-11:50 *Near- and Far-field Excitation of Topological Plasmonic Metasurfaces.* **Matthew Proctor**, Richard V. Craster, Stefan A. Maier, Vincenzo Giannini, and Paloma Arroyo Huidobro.

Pre-recorded talks Pre-recorded talks and videos on YouTube.

1. *Silver nanoparticle chains as subwavelength fluorescence-guides at ultra-long distances.* **Javier Fernández-Martínez**, Javier López-Fernández, Pablo Molina, Sol Carretero-Palacios, Mariola O Ramírez, and Luisa E. Bausá.

Posters

1. *Gain layer photoluminescence enhancement via its hybridization with multilayer all-dielectric metasurface.* **Kateryna Domina** and V.V. Khardikov.
2. *Theoretical investigation of the molecular structure, vibrational spectra, thermodynamic and nonlinear optical properties of 4, 5-dibromo-2, 7dinitro- fluorescein.* **J. B. Fankam Fankam**, G. W. Ejuhb, and J. M. B. Ndjakaa.
3. *Nanoparticle structures on active photovoltaic LiNbO3 substrates for plasmonic fluorescence enhancement.* **Andrés Puerto**, I. Elvira, A. García-Cabañes, and M. Carrascosa.

CMD2020GEFES mini-colloquium

Quantum thermoelectrics and heat currents in the nanoscale

Rafael Sánchez, Linda Zotti, Edmund Leary, Janine Splettstoesser

The drive to an energy-sustainable future requires a fundamental understanding of heat and electrical transport at the nanoscale. Transport in quantum electrical conductors has recently expanded its scope to include the study of heat and thermoelectric currents. This is in part due to the improved experimental control of temperature gradients and thermometry in a variety of systems including interacting quantum dots, molecular junctions, chiral edge states in the quantum Hall regime, or tunnel junctions. They have demonstrated salient thermal and thermoelectric properties due to e.g., effects of confinement, quantum interference, and the role of interactions and non-linearities. In practice, they work as efficient thermoelectric generators, refrigerators, energy harvesters, and thermal rectifiers. Fundamentally, the investigation of heat transport at the nanoscale sheds light on phenomena based on electron-electron interactions, phase coherence and coupling to non-equilibrium environments (such as molecular vibrations, phonon baths, cavity photons, or electromagnetic fluctuations) not present in macroscopic configurations. They also allow for direct measurements of entropy production or mutual information transfer. For these reasons, the interest of mesoscopic thermal devices lies at the intersection of fields as diverse as quantum and stochastic thermodynamics, quantum transport and energy management.

Overall, this colloquium provides an excellent opportunity for bringing together theoreticians and experimentalists from different fields such as molecular electronics, quantum dots and metallic nanocontacts, all working under the common umbrella of thermal conductance and thermoelectricity.

Wednesday, 02 September 2020

Zoom host: Isabel Guillamón.

9:30-10:10 *Thermoelectric Properties of Atomic Contacts and Single-Molecule Junctions*. **Nicolás Agraït (invited)**.

10:10-10:50 *Thermal conductance and thermoelectricity of single-atom and single-molecule junctions*. **Fabian Pauly (invited)**.

10:50-11:10 *Thermoelectric Transport in a Graphene Moiré Super Lattice*. **Christopher R. Anderson**, Victor H. Guarochico-Moreira, Alessandro Principi, Irina Grigorieva, Vladimir I. Fal'ko, and Ivan J. Vera-Marun.

11:10-11:30 *Thermal and thermoelectric transport along single molecule junctions*. **Andrea Gemma**, H. Dekkiche, N. Mosso, S. Sangtarash, U. Drechsler, M. Calame, C. Lambert, M. R. Bryce, H. Sadeghi and B. Gotsmann.

11:30-11:50 *Record spintronic harvesting of thermal fluctuations using paramagnetic molecular centers*. **Bhavishya Chowrira Poovanna**, L. Kandpal, D. Mertz, C. Kieber, J. Arabski, A. Bahouka, R. Bernard, L. Joly, E. Monteblanco, S. Mohapatra, E. Sternitzky, F. Scheurer, V. Da Costa, M. Hehn, F. Montaigne, B. Vileno, F. Choueikani, E. Otero, P. Ohresser, D. Lacour, W. Weber, S. Boukari, M. Bowen.

11:50-12:10 *Quantum thermopower of single-molecule junctions*. **Laura Rincón-García**, Charalambos Evangeli, Edmund Leary, M. Teresa González, Gabino Rubio-Bollinger, and Nicolás Agraït.

12:10-12:30 *Nanoengineering Thermoelectrics*. **Marisol Martín-González**, A. Ruiz-Clavijo, J. A. Perez-Taborda, L. Vera-Ondono, F. Briones, O. Caballero-Calero.

Thursday, 03 September 2020

Zoom host: Isabel Guillamón.

9:30-10:10 *Thermocurrent Coulomb diamonds of a single-molecule transistor*. **Herre van der Zant (invited)**.

10:10-10:50 *Simulating time-dependent thermoelectric transport in quantum systems*. Adel Kara Slimane, Phillipp Reck and **Geneviève Fleury (invited)**.

10:50-11:10 *Heat transport and thermopower in a strongly coupled single-quantum-dot device*. B. Dutta, D. Majidi, A. García Corral, S. Florens, P. Erdman, T. Costi , W. Talarico, N. Lo Gullo , H. Courtois, and **Clemens Winkelmann**.

11:10-11:30 *Power-efficiency-fluctuations trade-off in steady-state heat engines: The role of interactions*. **Giuliano Benenti**.

11:30-11:50 *Strongly reduced thermal conductivity of supported multilayer graphene nanowires*. S. Timpa, J. Rastikian, S. Suffit, P. Lafarge, C. Barraud, and **Maria Luisa Della Rocca**.

11:50-12:10 *Cooling by Powering the Quantum Hall Effect*. **David Sánchez**, Rafael Sánchez, Rosa López, and Björn Sothmann.

12:10-12:30 *The Nernst effect in Corbino geometry*. A. V. Kavokin, B. L. Altshuler, S. G. Sharapov, P. S. Grigoryev, and **Andrey Varlamov**.

Special sessions Thursday Afternoon

Zoom host: Isabel Guillamón. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Low-Frequency Imaginary Impedance at the Superconducting Transition of 2H-NbSe2*. **David Perconte**, Samuel Mañas-Valero, Eugenio Coronado, Isabel Guillamón, and Hermann Suderow.
2. *Thermal relaxation in double-spin systems*. **Philipp Stegmann**, J. König, and B. Sothmann.
3. *Detection of correlated noise sources in quantum rings*. Christian Riha, Sven S. Buchholz, Olivio Chiatti, Andreas D. Wieck, Dirk Reuter, and **Saskia Fischer**.
4. *Density functional theory studies of the effect of B, Al, N and P impurities on the electronic structure of Si0.3Sn0.7Ge alloy*. **Collins E. Ouserigha**, Ayibapreye K. Benjamin.

Posters

1. *Connectivity dependent thermoelectric properties of single thiophene molecule*. Hatef Sadeghi, Abdalghani Daaoub and **Nickel Blankevoort**, rest of authors.
2. *First Principle Investigation of Transport properties for 2-D Hetero-structure of Sb/h-BN: A Potential Candidate for Thermoelectric Energy Harvesting*. **Shivani Saini**, Anup Shrivastava and Sanjai Singh.
3. *Heat transport by electrons and phonons in tubular nanowires*. **Hadi Rezaie Heris**, Movaffaq Kateb, Sigurdur I. Erlingsson, Andrei Manolescu.
4. *High-performance n-type tin-deficient SnSe thermoelectric polycrystal*. **Javier Gainza Matín**, João E.F.S. Rodrigues , Yves Huttel, Oscar J. Dura, Michael M. Koza, María Teresa Fernández-Díaz, Juan J. Meléndez, Bence G. Márkus, Ferenc Simon, José Luis Martínez, Federico Serrano-Sánchez, Norbert M. Nemes, José Antonio Alonso.
5. *Quantum Heat Engine (QHE) Based on the Heisenberg XXZ Model*. **Youssef Khlifi**, A. El Allati and Y. Hassouni.
6. *Self-Oscillations in Quantum Nanomotors*. **Jorge Tabanera**, Juan M. R. Parrondo, Natalia Ares.
7. *Single-material unipolar thermoelectrics at nanoscale*. **Alhun Aydin**, Altug Sisman, Jonas Fransson.
8. *Single-Molecule Junctions: Thermoelectric Properties*. **Pablo Bastante Flores**, Juan Hurtado-Gallego and Nicolás Agraït.

Friday, 04 September 2020

Zoom host: Isabel Guillamón.

9:30-10:10 *Experiments on superconducting quantum heat valves and rectifiers*. **Bayan Karimi (invited)**, Yu-Cheng Chang, Jorden Senior, Alberto Ronzani, Azat Gubaydullin, Joonas T. Peltonen, and Jukka P. Pekola.

10:10-10:50 *Phase-coherent caloritronics with topological Josephson junctions*. **Björn Sothmann (invited)**.

10:50-11:10 *Thermoelectric current in a graphene Cooper pair splitter*. Z. B. Tan, A. Laitinen, **Nikita Kirsanov**, A. Galda, V. M. Vinokur, M. Haque, A. Savin, D. S. Golubev, G. B. Lesovik, and P. J. Hakonen.

11:10-11:30 *Thermoelectric detection of Andreev states from unconventional pairings*. T. Savander, S. Tamura, C. Flindt, Y. Tanaka, and **Pablo Burset**.

11:30-11:50 *Nonlocal Thermoelectricity in a S-TI-S Junction in Contact with a Normal-Metal Probe: Evidence for Helical Edge States*. **Gianmichele Blasi**, Fabio Taddei, Liliana Arrachea, Matteo Carrega, and Alessandro Braggio.

11:50-12:10 *Heat pumping from Majorana braiding: statistics and fluctuation theorems*. Thomas Simons, Dganit Meidan and **Alessandro Romito**.

12:10-12:30 *Nonequilibrium Josephson junctions: thermoelectricity and coherent effects*. Giampiero Marchegiani, Claudio Guarcello, Francesco Giazotto, and **Alessandro Braggio.**

CMD2020GEFES mini-colloquium

Scanning Probe Lithography for novel materials and advanced devices

Yu Kyoung Ryu, Armin Wolfgang Knoll

Scanning Probe Lithography is a powerful technique that yields direct, clean, non-destructive and high resolution processing on a wide number of samples: magnetic, conductive, insulating, polymer, biological, 2D materials. It is based on the highly-localized physical and/or chemical interaction between the atomic force microscope tip and a given sample to modify its composition, displace it, remove it selectively. SPL has demonstrated sub-10 nm resolution patterning, sub-10 nm positioning accuracy, nanometer accuracy in grayscale lithography and mix-and-match compability with optical and electron beam lithographies to combine high-resolution and high-throughput. These capabilities have been exploited in the last years to fabricate successfully silicon and 2D materials (transition metal dicalchogenides, black phosphorus, graphene) based electronic devices at the nanoscale, Brownian motor nanofluidic ratchets, tissue topography nanoscale replication for cell culture, reconfigurable magnetic metamaterials and controlled layer-by-layer thinned black phosphorus flakes.

Friday, 04 September 2020

Zoom host: Lidia Martínez.

9:30-10:10 *Scanning-Probe-Assisted Nanowire Circuitry*. **Pablo Ares (invited)**, Miriam Moreno-Moreno, Consuelo Moreno, Félix Zamora, Cristina Gómez-Navarro, Julio Gómez-Herrero.

10:10-10:50 *The Rising Ratchet: Precise Particle Sorting using Nanofluidic Rocking Brownian Motors*. **Philippe Nicollier (invited)**, Christian Schwemmer, Francesca Ruggeri, Armin Wolfgang Knoll.

10:50-11:10 *Puzzling Electrical Conduction of Nanowire-like Surface Entities Fabricated by Interfacial Electron Beam Lithography*. **Jacob Sagiv,** Rivka Maoz, Shuangyang Zou, Bedanta Gogoi, Peter Nelson, Jonathan Berson, Doron Burshtain, Ora Bitton.

11:10-11:30 *Thermal Scanning Probe Lithography- a Review*. **Felix Holzner**.

11:30-11:50 *Thermomechanical Nanocutting of 2D Materials using Thermal Scanning Probe Lithography*. **Ana Conde-Rubio,** Xia Liu, Samuel Tobias Howell, Giovanni Boero, Juergen Brugger.

11:50-12:10 *Production of Large Single Layer Oxidized Regions by Massive Local Anodic Oxidation of Graphene*. **Sergio Quesada**, Fernando Borrás, Carmen Coya, Esteban Climent, Carmen Munuera, Ignacio Villar, Víctor A. de la Peña O'Shea, Alicia de Andrés, Ángel L. Álvarez.

12:10-12:30 *Optical Fourier Surfaces*. **Nolan Lassaline,** Raphael Brechbühler, Sander J. W. Vonk, Korneel Ridderbeek, Martin Spieser, Samuel Bisig, Boris le Feber, Freddy T. Rabouw, David J. Norris.

12:30-12:50 *o-SPL on 2D Materials: High-Resolution patterning and Nanodevices*. **Francisco M. Espinosa,** Yu Kyoung Ryu, Arancha I. Dago, Yang He, Carmen Munuera, Elena López-Elvira, Ricardo Garcia.

CMD2020GEFES mini-colloquium

Spin Orbit physics in condensed matter

Paolo Perna, Stefania Pizzini, Oksana Chubykalo-Fesenko, Félix Casanova, Jean-Philippe Attané, Ingrid Mertig

The aim of this research mini colloquium is to highlight the very recent experimental and theoretical developments related to the spin-orbit physics in condensed matter.

The conference will be focused on the interplay of the spin orbit interaction with electronic structure, magnetism, transport in bulk materials, at surfaces and interfaces, in thin films, 2 dimensional materials and heterostructures. We aim at discussing and exploring new concepts in spintronics based on spin dependent transport, as spin orbit torques, Rashba effect, Spin Hall Effect, topological insulators, antiferromagnetic spintronics, spin caloritronics, spin pumping, Spin-Charge conversion, including field, current and light-driven phenomena.

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Monday, 31 August 2020

Zoom host: Cristina Bran.

9:30-10:10 *Antiferromagnetic Insulatronics: Spintronics without magnetic fields*. **Matthias Klaui (invited)**.

10:10-10:50 *Different mechanisms of the current-induced switching in antiferromagnets*. **Helen Gomonay (invited)**.

10:50-11:30 *Interface-induced chiral magnetism and current-driven wall motion in ferrimagnetic insulators*. **Saul Velez (invited)**, Jakob Schaab, Martin S. Wörnle, Marvin Müller, Elzbieta Gradauskaite, Pol Welter, Cameron Gutgsell, Corneliu Nistor, Christian L. Degen, Morgan Trassin, Manfred Fiebig, and Pietro Gambardella.

11:30-11:50 *Spin Hall effect in ferroelectric Rashba semiconductor GeTe*. **Jagoda Sławińska**, Christian Rinaldi.

11:50-12:10 *Spin-Orbit Torque from the Introduction of Cu Interlayers in Pt/Cu/Co/Pt Nanolayered Structures for Spintronic Devices*. **Alberto Anadon**, R. Guerrero, J. A. Jover-Galtier, A. Gudín, J. M. Díez, P. Olleros-Rodríguez, R. Miranda, J. Camarero, and P. Perna.

12:10-12:30 *Magnetization reorientation due to the superconducting transition in heavy-metal heterostructures*. **Lina G. Johnsen**, Niladri Banerjee, Jacob Linder.

Special sessions Monday Afternoon

Zoom host: Cristina Bran. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Strong interfacial exchange field in a heavy metal/ferromagnetic insulator system determined by spin Hall magnetoresistance*. **J. M. Gomez-Perez**, K. Oyanagi, X.-P. Zhang, F. Calavalle, M. Ilyn, C. Gonzalez-Oreallana, M. Gobbi, E.Sagasta, T. Kikkawa, C. Rogero, V. N. Golovach, L. E Hueso, F. Sebastian Bergeret, E. Saitoh and F. Casanova.
2. *Quantum spin liquid ground state in the disorder free triangular lattice NaYbS2*. **R. Sarkar**, Ph. Schlender, V. Grinenko, E. Haeussler, Peter J. Baker, Th. Doert, and H.H. Klauss.
3. *Spin-orbit interaction and snake states in a graphene p-n junction*. **De Martino**, D. Bercioux.
4. *Improved effective equation for the Rashba spin-orbit coupling in semiconductor nanowires*. **Samuel D. Escribano**, Alfredo Levy Yeyati, and Elsa Prada.
5. *Superconductivity-induced change in magnetic anisotropy in epitaxial ferromagnet-superconductor hybrids with spin-orbit interaction*. **César González-Ruano**, Diego Caso, Lina G. Johnsen, Coriolan Tiusan, Michel Hehn, Niladri Banerjee, Jacob Linder, Farkhad G. Aliev.
6. *Bi-induced chiral spin textures through Dzyaloshinskii-Moriya interaction*. **Miguel A. González Barrio**, Gong Chen, Silvia Gallego, Sandra Ruiz Gómez, Andreas K. Schmid, Enrique G. Michel, Arantzazu Mascaraque.

7. *High spin-to-charge conversion signals in amorphous BixSe1-x.* **I.C. Arango**, C. K. Safeer, L. E. Hueso, F. Casanova.

8. *Highly tunable spin-orbit torque and anisotropic magnetoresistance in topological insulator thin films.* **Ali G. Moghaddam**, A. Qaiumzadeh, A. Dyrdal, J. Berakdar.

9. *Electrical control of spins and giant g-factors in ring-like coupled quantum dots.* **A. Tsintzis**, H. Potts, I-J. Chen, A. Tsintzis, M. Nilsson, S. Lehmann, K. A. Dick, M. Leijnse, C. Thelander.

10. *Inertial Domain Wall Motion Driven by Staggered Spin-Orbit Fields in Uncompensated Antiferromagnets.* **R. Rama-Eiroa**, P. E. Roy, J . M. González, K. Y. Guslienko, J. Wunderlich, R. M. Otxoa.

11. *R-Fe and Fe-Fe magnetic interactions and spin-phonon coupling of RFeO3.* **R. Vilarinho**, M.C. Weber, M. Guennou, A. Miranda, T. Teixeira, C. Dias, P. Tavares, J. Kreisel, A. Almeida, and J. Agostinho Moreira.

12. *Insights into the electric transport of sputtered Sb2Te3 topological insulator thin films towards spintronics applications.* **Sofia Ferreira Teixeira**, Ana L. Pires, João P. Araújo, André M. Pereira.

13. *g-tensor resonance in double quantum dots with site-dependent g-tensors.* **Philipp M. Mutter**, Guido Burkard

Tuesday, 01 September 2020

Zoom host: Cristina Bran.

9:30-10:10 *Harnessing the spin orbit interaction at various interfaces for the interconversion between spin and charge currents.* **Laurent Vila (invited)**, P. Noel, Y. Fu, M. Cosset-Chenneau, V.T. Pham, A. Marty, J-P Attane.

10:10-10:50 *Optimizing the spin Hall effect from material design.* **Martin Gradhand (invited)**.

10:50-11:30 *Spin-to-charge conversion using surface states of topological insulators.* **Nicolas Reyren (invited)**, L. Baringthon, E. Rongione, T. H. Dang, M. Morassi, G. Patriarche, A. Lemaître, S. Dhillon, J. Hawecker, J. Mangeney, J. Tignon, R. Lebrun, H. Jaffrès, A. Fert, P. Lefèvre, J.-M. George.

11:30-11:50 *Charge-to-Spin Conversion in Low-Symmetry Topological Materials.* **Jose H. Garcia**, Marc Vila, Chuang-Han Hsu, Jose H. Garcia, L. Antonio Benitez, Xavier Waintal, Sergio Valenzuela, Vitor M. Pereira, and Stephan Roche.

11:50-12:10 *Charge to spin conversion in graphene/BiTeBr heterostructures.* **Péter Makk**, Zoltán-Kovács Krausz, Simon Zihlmann, Anamul Md Hoque, Bálint Szentpéteri, Saroj Dash, Christian Schönenberger and Szabolcs Csonka.

12:10-12:30 *Gate tunability of highly efficient spin-to-charge conversion by spin Hall effect in graphene proximitized with WSe2.* **Franz Herling**, C.K. Safeer, Josep Ingla-Aynés, Nerea Ontoso, Luis E. Hueso, and Fèlix Casanova.

Special sessions Tuesday Afternoon

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Wednesday, 02 September 2020

Zoom host: Cristina Bran.

9:30-10:10 *Interfacial Dzyaloshinskii-Moriya interaction in BTO/CoFeB/Pt system: effect of the oxide termination and polarization.* **Silvia Tacchi (invited)**, Weinan Lin, Baishun Yang, Andy Paul Chen, Xiaohan Wu, Rui Guo, Shaohai Chen, Qidong Xie, Xinyu Shu, Liang Liu, Yajuan Hui, Gan Moog Chow, Yuanping Feng, Giovanni Carlotti, Hongxin Yang, Jingsheng Chen.

10:10-10:50 *Skyrmiogenesis: Asymmetric skyrmion-antiskyrmion production in ultrathin ferromagnetic films.* **Joo-Von Kim (invited)**, Ulrike Ritzmann, Bertrand Dupé, Louise Deplat, Robert E. Camley.

10:50-11:30 *Ultrafast Light-Induced Nucleation of Skyrmion Lattices.* **Pablo Olleros-Rodríguez (invited)**, Mara S. Strungaru, Sergiu I. Ruta, Paul I. Gavriloaea, Paolo Perna, Oksana Chubykalo-Fesenko, Roy W. Chantrell.

11:30-11:50 *Spin-orbit magnetic state readout in scaled ferromagnetic/heavy metal nanostructures.* **Inge Groen**, Van Tuong Pham, Sasikanth Manipatruni, Won Young Choi, Dmitri E. Nikonov, Edurne Sagasta, Chia-Ching Lin, Tanay Gosavi, Alain Marty, Luis E. Hueso, Ian Young, and Fèlix Casanova.

11:50-12:10 *Electronically driven spin-reorientation transition of the correlated polar metal.* **I. Marković**, M. D. Watson, O. J. Clark, F. Mazzola, E. Abarca Morales, C. A. Hooley, H. Rosner, C. M. Polley, T. Balasubramanian, S. Mukherjee, N. Kikugawa, D. A. Sokolov, A. P. Mackenzie, P. D. C. King.

12:10-12:30 *X-ray magnetic circular dichroism in topological insulators interfaced with rare-earth iron garnets.* **Adriana I. Figueroa**, Frédéric Bonell, Lorenzo Camosi, Regina Galceran, Danilo Longo, Sergio O. Valenzuela.

CMD2020GEFES mini-colloquium

Spin Transport via Geometric Design at the Nanoscale

Diego Frustaglia, Carmine Ortix

This mini-colloquium focuses on spin transport in quantum wires and films where the geometric shape can play a fundamental role in spin dynamics and interferometry. This includes nanostructured circuits and devices based on semiconducting, superconducting, and topological materials, together with graphene.

Keywords:
- Spin-orbitronics.
- Topological spintronics.
- Aharonov-Bohm/Casher/Anandan phases.
- Berry curvature and geometric phases.
- Nanostructures, devices and applications.

Tuesday, 01 September 2020

Zoom host: Pablo Llombart.

9:30-10:10 *Spin interference controlled by geometric effects*. **Junsaku Nitta (invited).**

10:10-10:50 *Magnetotransport and Quantum Hall Effect in Curved Topological Insulator Nanowires*. **Klaus Richter (invited)**.

10:50-11:10 *Geometrically driven effects in curved superconducting nanostructures*. **Paola Gentile**.

11:10-11:30 *Spin-polarized currents in corrugated graphene nanoribbons*. **Hernán Santos**.

11:30-11:50 *Abelian and not-Abelian geometric phases in transport through polygonal structures*. **Dario Bercioux**.

11:50-12:10 *Effects of environment to the generation of quantum phases*. **Anton Ramsak.**

12:10-12:30 *Simulation of chiral topological phases in driven quantum dot arrays*. **Beatriz Pérez**.

Wednesday, 02 September 2020

Zoom host: Pablo Llombart.

9:30-10:10 *Perspectives on topology and geometry for nanoelectronics*. **Ivan Vera-Marun (invited)**.

10:10-10:50 *From fractional boundary charges to quantized Hall conductance*. **Jelena Klinovaja (invited)**.

10:50-11:10 *A quantum dot spin valve*. **Andreas Baumgartner**.

11:10-11:30 *Quantum spin-Hall disks and bent 3DTIs: harnessing the properties of topological states of matter*. **Raffaele Battilomo**.

11:30-11:50 *Designing topological phases, spin textures and spin interferometers by nanoscale shape deformation*. **Mario Cuoco**.

11:50-12:10 *Spin valves with exfoliated 2D materials: MoS2*. **Marta Galbiati**.

12:10-12:30 *Nanoscale spin injector driven by a microwave voltage*. **Andrei Nikitchenko**.

CMD2020GEFES mini-colloquium

Strain in Metal-Halide Perovskites and other Emerging Nanomaterials

Miguel Anaya, Javier Martín Sánchez, Ilaria Zardo, Krzysztof Galkowski

Whereas unintentional static strain in practical devices has been regarded as a feature to avoid for many years, strain engineering is nowadays ubiquitously used, e.g., to enhance the carrier mobility in transistors or to achieve lasing at reduced current densities in heterostructure systems. This is due to the fact that the physical properties of materials ultimately depend on the inter-distance between their constitutive atoms. As a natural consequence, the electrical, magnetic and optical response of materials can be tailored by modifying their deformation state. This strain-modulated control is especially interesting for the case of nanomaterials where size-dependent quantum confinement effects become relevant for a wide range of applications in quantum technologies.

In this symposium, we will focus on the recent progress on the static and elastic strain engineering of the optical and phononic properties of nanomaterials including metal halide perovskites nanostructures, nanowires, van der Waals bidimensional materials or quantum dots. We will cover advances on the active strain tuning of their physical properties as well as the influence of strain on the performance of nanomaterials for practical applications.

The first part will focus on “strain in metal halide perovskites”. This reborn family of materials show excellent optoelectronic properties such as strong light absorption, long charge carrier diffusion lengths and high radiative recombination yields. These factors have put them at the forefront of the emerging photovoltaic and lighting technologies. Recently, strain has been proven to correlate with the presence of defects in these materials, with a detrimental effect in the final performance of devices. This slot will focus on the fundamental understanding of strain in perovskites and how intrinsic or externally applied strain can dictate the performance of perovskite devices, now having realistic prospects of penetrating in the market in their flexible form.

The second part will be dedicated to “strain in quantum-confined nanostructures including quantum dots, Van der Waals materials for optoelectronics and nanowires”. The recent discovery of quantum light emission and direct bandgap in semiconductor transition metal dichalcogenide monolayers have triggered intensive research of these materials as promising candidates for flexible and ultra-compact advanced quantum technologies in photonics. In another note, nanowires are filamentary crystals that offer the possibility to apply a higher level of strain, thereby allowing fine-tuning of their electrico-optical and thermal properties since the reduction of dimensions increases the fracture stress limits. In the context of this session, we will discuss the possibility of controlling the optoelectronic properties of semiconductor quantum dots in nanomembranes, nanowires and VdW materials in a large range owing to their extraordinary stretchability, strategies that offer exciting perspectives.

This symposium will be highly interdisciplinary, bridging the fields of materials science, chemistry, physics and engineering. We will discuss cutting-edge progress on materials processing, device fabrication and characterisation in the macro, micro and nanoscale, from both theoretical and experimental perspectives. We expect to incentivise the development of novel practical systems that base their working principles on strain management.

Thursday, 03 September 2020

Zoom host, Dolores Martín.

9:30-10:10 *Using pressure to study the impact of the electron-phonon interaction on the band structure of bulk and nano-crystalline hybrid perovskites*. **Alejandro R. Goñi (invited)**.

10:10-10:30 *Controlled epitaxial growth of hybrid halide perovskites*. **Sheng Xu**.

10:30-10:50 *Photoflexoelectricity in Halide Perovskites*. **Gustau Catalan**, Longlong Shu.

10:50-11:10 *Strain and chemi-structural mechanisms when FAPbI3 perovskite matches the PbS QDs lattice*. **Sofia Masi,** Carlos Echeverría-Arrondo, K. M. Muhammed Salim, David F. Macias-Pinilla, Juan I. Climente, Iv n Mora-Ser .

11:10-11:30 *Segregation of defects at grain boundaries in halide perovskites*. **Ji-Sang Park**.

11:30-11:50 *Strain engineering in perovskite solar cells and its impacts on carrier dynamics*. **Qi Cheng**.

11:50-12:10 *Transient behavior of nanomechanical domains in triple cation perovskite films studied by atomic force microscopy*. **Ioanna Mela**, Chetan Poudela, Miguel Anaya, Géraud Delport, Kyle Frohna, Samuel D. Strank and Clemens Kaminski.

12:10-12:30 *Permanent Lattice Compression of Lead-Halide Perovskite for Persistently Enhanced Optoelectronic Properties*. **Ahmed Abdelhady**.

Special session Thursday Afternoon

Zoom host, Dolores Martín. Pre-recorded talks and poster videos on Youtube.

Pre-recorded talks

1. *Fracturing of polycrystalline MoS2 nanofilms*. **Marianna Sledzinska**, G. Jumbert, M. Placidi, A. Arrighi, P. Xiao, F. Alzina and C.M. Sotomayor Torres.
2. *Mechanical properties of atomically-thin chromium trihalides*. **Fernando Cantos-Prieto**, Alexey Falin, Martin Alliati, Dong Qian, Rui Zhang, Tao Tao, Elton J. G. Santos, Lu Hua Li, Efrén Navarro-Moratalla.

Posters

1. *Compression increases the activation barrier for phase segregation in mixed-halide perovskites*. **Loreta A. Muscarella**, Eline M. Hutter, Francesca Wittmann, Young Won Woo, Young-Kwang Jung, Jan Versluis, Aron Walsh, Huib J. Bakker, Bruno Ehrler.
2. *Structural and optical properties of mixed-valence gold halide perovskite, Cs2Au2I6: Emerging lead-free material for photovoltaic applications*. **Bhawna,** Mrinmoy Roy, Aftab Alam, M. Aslam.
3. *Femtosecond laser cutting of PMN-PT substrates for the fabrication of piezoelectric actuator devices*. **Sandra Stroj**, Giovanni Piredda, Dorian Ziss, Julian Stangl, Rinaldo Trotta, Javier Martí chez, Armando Rastelli.
4. *Reconstructive versus displacive-like transition in FeF3*. **Alvaro Lobato**, Miguel Recio-Poo, Alberto Otero-de-la-Roza, Miguel A. Salvadó, and J. Manuel Recio.

5. *Correlative microscopy techniques for probing subgrain structure and composition in halide perovskites*. **Affan N. Iqbal**, Tiarnan Doherty, Elizabeth Tennyson,Yu-Hsien Chiang, Miguel Anaya, Simone Ruggeri, Duncan Johnstone, Samuel Stranks.
6. *Influence of strain on the thermoelectric properties of Bi/TiO2 core/shell nanowires*. **Maximilian Kockert**, R. Mitdank, H. Moon, J. Kim, A. Mogilatenko, S. H. Moosavi, M. Kroener, P. Woias, W. Lee, S. F. Fischer.

Friday, 04 September 2020

Zoom host: Dolores Martín.

9:30-10:10 *Illuminating novel functionalities of TMD nanostructures with electron microscopy*. **Sonia Conesa-Boj (invited)**.

10:10-10:50 *Site-controlled and energy-tuneable single-photon sources in two-dimensional materials*. **Rinaldo Trotta (invited)**, M. Savaresi, A. Martínez-Suárez, D. Tedeschi, V. M. G. Suarez, P. Alonso-González, J. Martín-Sánchez.

10:50-11:10 *Strain-engineered single photon sources with atomically thin crystals*. **Schneider Christian**.

11:10-11:30 *2D straintronics*. **Andrés Castellanos**, Patricia Gant, Peng Huang, David Pérez de Lara, Dan Guo, Riccardo Frisenda.

11:30-11:50 *Strain tuning of the anisotropy in the optoelectronic properties of the two-dimensional transition metal trichalcogenide TiS3*. **Jose Angel Silva Guillen**, Enric Canadell, Pablo Ordejón, Francisco Guinea, Rafael Roldán.

11:50-12:10 *Strain engineering in hBN-encapsulated graphene*. **Lujun Wang**, Blesson Varghese, Andreas Baumgartner, Simon Zihlmann, Peter Makk, Jan Overbeck, David Indolese1, Kenji Watanabe, Takashi Taniguchi, and Christian Schönenberger.

12:10-12:30 *Direct and converse flexoelectricity: the effect of strain gradients and electric field gradients on nanoscale electromechanical responses*. **Neus Domingo**.

CMD2020GEFES mini-colloquium

Strongly disordered superconductors

Miguel Ortuño, Igor Yurkevich, Claire Marrache-Kikuchi

The interplay between disorder and superconductivity is a fundamental problem of condensed matter physics. Strongly disordered superconductors exhibit many unique characteristic properties and their behaviour violates the conventional theory of superconductivity posing a long-standing puzzle for a nature of the superconducting state.

The aim of the mini-workshop is to gather world-known experts in theory and experiment of disordered superconductors to address new challenges emerged recently due to innovative experimental techniques, fabrication of novel materials and the theoretical progress on the physics of strongly disordered and low dimensional superconductors.

Thursday, 03 September 2020

Zoom host: Hermann Suderow.

9:30-10:10 *Superconductor-Metal-Insulators Transitions in In/InOx Composites*. **Aaron Kapitulnik**, Xinyang Zhang, Bar Hen, Viktor Shelukhin, and Alexander Palevski.

10:10-10:50 *Broken Paradigms across Superconductor-Insulator Transitions*. **Nandini Trivedi**.

10:50-11:30 *Overactivated transport in the localized phase of the superconductor-insulator transition*. **V. Humbert**, M. Ortuno, A. M. Somoza, L. Bergé, L. Dumoulin, C.A. Marrache-Kikuchi.

11:30-11:50 *Higgs and Phase modes in disordered superconductors*. **Rajdeep Sensarma**, Abhisek Samanta, Amulya Ratnakar, Nandini Trivedi.

11:50-12:10 *Mesoscopic fluctuations of the local density of states and the order parameter in disordered superconductors*. **I. Burmistrov**.

12:10-12:30 *Two-body mobility edge of the Anderson-Hubbard model in three dimensions*. **G. Orso,** F. Stellin.

Friday, 04 September 2020

Zoom host: Hermann Suderow.

9:30-10:10 *Dissipation in quantum systems as near T=0 K.* **Dan Shahar**.

10:10-10:50 *Quantum criticality and crossing points in the magnetoresistance of thin TiN-films.* **C. Strunk**.

10:50-11:30 *Gate-tunable superconductivity in the AlOx/SrTiO3 heterostructure*. **Shamashis Sengupta**, Miguel Monteverde, Tobias Roedel, Anil Murani, Claire Marrache-Kikuchi, Andrés F. Santander-Syro, Franck Fortuna.

11:30-11:50 *Superconducting edge states in a topological insulator*. **V. Kagalovsky** and I. V. Yurkevich.

11:50-12:10 *Effect of disorder on Majorana localization in topological superconductors: a quasiclassical approach*. **Yao Lu**, Pauli Virtanen, and Tero T. Heikkilä.

12:10-12:30 *Non-ergodic metallic phase in Josephson-Junctions arrays*. **M. Pino**.

CMD2020GEFES mini-colloquium

Symmetry and Non-Linearity in Low-Dimensional Systems

Mario Amado Montero, José Manuel Caridad, Angelo di Bernardo, Jorge Quereda

The aim of this mini-colloquium is to study the interplay between symmetry and nonlinear effects in nanoscaled low-symmetry and low-dimensional systems.

The research community working in mesoscopic physics has seen intense research efforts in the field of two-dimensional systems in the last fifteen years working mainly with low-dimensional materials with relatively symmetrical 2D crystal lattices. These materials, such as graphene, hexagonal boron nitride (hBN) and molybdenum disulphide (MoS2), present in the bulk mostly isotropic in-plane physical properties leading to similar electrical, optical and phonon properties along the different crystal directions. This effect is favorable for the generation of many conventional electronic and photonic applications with controlled responses under external stimulus.

A novel approach for the generation of conceptually new semiconductor devices has aroused in the last years. It involves mesoscopic systems with extreme in-plane aspect ratios, such as nanoconstrictions or nanoribbons, together with the scrutiny of an emerging group of 2D-like materials with reduced in-plane crystal symmetry. The latter family of low-symmetrical materials encompasses a vast group of the transition metal dichalcogenides (as for example ReS2), group IV of mono-calchogenides (SnSe, GeSe, etc), black phosphorous, chiral molecules, (crystalline) topological insulators, etc. Due to their reduced crystal symmetry they possess distinct electrical, optical, thermal and mechanical characteristics along different in-plane directions. This new degree of freedom can provide previously unexplored tunability on semiconductor devices paving the way for the study of different exciting effects with great potential for technological impact.

We expect that this mini-colloquium will be a great opportunity to hear of the latest experimental developments in the study of interplay between symmetry and nonlinearity including (but not restricted to) valleytronics, quantum anomalous Hall effect, thermoelectricity, anomalous photovoltaic effects, unconventional superconductivity and chirality induced spin selectivity. Presentations of challenging theoretical ideas as well as novel detection schemes will also enrich the discussions.

Monday, 31 August 2020

Zoom host: Alberto Cortijo.

9:30-9:50 *Welcome and opening remarks.* **Jorge Quereda.**

9:50-10:30 *Controlling Spin-Orbit Torques Using Van der Waals Materials.* **Marcos H. D. Guimarães (invited).**

10:30-10:50 *Symmetry evolution of spin-scattering processes in two-dimensional transition metal dichalcogenides.* **Carmem M. Gilardoni**, F. Hendriks, C. H. van der Wal, Marcos H. D. Guimarães.

10:50-11:10 *Excitons, trions and Rydberg states in monolayer MoS2 revealed by low-temperature photocurrent spectroscopy.* **Daniel Vaquero**, V. Clericò, J. Salvador-Sánchez, A. Martín-Ramos, E. Díaz, F. Domínguez-Adame, Y.M. Meziani, E. Diez and J. Quereda.

11:10-11:50 *Symmetry Breakdown in a natural superlattice: Franckeite.* **Andrés Castellanos-Gómez (invited)**, R. Frisenda, G. Sanchez-Santolino, N. Papadopoulos, J. Urban, M. Baranowski, A. Surrente, D. K. Maude, M. Garcia-Hernandez, H. S. J. van der Zant, P. Plochocka and P. San-Jose.

11:50-12:10 *In-plane anisotropic optical and mechanical response in 2D MoO3.* **Sergio Puebla**, C. Munuera and A. Castellanos-Gómez.

12:10-12:30 *Mapping a Hierarchy of Modes in Finite-Length Spinful Nonlinear Luttinger Liquids.* **Pedro Vianez**, W. Kiat Tan, O. Tsyplyatyev, Y. Jin, A. Anirban, A. Anthore, I. Farrer, D. Ritchie, J. Griffiths, L. Glazman and C. Ford.

Tuesday, 01 September 2020

Zoom host: Alberto Cortijo.

9:30-10:10 *Transport through twisted double bilayer graphene: gaps, layers and interactions*. **Klaus Ensslin (invited)**, P. Rickhaus, F. de Vries, J. Zhu, E. Portolés, G. Zheng, M. Masseroni, A. Kurzmann and T. Ihn.

10:10-10:30 *Spectral properties of disordered surfaces of topological insulators*. **José Luis Hernando**, Y.Baba, E. Díaz and F. Domínguez-Adame.

10:30-10:50 *Chiral electronics in topological semimetals*. **Yuriko Baba**, F. Domínguez-Adame and R. Molina.

10:50-11:10 *Charge carrier transport properties in thin film hybrid field effect transistor structures*. **Andrius Aukštuolis**, N. Nekrašas, K. Genevičius, J. Jonikaitė-Švėgždienė and G. Juška.

11:10-11:50 *The electron spin and chiral systems. Merging that results from non-linear properties*. **Ron Naaman (invited).**

11:50-12:10 *Detecting chirality in two-terminal spintronic devices*. **Xu Yang**, C.H. van der Wal, and B. J. van Wees.

12:10-12:30 *Thermal and disorder effects in chiral induced spin-selectivity*. **Elena Díaz**, F. Domínguez-Adame, R. Gutierrez and V. Mujica.

CMD2020GEFES mini-colloquium

Synthesis of Nanoparticles: Applications and New Perspectives

Sergio D'Addato, Yves Huttel

Synthesis, studies and applications of NanoParticles have been playing a major role in material science and technology over the last 20 years, although some important examples of NP presence in manufactured goods can be dated back to ancient history. Realization of NPs with chemical methods is nowadays mainstream, because of the cost effectiveness and scalability. On the other hand, physical synthesis either with a bottom-up or a top-down approach presents some advantages, especially when a “fine tuning” of the NP properties is required. Physical synthesis can be single-step and ligand-free, and these characteristics can result in a more accurate analysis of the NP structure and of their electronic, optical and magnetic behavior. Moreover, at present there is a variety of techniques; ball milling, gas-phase synthesis, pulsed laser deposition, physical vapor deposition, supersonic cluster beam, pyrolysis etc., that can be used for specific physical investigation and experimental analysis methods. We propose a minicolloquium focused on the properties of NPs obtained on physical synthesis and on other innovative synthesis methods. In particular, during the colloquium it is expected a focus on the relation between the structure and electronic properties of NPs and their relation with some phenomena like photocatalysis, energy and magnetic memory applications. Great emphasis will be given on innovative techniques and their potential scalability for industrial applications.

Tuesday, 01 September 2020

Zoom host: Lidia Martínez.

9:30-10:10 *Preparation of Liquid Suspensions of Nanoparticles for Medical Applications by Cluster Beam Deposition*. **Chris Binns (invited)**, Jose Angel de Toro, Peter Normile, Pablo Muñiz.

10:10-10:50 *Size and Concentration effects on the metamagnetic phase transition from B2-like FeRh nanoclusters assemblies*. **Veronique Dupois (invited)**, Anthony Robert, Adela Reyes, Guillermo Herrera, Damien Le Roy, Florent Tournus, Alexandre Tamion .

10:50-11:10 *Magnetic properties of ferromagnetic/antiferromagnetic metallic nanocomposites*. **Davide Peddis**, K.N. Trohidou, D. Fiorani, C. Binns.

11:10-11:30 *Aggregates and dipolar interactions in nanoparticle assemblies for hyperthermia*. **Òscar Iglesias**.

11:30-11:50 *Composition-dependent structure of bulk-immiscible bimetallic Au1Ni1-x nanoclusters*. **Anupam Yadav**, Ting-Wei Liao , Kuo-Juei Hu , Didier Grandjean , Peter Lievens.

11:50-12:10 *Tuning the morphology and the oxidation state of iron oxide nanoparticles*. **Mariona Escoda-Torroella**, C. Moya , A. Fraile Rodr guez , X. Batlle, A. Labarta.

12:10-12:50 *Cluster beam deposition for solvent-free production of heterogeneous catalysts*. **Maria Chiara Spadaro (invited)**, Richard E. Palmer, Jordi Arbiol.

Wednesday, 02 September 2020

Zoom host: Lidia Martínez.

9:30-10:10 *Synthesis of new carbon nanoarchitectures in the gas-phase*. Lidia Martínez (invited) Gonzalo Santoro, Pablo Merino, Miguel Jiménez, I. Tanarro, V. Herrero, L. Vázquez, A. Mayoral, M. Acolla1, G. Ellis, C. Joblin, J. Cernicharo, J. A. Martín-Gago.

10:10-10:50 *In-flight plasma modification of nanoparticles*. Hyneck Biederman (invited), Hana Libensk , Jan Hanu , Tereza Ko utov , Ond ej Kyli n, Miroslav Cieslar, Andrei Choukourov.

10:50-11:10 *Polar step-driven nucleation of plasmonic Ag nanoparticles on ZnO(1010)*. **Stefania Benedetti**, Ilaria Valenti, Sergio Valeri, Sebastian Castilla, Edouard Touz , Yael Bronstein, Alexandra Toumar, Fabio Finocchi, R mi Lazzari.

11:10-11:30 *Bonding of size-selected gold nanoclusters on graphene with and without point defects for the creation of functional hybrid nanostructures*. **Theodoros Pavloudis**, J. Kioseoglou, R.E. Palmer.

11:30-11:50 *Ultrafast dynamics of plasmon-mediated charge transfer in Ag@CeO2*. **Jacopo Stefano Pelli Cresi**, Emiliano Principi, Eleonora Spurio, Daniele Catone, Patrick O'Keeffe, Sergio D'Addato, Riccardo Mincigrucci, Laura Foglia, Claudio Masciovecchio, Federico Boscherini, Paola Luches.

11:50-12:10 *Nanoribbon arrays of palladium nanoparticles on flexible substrates for transparent conduction and hydrogen detection*. Elena H. Sànchez, Peter S. Normile, Jose A. De Toro, Rubén Caballero, Esther Rebollar, Marta Castillejo, Jose M. Colino.

12:10-12:30 *Preparation of Bi2S3 nanostructures for Computed Tomography*. **Carlos Moya**, M. Escoda-Torroella, D. Doblas, A. Fraile Rodríguez, A. Labarta, X. Batlle.

12:30-13:30 *Poster Session*

Posters

1. Enhanced photocatalytic efficiency by divalent cation doping at Bi site in BiFe0.95Mn0.05O3 Nanoparticle. **Astita Dubey,** Marianela E. Castillo, Vladimir V. Shvartsman, Doru C. Lupascu.

2. Optical and morphological properties of silver nanoparticles embedded in magnesium oxide for photovoltaic application. **Matteo Caleffi**, Sergio D'Addato, Valentina De Renzi.

3. Nanoparticles Based on Silicon and Iron: Physical Properties and Potential Bio-applications . **Yulia V. Kargina**, A.M. Perepukhov , A.V. Sobolev , M.V., E.S. Kozlyakova , E.A. Zvereva , A.Yu. Kharin , S. V. Savilov , A.A. Ischenko , V. Yu. Timoshenko.

4. Single step synthesis of hybrid lead halide perovskite nanoparticles via ionic metathesis. **Mrinmoy Roy**, Vikram , Arijit Mitra , Aftab Alam , M. Aslam.

CMD2020GEFES mini-colloquium

Topology- and Geometry-Controlled Functionalization of Nanostructured Metamaterials

José Manuel Llorens, Vladimir M. Fomin, Oliver Marquardt

Study of topological matter is one of the fascinating key trends of modern physics. This Mini-Colloquium is aimed at topology- and geometry-driven effects owing to complex geometries of advanced micro- and nanoarchitectures fabricated of both conventional and topologically nontrivial materials. Their design, production, and characterization constitute a main road towards future quantum devices for light emission, quantum cryptography, quantum information processing, thermoelectrics, bolometry and other nanotechnologies. Correspondingly, many experimental and theoretical efforts have been invested in a systematic understanding of their properties leading to novel applications. The Mini-Colloquium brings together world-leading experts in the field of topology- and geometry-controlled functionalization of nanostructured materials.

Thursday, 03 September 2020

Zoom host: Pablo Llombart.

9:30-10:10 *Geometry- and Topology-Driven Phenomena in Superconductor Micro-/Nanoarchitec-tures.* **V. M. Fomin (invited)**.

10:10-10:50 *Optical shaping of the polarization anisotropy in a laterally coupled quantum dot dimer.* **K. Kyhm (invited)**.

10:50-11:10 *Emerging chiral p-wave oscillations in a topological insulator.* **A. A. Golubov**.

11:10-11:30 *Phonon-engineered thermal conductivity in graphene.* **D. L. Nika**.

11:30-11:50 *Tuning of plasma frequency in THz grid metasurfaces for accurate sensing.* **G. P. Papari**, C. Koral, A. Andreone.

11:50-12:10 *Dynamic control of pattern formation and restructuring in constrained hydrogel membranes.* **Y. Xiong,** O. Kuksenok.

12:10-12:30 Special flash-talk Session (5 min. each) for pre-recorded talks:

1. *Nucleation chronology and electronic properties of In(As,Sb,P) graded-composition quantum dots.* **O. Marquardt**, K. M. Gambaryan, T. Boeck, A. Trampert.
2. *Exploiting the quantum dot-ring transition in type-II InAs/GaAsSb quantum dots.* **J. M. Llorens**, V. Lopes-Oliveira, V. López-Richard, J. M. Ulloa, B. Alén.
3. *Modelling of Phonons in Rolled-Up Nanostructures.* **I. Bogush**, V. M. Fomin.
4. *Thermal transport in Si/SiO2 multishell nanotubes.* **C. Isacova**, A. Cocemasov, D. L. Nika, V. M. Fomin.

Friday, 04 September 2020

Zoom host: Pablo Llombart.

9:30-10:10 *Unconventional Josephson junctions for quantum architectures.* **D. Massarotti (invited)**, H. G. Ahmad, A. Miano, R. Caruso, M. Arzeo, D. Montemurro, L. Parlato, P. Lucignano, G. P. Pepe, F. Tafuri.

10:10-10:50 *Functional nanostructures with complex topology.* **A. Sidorenko (invited).**

10:50-11:10 *Flat bands and nontrivial topological properties in an extended Lieb lattice.* **B. Pal**, A. Bhattacharya.

11:10-11:30 *Dynamic electrical properties of coupled topological chains.* **M. Kurzyna**, K. Tomasz.

11:30-11:50 *IrRep: a code to calculate symmetry properties of ab initio bandstructures.* **M. Iraola**, J. L. Mañes, T. Neupert, M. G. Vergniory, S. S. Tsirkin.

11:50-12:10 *Novel transrotational solid state order discovered by TEM for crystal growth in nanothin amorphous films.* **V. Kolosov**.

12:10-12:30 *Micro- and nano-structuring on different surface geometries and materials.* **M. Schnieper**, I. Zhurminsky, B. Gallinet, G. Basset.

CMD2020GEFES mini-colloquium

Ultrafast Dynamics and Transient States in Matter

Joaquim Agostinho Moreira, Klaas-Jan Tielrooij, Harvey Amorín

The emergence of ultrashort pulse lasers and the thereby enabled nonlinear experiments has pushed forward new capabilities to explore matter at ultrashort time scales. Ultrashort high power laser pulses can induce strong perturbations in electronic and crystallographic structures that can lead to new nonequilibrium states of condensed matter, basically cooperative changes in electronic, magnetic, optical and phononic states. The generation and detection of femtosecond pulses across the electromagnetic spectrum from terahertz to x-ray regions have enabled advanced ultrafast time-resolved spectroscopic techniques. Interesting experimental results have recently been reported on ultrafast phenomena in surfaces, nanostructures and 2D materials, ranging from light induced magnetism or superconductivity, dielectricto-metal transitions, and to nanoscale heat transport. Additionally, it is also important to establish theoretical methods that can be used to simulate low energy, high peak power laser pulse-matter interactions, and to predict the evolution of far-from-equilibrium systems. These processes can be exploited for applications, such as ultrashort pulse detection and sensing, and have revealed great scientific and practical impact towards providing a superior knowledge of room-temperature photoinduced superconductivity, bandgap metamaterial engineering, and novel metastable states of matter.

The purpose of this mini-colloquium is to present and discuss the emerging theoretical, numerical, and experimental results, share ideas and current knowledge, and expand the scope of future research towards advanced technologies based on non-equilibrium ultrafast phenomena. The mini-colloquium will address:

1. Metastability of transient states and non-equilibrium excitations 2. Light-induced phase transitions: superconductivity, magnetism and ferroelectricity 3. Light-wave coherent control of quantum systems 4. Ultrafast magnetism, bandgap photonics and dynamics 5. Experimental challenges: high-energy THz sources, detection in pump-probe techniques, timeresolved spectroscopy with ultrashort laser pulses, field measurements 6. Theory of time-dependent ultrafast and non-equilibrium processes at femto- and attosecond time scales.

The proposed mini-colloquium aims to encourage the participation of well-known high-level scientists, who will be invited to present talks on their own theme of research within this topic. The sessions are opened to all those researchers, who have already carried out work on this field, and in particular, to young scientists. This mini-colloquium also aims at providing open discussions, and strengthening future scientific collaborations among its participants.

Monday, 31 August 2020

Zoom host: Harvey Amorin.

9:30-10:10 *Ultrafast optical control of quantum materials by resonant lattice excitation.* **Andrea Caviglia (invited).**

10:10-10:50 *Higgs Spectroscopy in Superconducting Cuprates.* **Stefan Kaiser (invited)**.

10:50-11:30 *What is the role of vibrational coherence in ultrafast phase transitions?* **Simon Wall (invited)**.

11:30-11:50 *Direct Observation of Nuclear Reorganization Driven by Ultrafast Spin Transitions.* **Yifeng Jiang**, Lai Chung Liu, Antoine Sarracini, Kamil M. Krawczyk, Jordan S. Wentzell, Cheng Lu, Ryan L. Field, Samir F. Matar, Wojciech Gawelda, Henrike M. Müller-Werkmeister, R. J. Dwayne Miller.

11:50-12:10 *Clocking Light Driven Coherence in the Excitonic Insulator Ta2NiSe5*. **Min-Jae Kim,** Sydney Dufresne, Fabio Boschini, Sergey Zhdanovich, Parmida Shabestari, Tomohiro Takayama, Masahiko Isobe, Hidenori Takagi, David Jones, Andrea Damascelli, Stefan Kaiser.

12:10-12:30 *Imaging laser-driven electron dynamics in crystals with ultrafast x-ray scattering.* **Daria Popova-Gorelova**, Robin Santra.

Special sessions Monday Afternoon

Zoom host: Harvey Amorin. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *Time-Resolved Circular Dichroism: A New Direct measure ofAromatic Ring Currents.* **Yeonsig Nam**, Jérémy R. Rouxel, Jin Yong Lee, Shaul Mukamel.
2. *Coherent Diffractive Imaging Spectroscopy of Vanadium Oxides.* **Allan S. Johnson**, Jordi Valls Conesa, Luciana Vidas, Christian M. Günther, Timothy A. Miller, Bastian Pfau, Daniel Perez-Salinas, Elías Martínez, Michael Schneider, Erik Gührs, Robert E. Marvel, Kent A. Hallman, Richard F. Haglund Jr, Stefan Eisebitt, Simon Wall.
3. *Exciton dynamics in BiI3 single crystal.* **Selene Mor**, Valentina Gosetti, Paolo Franceschini, Claudio Giannetti, Vadim Fadeevich Agekyan, Luigi Sangaletti, Stefania Pagliara.

Posters

1. *Excitons and narrow bands determine the optical properties of cesium bismuth halides.* **Sebastian Rieger,** Bernhard J. Bohn, Linn Leppert, Markus Döblinger, Alexander F. Richter, Yu Tong, Kun Wang, Peter Müller-Buschbaum, Lakshminarayana Polavarapu, Jacek K. Stolarczyk, Jochen Feldmann.
2. *Mapping the ultrafast dynamics of the orbital-order order-parameter with transient anisotropy spectroscopy.* **Daniel Perez-Salinas,** Allan Johnson, Simon Wall.
3. *Spectroscopic studies of thin films of cryovacuum condensates of freons and their mixtures at low temperatures.* **Assel Nurmukan**, Abdurakhman Aldiyarov, Dmitriy Sokolov, Yevgeniy Korshikov.
4. *Quench dynamics in two-atom system on a surface.* **Tomasz Kwapiński**, Marcin Kurzyna.

CMD2020GEFES mini-colloquium

Ultrastable Glasses: New Perspectives for an Old Problem

Miguel Ángel Ramos, Javier Rodríguez-Viejo, Tullio Scopigno, Ludovic Berthier

Glasses are well-known materials since long. However, the nature of the glass state and its physical properties continue to be the subject of vivid debate in the scientific community. In fact, when several leading scientists analyzed the main challenges that should be addressed in the 21st century, it was stated that “The deepest and most interesting unsolved problem in solid state theory is probably the theory of the nature of the glass and the glass transition” [P.W. Anderson, Science 267, 1615-1616]. The main reason why this problem remains unresolved is that two contradictory aspects compete in it and that both play an important role in understanding the phenomenon of glass transition: kinetics and thermodynamics.

From an applied point of view, glasses combine the microscopic disordered structure of the liquids with the macroscopic mechanical properties of the solids. Its complex nature is the basis of its success in a large number of applications. The ability to adjust or tune physical properties is a fundamental characteristic of the glass state, due to the huge number of different structural configurations at the local level that may exist in the same sample. These intrinsic characteristics of non-crystalline solids explain the important role of glass in modern technologies and make them ubiquitous in our daily lives. Nevertheless, the main disadvantage for an even greater use of vitreous materials in many technologies is their possible instability over time due to possible devitrification or gradual change of their properties in these unstable states.

However, one of the most important recent advances in the scientific research of glasses, both experimentally and theoretically, was the discovery of the so-called "ultra-stable glasses" in 2007 by Mark Ediger’s group at the University of Wisconsin, soon followed by other groups. These ultrastable glasses were prepared by Physical Vapor Deposition and have differentiated properties of other glasses, such as higher glass transition temperatures, lower water absorption, less aging after thermal treatments, higher density, improved mechanical properties and a long list that make them potentially interesting for new applications. Another interesting type of highly-stable glasses has recently been found in amber glasses geologically aged for more than 100 million years. Finally, all these extremely stable glasses can be a clue to unravel some of the current enigmas of the vitreous state and the glass transition.

In last years, the number of research groups interested worldwide in ultrastable glasses have increased further, both from experimental and theoretical/computational points of view. Hence, a specific minicolloquium on this hot topic seems timely and most appealing.

Monday, 31 August 2020

Zoom host: Laura Arriaga.

9:30-10:10 *Evidence for heterogeneous bulk melting dominating the transition of organic stable glasses.* **Marta González-Silveira (invited)**, Ana Vila-Costa, Marta Rodríguez-López, Aitor F. Lopeandía, Libertad Abad, Javier Rodríguez-Viejo.

10:10-10:50 *Facilitation view of melting dynamics in ultrastable glasses.* **Juan P. Garrahan (invited)**, Ricardo Gutiérrez.

10:50-11:30 *Atomic motion in ultrastable metallic glasses.* **Beatrice Ruta (invited)**, Martin Luettich, Konrad Samwer.

11:30-11:50 *Surface-Bulk Interplay in Vapor-Deposited Glasses: Crossover Length and the Origin of Front Transformation.* **Cristian Rodríguez-Tinoco**, Marta González-Silveira, Joan Ràfols-Ribé, Ana Vila-Costa, Julio César Martínez-García, Javier Rodríguez-Viejo.

11:50-12:10 *Generalized configurational entropy equation of glass forming systems.* **Julio César Martínez-García**, Javier Rodríguez-Viejo**.**

12:10-12:30 *Ultrastable polymer glass.* **James Forrest**, Adam N. Raegen, Junjie Yin, Qi Zhou.

Special session Monday Afternoon

Zoom host: Laura Arriaga. Pre-recorded talks and posters videos on YouTube.

Pre-recorded talks

1. *Deposition rate/substrate temperature superposition predicts anisotropy in vapor-deposited glasses.* **Camille Bishop**, Y. Li, M. F. Toney, L. Yu, M. D. Ediger.
2. *Enhancing resistance towards crystallization in semiconducting molecular glasses with deposition temperature.* **Kushal Bagchi**, Marie Fiori, Camille Bishop, M. F. Toney, Mark. D. Ediger.
3. *Modulation of Chemical Reactions by Glass Packing.* **Yue Qiu**, Mark. D. Ediger.
4. *Physical vapor deposition of a polyamorphic system: Triphenyl phosphite.* **Ben J. Kasting**, M. S. Beasley, M. E. Tracy, A. Guiseppi-Elie, M. D. Ediger.
5. *Stable polystyrene glass films through PVD and UV radiation.* **Junjie Yin**, Adam Raegen, James Forrest.
6. *Substrate temperature during PVD controls glassy structure within a few nanometers of organic/organic interfaces.* **Marie E. Fiori**, Kushal Bagchi, Michael F. Toney, Mark D. Ediger.

Posters

1. *A study of factors controlling the enhanced surface diffusion in metallic glasses.* **Ajay Annamareddy**, Dane Morgan.
2. *Specific heat at very low temperatures of ultrastable glasses.* **Manuel Moratalla**, C. Rodríguez-Tinoco, J. Rodríguez-Viejo, R. J. Jiménez-Rioboó, T. Pérez-Castañeda, M. A. Ramos.

3. *Simulating PVD Glass: Over What Length Scale Does an Inorganic Substrate Perturb the Structure of a Glassy Organic Semiconductor?* **Chuting Deng**, Nicholas E. Jackson, J. J. de Pablo.

4. *Surface diffusion in molecular glasses: Effect of interfacial molecular alignment and bulk penetration.* **Yuhui Li**, Wei Zhang, Camille Bishop, Chengbin Huang, M. D. Ediger, Lian Yu.

Tuesday, 01 September 2020

Zoom host: Laura Arriaga.

9:30-10:10 *Ideal glasses and new materials.* **Mark Ediger (invited)**.

10:10-10:50 *Depletion of two-level systems in ultrastable computer-generated glasses.* **Camille Scalliet (invited)**.

10:50-11:30 *Evolution of elastic matrix disorder approaching the bottom of the energy landscape with hyperaged amber.* **Eva Pogna (invited)**.

11:30-11:50 *Numerical measurements of two level system statistics in glasses.* **Dmytro Khomenko**, Camille Scalliet, Ludovic Berthier, David R. Reichman, Francesco Zamponi.

11:50-12:10 *Low-temperature approximation of phonon specific heat from the point of view of quantum field theory.* **Alexander I. Krivchikov.**

12:10-12:30 *Extreme Elasticity Anisotropy in Molecular Glasses.* **Yu Cang**, Zuyuan Wang, Camille Bishop, Mark D. Ediger, George Fytas.

CMD2020GEFES mini-colloquium

Visualizing electronic correlations in quantum materials

Hermann Suderow, Dimitri Roditchev, Peter Wahl

The problem of strong electronic correlations is at the heart of some of the most spectacular phenomena in condensed matter physics, such as high critical temperature superconductivity, the Kondo effect, quantum criticality or topologically non-trivial edge states. Directly visualizing these correlations and determining their spatial dependence is key to provide a breakthrough in how electronic interactions result in these phenomena and how we may be able to control them for future applications. Scanning Probe Microscopy provides the needed spatial resolution and can be used to view electrons in cuprate superconductors, pnictide materials, topological superconductors and in low dimensional strongly disordered electronic systems. Recent technical developments enable deep insights to the electronic bandstructure, the Cooper pair density or the magnetic properties with a spectacular spatial resolution, from macroscopically large areas and down to the atomic scale, and in temperature and magnetic field ranges that were not thought to be possible just a few years ago. The shear amount of data produced by scanning probe microscopes requires joining efforts with bandstructure calculations and can lead to a significant improvement in our understanding of the physics of quantum materials through mutual fertilization. High quality single crystalline materials are key to obtain intrinsic and well-controlled behaviour. In this minicolloquium we intend to gather materials scientists, theoreticians and experts in microscopy to foster the fruitful collaboration that defines the needed effort to advance in the field of strong electronic correlations through direct imaging techniques mapping relevant phenomena at the nanoscale.

Monday, 31 August 2020

Zoom host: Hermann Suderow.

9:30-10:10 *Exploring non-local correlations in iron-based superconductors: a theoretical approach.* **Roser Valentí (invited)**.

10:10-10:50 *A strongly inhomogeneous superfluid in an iron-based superconductor.* **Milan P Allan (invited)**.

10:50-11:30 *Microscopic coexistence of anisotropic superconductivity and spin-vortex antiferromagnetism in Ni-doped CaKFe4As4*. **Isabel Guillamón (invited)**.

11:30-12:10 *Imaging phase transitions with scanning SQUID.***Beena Kalisky (invited)**.

12:10-12:30 *Yu-Shiba-Rusinov Bands in Hydrogenated Boron-doped Diamond.* **Tomas Samuely**.

Special session Monday Afternoon

Zoom host: Hermann Suderow. Pre-recorded talks and poster videos on YouTube.

Pre-recorded talks

1. *2H- and 1T'- MoTe2 islands on Graphene/Ir(111): Growth, Topography and Electronic Structure*. **Pablo Casado Aguilar**.
2. *Atomic charge density imaging in the scanning transmission electron microscope*. **Gabriel Sánchez Santolino**.
3. *Dynamical torques from Shiba states in s-wave superconductors*. **Mircea Trif**.
4. *Fresh insight into the charge density wave phase of selected transition metal dichalcogenides via quantitative analysis of their STM images*. **Árpád Pásztor**.
5. *Phase transition in the cuprates from a magnetic-field-free stiffness meter viewpoint*. **Amit Keren**.
6. *Quasi-particle interference and confinement effects in a correlated Rashba spin-orbit split 2D electron gas*. **Chi Ming Yim**.
7. *Sliding single and twin domains in VO2 self-heated single crystals*. **Bertina Fisher**.
8. *Vortex state in a strongly correlated d-wave superconductor*. **Anushree Datta**.
9. *Dielectric Function Method for superconducting materials*. **Dietrich Elst.**

Posters

1. *Impurity-induced resonant spinon zero modes in Dirac quantum spin-liquids*. **Guangze Chen**.
2. *Large magnetoresistance in the iron-free pnictide superconductor LaRu2P2 due to open orbits*. **Marta Fernández-Lomana Gómez-Guillamón**.
3. *Spatial extension of Yu-Shiba-Rusinov states in S doped 2H-NbSe2*. **Anita Smeets**.
4. *STM imaging of the superconducting gap and vortex structure in BaFe2(As1-xPx)2*. **Víctor Barrena**.

5. *Quantitative determination of the vortex core size probed by scanning tunneling microscopy*. **Alicia Escobar**.

Tuesday, 01 September 2020

Zoom host: Hermann Suderow.

9:30-10:10 *Revival of the physics of Cu-based high temperature superconductors: Dynamical charge density fluctuations and anomalous metallic behavior*. **Carlo di Castro (invited)**.

10:10-10:50 *Nematicity, checkerboard charge order and magnetic-field tuning of a van Hove singularity in the surface layer of Sr2RuO4*. **Carolina Marques (invited)**.

10:50-11:30 *Detection and manipulation of dopants and atoms in a high-Tc superconductor*. **Free Massee (invited)**.

11:30-12:10 *Magnetic force microscopy imaging and manipulation of vortices in tilted magnetic fields*. **Carmen Munuera (invited)**.

12:10-12:30 *Genuine RKKY-Kondo quantum phase transitions*. **Krzysztof Wójcik**.

Special Sessions

European Physical Society
Condensed Matter Division

División de Física de la Materia Condensada

Real Sociedad Española de Física

R.S.E.F.

Diversity and Inclusiveness

Round table: "How to create a welcoming and inclusive environment in Science"

Science and research should be equally accessible for every person. However, at present different collectives (women, lgtb+ people, ethnic minorities, people with functional diversity, …) face barriers which difficult their research careers and their engagement with science. In this round table we will discuss the present challenges in the integration of these groups with main emphasis in the positive actions which can be taken by individual researchers and by institutions. Questions from the public will be encouraged.

Panelists:

Luc Bergé, Research director at CEA-DAM (Ile-de-France). President-elect of the EPS. Chair of the Equal Opportunities Committee of the EPS.

Pascuala García Martínez, Professor of Optics, University of Valencia (Spain). President of the Women in Physics Group of the Spanish Physical Society RSEF.

Sònia Estradé, Lecturer at IN2, Universitat de Barcelona-UB (Spain). President of the Equality Committee of the Physics Department of UB, Board member of PRISMA, the association for affective-sexual diversity in STEM, vice-president of the Association of Women in Science and Technology in Cataluña (AMIT-CAT).

Fasil Kidane Dejené. Lecturer in Physics at Loughborough University (UK) and Member of the Equality and Diversity Committee.

The session is organized by the Equality Committee of the Condensed Matter Division GEFES of the Spanish Royal Physics Society RSEF.

EPS Young Minds sessions

Samuel Mañas-Valero[1], Roberta Caruso[2]

[1] Universitat de València, C/ Catedrático José Beltrán, 2, 46980, Paterna, Spain.
[2] Physics Department, University of Naples Federico II, via Cinthia Monte S. Angelo, 80126 Napoli, Italy.

Monday August 31st: Career opportunities in Academia.

17:00-17:45 *A PhD is not enough.* **Petra Rudolf.**

17:45-18:30 *ERC program.* **Janne Salo**.

Tuesday September 1st: Meet the editors.

17:00-17:10 *European Physics Letters.* **Bart van Tiggelen.**

17:10-17:20 *Physical Review Letters.* **Samindranath Mitra**.

17:20-17:30 *Nature Physics.* **David Abergel.**

17:30-18:30 *Questions & Answers.*

Wednesday September 2nd: Career opportunities in the Industry.

17:00-17:10 *IBM.* **Almudena Carrera Vázquez.**

17:10-17:20 *Seeqc, Inc.*. **Matthew Hutchings.**

17:20-17:30 *nB nanoScale Biomagnetics SL*. **Nicolás Cassinelli.**

17:30-18:30 *Questions & Answers.*

GEFES awards

17:00 – 17:15 Award ceremony.

17:15 – 17:45 *Tuning the spin Hall effect in heavy metals.* **Edurne Sagasta. Best experimental thesis, 7th edition (August 2018 – July 2019)**

17:45 – 18:15 *Toward Next-Generation Nanophotonic Devices.* **Renwen Yu. Best theoretical thesis 7th edition (August 2018 – July 2019)**

18:15 – 18:45 *Quantum dots in two-dimensional heterostructures.* **Mauro Brotons i Gisbert. Highlighted article of the year (October 2018-September 2019)**