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FlashTalks

What research in ICB?

The association of PhD students (ATCPB) organises sessions of Flashtalks, where students and researchers can briefly present and discuss their research!

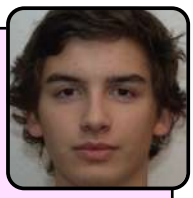
María Daniela Barrios

2nd year PhD student

Daniela works on protein sequencing through solid-state nanopores, in the team of Patrick Senet in ICB.

Sequencing proteins is capital for the understanding of biological processes. Solid-state nanopores has gain interest in the last decade, since they can be used to probe proteins with high bandwidth. The solid-state ionic conductivity of a few atom thick layer of molybdenum disulfide (MoS2) is monitored as the protein translocates through a nanopore. As the biomolecule passes through the nanopore, the ionic conductivity drops. This provides a single base resolution protein-probing device.

Using an analytical model, Daniela investigates the effect of the thickness of the MoS2 layer and the diameter of the pore. She found that the sequencing is much faster when the thickness is minimal, and the conductivity measurement is better when the diameter of the nanopore is of the order of the size of the protein.



Jonas Fischer

2nd year PhD student

Jonas works in a franco-german collaboration, under the supervision of Dominique Sugny in ICB and Christiane Koch in the University of Kassel. He presented his work on non-Markovian quantum systems.

Non-Markovian dynamics emerges in open systems (i.e., systems transfering energy to their environment), when the environment reacts by transfering energy back to the system. In other terms, the environment memorizes information lost by the system and uses this information to act back on its dynamics.

Jonas works on the general mathematical tools which can be used to treat non-Markovian dynamics. He applies those tools in the framework of quantum control, to steer the dynamics of quantum systems in a desired way using an external field. It appears that non-Markovianity can help access new target states and revive quantum properties (e.g. coherence) usually lost in open systems.

Richard Dupiol

2nd year PhD student

Richard Dupiol works jointly with the SLCO team in ICB and the University of Limoges in the XLIM Laboratory. He investigates the spatio-temporal dynamics of beam propagation in optical fibers.

Multimode fibers (MMFs), are optical waveguides which support various propagating modes. MMFs attract attention nowadays for the next generation of telecommunication systems and the construction of high energy fiber lasers. The complexity of non-linear effects increases dramatically with the number of interacting modes, thus MMFs exhibit new physical phenomena. In particular, those non-linear effects can lead to a strong modification of the transverse spatial beam, enabling a process called “beam cleaning”, or to high frequency conversion processes through intermodal interactions.

Adrian Agreda

2nd year PhD student

Adrian works in the OSNC team in ICB. He presented his work on the electrical control of broadband light emission in plasmonic gap antennas.

Gold optical antennas are commonly used in nano-photonics and the control of their optical properties, via nanoelectronics, is a subject of great interest. The device consists on electrically connected gap antennas (bow-tie shapes or parallel plates) fabricated by electron beam and UV lithography.

Evidence shows that by applying a strong electric field through the gap, the nonlinear optical response can be modulated. Several physical phenomena are considered as the underlying processes for the broadband light emission, including thermal radiation, inelastic light scattering and multi-photon photoluminescence. Adrian investigates the thermal radiation where the light emission is related to the number of free electrons, thus modified by the application of the electric field.

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