Carl von Ossietzky
Universität
Oldenburg
Institut für PHYSIK

PHYSICAL COLLOQUIUM

INVITATION

Monday, 26.06.2023, 4.15 p.m., Room No. W02 1-148

speaks

Associate Professor Ajit Srivastava
Department of Physics, Emory University, Atlanta

about

"Towards On-demand Quantum Matter and Light with 2D Materials"

Atomically thin materials, such as graphene and transitional metal dichalcogenides (TMDs), are at the forefront of research in materials physics. This is largely due to the ease with which they can be combined into artificially engineered heterostructures that exhibit emergent electronic and optical properties. Enhanced Coulomb interactions in the truly 2D limit, reduced kinetic energy of electrons in moiré heterostructures and the presence of nontrivial quantum geometry is a perfect recipe for strongly correlated and topological electronic phases. Moreover, strong light-matter coupling results in stable optically excited quasiparticles such as excitons and their neutral and charged complexes. Furthermore, moiré heterostructures present a unique opportunity to study the interplay of correlated electrons and excitons. While electronic phases have garnered a lot of attention, many-body correlated phases of interacting optical excitations remain poorly studied. These out-of-equilibrium quantum phases could also serve as sources of exotic light.

In this talk, I will begin by highlighting some unique properties of excitons in TMDs. Next, I will show how trapped dipolar excitons can serve as high-resolution quantum sensors of correlated electronic phenomena1. Finally, I will talk about our recent efforts to engineer the internal structure of excitons to tune the strength and sign of excitonic interactions2 as a step towards realizing on-demand quantum matter in a driven-dissipative setting.

Bio:
Ajit Srivastava received his MS and PhD degrees from Rice University. He was a postdoctoral researcher and later senior scientist at ETH Zurich. Subsequently, he joined Emory University as an Assistant Professor in 2016 and was promoted to Associate Professor in 2020. He leads the Quantum Light-Matter Lab at Emory which investigates beyond-traditional quantum phenomena due to the interplay of light-matter coupling in low-dimensional materials.

1. Li *et al*., "Local Sensing of Correlated Electrons in Dual-moiré Heterostructures using Dipolar Excitons", *arXiv: 2111.09440*
2. Li *et al*., "Quadrupolar excitons in a tunnel-coupled van der Waals heterotrilayer", *arXiv: 2208.05490*

All interested persons are cordially invited.

Prof. Dr. Christian Schneider