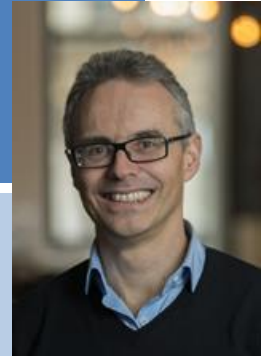




# PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik  
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 10.01.2024, 16 Uhr c.t.  
Großer Hörsaal, Raum \_0.111,  
Max-von-Laue-Str. 1



## Prof. Dr. Angel Rubio

*Max-Planck-Institut für Struktur und Dynamik der Materie, Hamburg*

*Center for Computational Quantum Physics Flatiron Institute,  
Simons Foundation, NY, USA*

### *"Photons and matter cooperate: new states of matter from QED-TDDFT"*

Computer simulations that predict the light-induced change in the physical and chemical properties of complex systems, molecules, nanostructures and solids usually ignore the quantum nature of light. Recent experiments at the interface between materials science and quantum optics have uncovered situations where both the molecular system and the photon field have to be treated in detail. In this talk, we will show how the effects of quantum-photons can be properly included in the newly developed quantum electrodynamics density-functional formalism (QED-TDDFT). We provide an overview of how well-established concepts in the fields of quantum chemistry and material sciences have to be adapted when the quantum nature of light becomes important in correlated matter-photon problems. We identify fundamental changes in Born-Oppenheimer surfaces, conical intersections, spectroscopic quantities, and quantum control efficiency. We also show how periodic driving of many-body systems allow to design Floquet states of matter with tunable electronic properties on ultrafast time scales.

Die Dozenten der Physik

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