Photophysics of organic materials: from ancient pigments to high-performance organic semiconductors

Organic (opto) electronic materials have been explored in a variety of applications in electronics and photonics. They offer several advantages over traditional silicon technology, including low-cost processing, fabrication of large-area flexible devices, and widely tunable properties through functionalization of the molecules. Over the past decade, remarkable progress in the material design has been made, which led to a considerable boost in performance of organic thin-film transistors, solar cells, and other applications that rely on photophysics and/or (photo) conductive properties of the material. Nevertheless, a number of fundamental questions pertaining to light-matter interactions and charge carrier photogeneration and transport in these materials remain.

In this presentation, I will briefly review the field and give examples of our efforts aiming to understand and tune exciton and charge carrier dynamics in high-performance organic materials and to develop novel, sustainable organic materials.