

Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



IMPRS UFAST Call for PhD applications 2025/2026

DK1 – Ultrafast Twistronics



Title of PhD Project	Ultrafast Twistronics
Type	Theory
Supervisor(s)	Dante Kennes Angel Rubio Lede Xian
Affiliation(s):	Max Planck Institute for the Structure and Dynamics of Matter RWTH Aachen University CAS Songshan Lake Materials Laboratory
Number of positions:	1
Abstract:	In this project a combination of time-dependent DFT and tight-binding based model calculations will be used to study the topological properties of periodically driven twisted van der Waals (vdW) materials. Topological properties are particularly amendable to control following this route, leading to novel nonequilibrium phases of matter such as Floquet topological insulators. First, twisted bilayer graphene will be studied for which novel geometric aspects can be explored to achieve strong light matter coupling. As a next step driven TMDs with strong spin orbit coupling for valley selective control by circular polarized light will be considered. However, in many real materials heating prohibits such types of control in experiments. To suppress heating twisted vdW materials will be advantageous as a full bidirectional optimization of the driving stimulus and the driven material towards each other can be provided – an opportunity rarely present in conventional solids and which will be explored within this project.
Contact person for scientific questions about the project:	Dante Kennes: dante.kennes@rwth-aachen.de Angel Rubio: angel.rubio@mpsd.mpg.de Lede Xian: lede.xian@mpsd.mpg.de

