



# PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik  
der Johann Wolfgang Goethe-Universität Frankfurt

**Mittwoch, den 16.11.2022, 16 Uhr c.t.**  
**Großer Hörsaal, Raum \_0.111,**  
**Max-von-Laue-Str. 1**

**Prof. Dr. Jens Bredenbeck**

*Institut für Biophysik – Goethe Universität*



## ***"Molecular Vibrations - Silent Observers and Active Players"***

Vibrations are sensitive probes of molecular structure and dynamics. Interrogated by ultrafast infrared pulse sequences, local vibrations provide information on structure changes of molecules from the size of a few atoms to large proteins and from femtoseconds to milliseconds, which we demonstrate for the case of photoreceptor proteins. But vibrations are also important active players in (bio-)molecular dynamics. Using a two-dimensional infrared correlation spectroscopy, we detected underdamped, THz motion of proteins proposed to enhance enzyme catalysis. Vibrations are also involved in energy transfer processes in proteins. We developed genetically encoded vibrational energy injectors and sensors to track energy transfer in proteins on the picosecond time scale on the level of single amino acids.

Excitation of vibrations can be used to manipulate molecular systems. In our VIPER (vibrationally promoted electronic resonance) 2D-IR spectroscopy, we exploit vibronic couplings to change the UV/VIS spectrum of molecular systems by mid-IR pulses. Applications are discussed from controlling chemical reactions over optoelectronics to photobiology.

Die Dozenten der Physik

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