

**PHYSICAL COLLOQUIUM**

**INVITATION**

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Monday, 14.06.2021, 4.15 p.m.,  
video conference: <https://meeting.uol.de/b/anj-2vc-j6s-fwe>

speaks

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About

**"Molecular structure at bio-interfaces provided by nonlinear spectroscopy"**

The work in our group focuses on unraveling the molecular-level factors behind the structure-function relations of lipids, proteins, and glycosaminoglycans as main membrane constituents. The rather heterogeneous and dynamically changing nature of such interfaces demands a real-time analytical method capable of fast data acquisition under physiologically relevant conditions in a label-free way, with monolayer sensitivity. Such a technique is vibrational sum-frequency generation (VSFG) spectroscopy, enabling the study of chemical structure, orientation, and dynamics at surfaces with high selectivity and sensitivity in situ. VSFG is a second-order nonlinear process, where two incoming electromagnetic fields generate the so-called sum-frequency signal, which contains structural and orientational information on the interfacial molecular species. In my talk, I will summarize our recent developments in laser technology which made it possible to increase the laser repetition rate employed in VSFG spectrometers by two orders of magnitude to 100 kHz.[1,2] This development has led to a drastic increase in signal-to-noise ratio and a decrease in acquisition time ( $\leq 10$  s) for solid-supported heterogeneous phospholipid monolayers and bilayers.[3,4] I will show examples for how we can investigate real-time interactions of bio-molecules in model membranes at air-solid and air-liquid interfaces, and the orientation of macromolecules that have chiral centers and organize themselves into ordered macromolecular structures.[5,6]

[1] Z. Heiner, V. Petrov, M. Mero, APL Photonics, 2017, 2, 066102.

[2] Z. Heiner, L. Wang, V. Petrov, M. Mero, Opt. Express, 2019, 27, 15289.

[3] F. Yesudas, M. Mero, J. Kneipp, Z. Heiner, J. Chem. Phys., 2018, 148, 104702.

[4] F. Yesudas, M. Mero, J. Kneipp, Z. Heiner, Anal. Bioanal. Chem., 2019, 411, 4861–4871.

[5] G.P. Szekeres, S. Krekic, R.L. Miller, M. Mero, K. Pagel, Z. Heiner, PCCP, 2021, DOI: 10.1039/D1CP01975A.

[6] S. Krekic, J. Horvath, Z. Nasztor, F. Bogar, M. Mero, A. Der, Z. Heiner 2021 in preparation

All interested persons are cordially invited.

Sgd. Prof. Dr. Caterina Cocchi