

# Nonlinear optical spectroscopy and microscopy seminar

Co-organized by  
Department of Physical Chemistry  
&  
Department of Applied Physics

## Special guest lecture by



Dr. Nicola Galvanetto  
Department of Physics &  
Department of Biochemistry  
University of Zurich

**“Molecular dynamics determine mesoscopic properties of biomolecular condensates”**

13:30, Dec. 5 (Tue), 2023

Room A50A, Science II

Registration: Please send an email to [Takuji.Adachi@unige.ch](mailto:Takuji.Adachi@unige.ch) if you are interested in attending the seminar and/or would like to receive future emails about the coming up seminars.

# Molecular dynamics determine mesoscopic properties of biomolecular condensates

Nicola Galvanetto

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Biomolecular condensates are droplet-like structures that result from the phase separation of biomolecules. The functions of condensates in living cells span many length scales: from the modulation of chemical reactions at the molecular scale to the compartmentalisation of the cell at the mesoscale. We use single-molecule fluorescence spectroscopy to study the conformations and dynamics of intrinsically disordered proteins within single droplets (1), combined with microrheology approaches to assess mesoscale properties. By tuning the strength of the interactions between the constituent proteins, we produced condensates spanning almost two orders of magnitude in viscosity, and observed a concomitant variation in the chain reconfiguration time of the proteins at the molecular scale—ranging from hundreds of nanoseconds to tens of microseconds. We then generalised our experimental results across length scales, providing a quantitative link between local protein reconfiguration, protein spatial diffusion and the macroscopic viscosity of such condensates.

1. Galvanetto, N. *et al.* Extreme dynamics in a biomolecular condensate. *Nature* **619**, 876–883 (2023).