

## Ma 5 - Dynamic Processes in Lipid Membranes

### Physics:

- Thermodynamics of lipid membranes and phase transitions of lipids in lamellar membranes
- Rotational diffusion
- Fluorescence
  - Emission
  - Excited state lifetime
  - Quenching
  - Anisotropy
- Absorption / Excitation
- Transition dipole moment
- $n-\pi^*$  transition and  $\pi-\pi^*$  transition
- Born-Oppenheimer approximation
- Franck-Condon principle, Jablonski diagram

### Technical:

- Steady-state fluorescence spectrophotometer
  - Monochromator
  - Lens optics
  - Polarization filters
  - Photomultiplier with adjustable sensitivity range
  - Anisotropy temperature scan of a lipid membrane with fluorescence probe
- Time-correlated single photon counting (TCSPC) setup for fluorescence lifetime
  - Pulsed laser source, start and stop signals
  - Polarization filter,  $\lambda/2$  waveplates
  - Excitation and emission filter settings
  - Time-resolved anisotropy temperature scan of a lipid membrane with fluorescence probe

### Data analysis:

- Steady-state setup:
  - Visualisation and peak finding in excitation and emission spectra
  - Gaussian fitting for vibrational transition energy levels differences
    - Excitation
    - Emission
  - G-factor calculations
  - Temperature dependent steady-state anisotropy calculation
- TCSPC setup:
  - Tail fitting for fluorescence decay analysis
  - Calculation of time resolved anisotropy and fit with model function
- Two-state analysis of temperature dependence of anisotropy values
- Comparison of steady-state and lifetime-based transition temperature data of the investigated lipid with calorimetric data (from literature)