1 Membrane proteins tune function by forming oligomers

**Objective:** Gain an understanding of PR function through measurements of protein dynamics, with an emphasis on unraveling the effect of protein-protein and protein-surfactant interactions

2 Monomers and oligomers can be separated by Fast Protein Liquid Chromatography

3 Light-activated EPR and time-resolved absorption spectroscopy reveal monomeric PR is fastest

The photocycle of PR enables vectorial transport through a series of conformational switches

4 Visible light spectroscopy shows hexameric PR is the most optimized to pump a proton

The pH of sea water ranges from 7.5 to 8.4, suggesting PR is not optimized as a proton pump

\[
pK_a \text{ hexamer } = 6.9 \\
pK_a \text{ monomer } = 7.9 \\
pK_a \text{ lipids } = 6.4
\]

The hexamer is the most efficient