MS077.O02

Time-resolved serial crystallography of bacteriorhodopsin using synchrotrons and X-ray lasers

Joerg Standfuss[1]
[1]*Paul Scherrer Institut, Villigen, Switzerland*
E-mail: joerg.standfuss@psi.ch

In 2017 the Swiss Free Electron Laser (SwissFEL) will start its operation at the Paul Scherrer Institute. Serial femtosecond crystallography (SFX) using such X-ray free-electron lasers (XFELs) is a powerful method to determine radiation damage free high-resolution structures and to study protein dynamics at room temperature.
One of the current bottlenecks in XFEL science is that many facilities are still under construction and, even when they will be finished, access will likely remain scarce. In this presentation I will describe how we have adapted high viscosity injector systems to carry out routine room-temperature serial millisecond crystallography (SMX) experiments at synchrotron sources (1, 2), where beamtime is more abundant. Based on these results we improved density and homogeneity of crystal preparations for efficient time-resolved data collection at the Spring-8 Angstrom Compact free electron Laser (SACLA) and Linac Coherent Light Source (LCLS), XFEL sources (3, 4). A series of 15 structural snapshots of the light-driven proton pump bacteriorhodopsin (bR) obtained with pump probe delays in the pico- to millisecond range demonstrate the feasibility of using sample efficient high viscosity injectors to determine three-dimensional molecular movies of membrane proteins in a native like environment.

References
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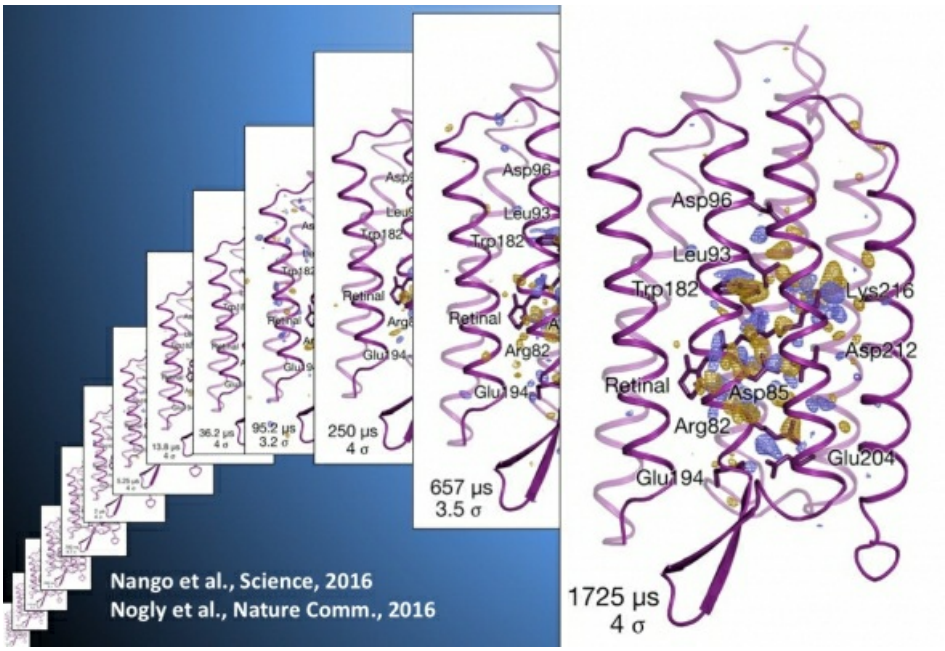

Keywords: serial crystallography, XFEL, protein dynamics