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## Time-resolved diffraction experiments at an X-ray free electron laser reveal ultrafast structural changes within a photosynthetic reaction centre

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X-ray free electron lasers (XFEL) have facilitated the development of time-resolved serial femtosecond crystallography (TR-SFX) approaches to study protein structural changes [1]. This method relies upon the continuous replacement of microcrystals using micro-jet (or other) technologies and has many advantages relative to traditional time-resolved Laue diffraction methods using synchrotron radiation [2]. Photosynthetic reaction centres are integral membrane proteins which harvest the energy content of sunlight in order to power the movement of electrons. We collected TR-SFX data at the LCLS in order to observe light induced structural changes in a bacterial photosynthetic reaction centre. Our observations revealed how the light-induced movement of electrons induced a complementary structural response of the protein which stabilized the charge-separated state [3].

[1] Tenboer, J., et al. Time-resolved serial crystallography captures high-resolution intermediates of photoactive yellow protein. *Science* 346,1242-1246 (2014).

[2] A. Wöhri et al., Light-induced structural changes in a photosynthetic reaction center caught by Laue diffraction, *Science* 328, 630-633 (2010).

[3] R. Dods et al., Ultrafast structural changes within a photosynthetic reaction centre, *Nature* 589, 310-314 (2021)

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