# Structural Studies of P. aestuarii FMO: High and low occupancy 8th BCL forms

**Fig 1. Apo and ~35% 8th BCL bound forms**

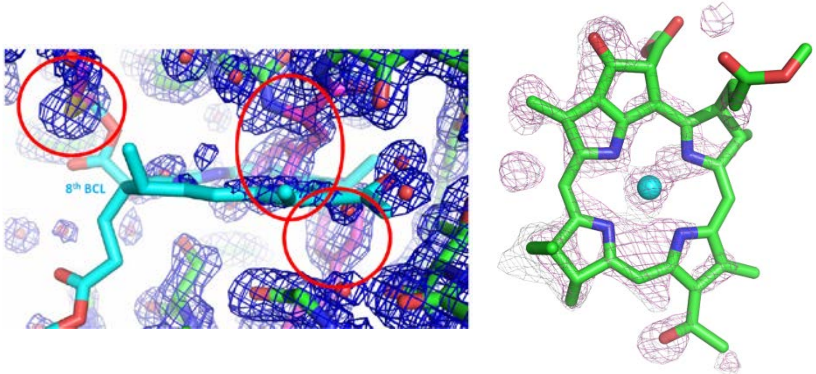
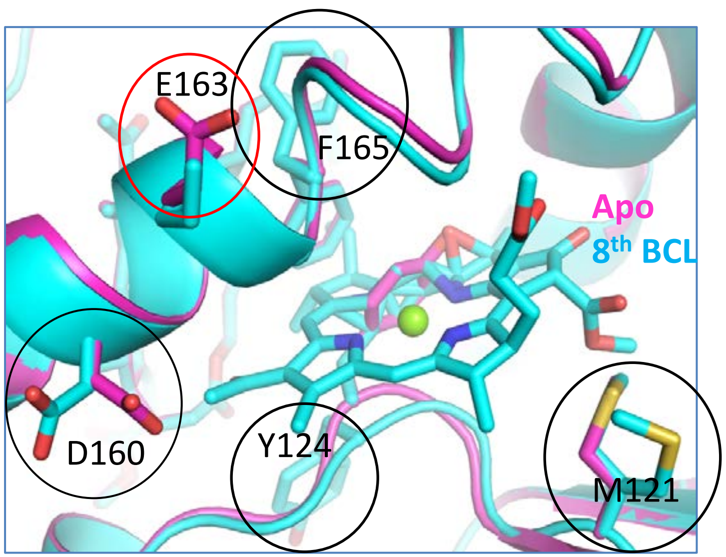



**Fig 2. Overlay of Apo and 8th BCL bound forms**




## Significance and Impact

**Neutron diffraction will reveal explicit hydrogen bonding interactions between protein and pigments in antenna complexes of i) LH2 (Cogdell lab) and ii) FMO (Blankenship lab)**

## Research Details

**Obtained new crystal forms of paFMO that are suitable for neutron diffraction (with Blankenship lab)**

**The 1.3 Å X-ray structure of the new H3 crystal form shows that two structurally distinct Apo and ~35% 8th BCL bound FMO conformers co-exist in the asymmetric unit.**

| | xtal9 | | xtal5M | | xtal5 | |
|---|---|---|---|---|---|---|
| Monomer | A | B | A | B | A | B |
| **8th BCL (%)** | **0** | **~25** | **~15** | **~35** | **~20** | **~35** |
| Res (Å) | 1.35 | | 1.55 | | 1.55 | |

M. Cuneo, X. Lu, D. Myles, G. Orf, R. Blankenship. Beam time proposal: Neutron crystallographic studies of the photosynthetic antennal protein FMO, submitted Sept 11, 2013.


U.S. DEPARTMENT OF ENERGY | Office of Science | OAK RIDGE National Laboratory | HFIR | SNS | CSMB Center for Structural Molecular Biology, Oak Ridge National Laboratory | Washington University in St. Louis | Photosynthetic Antenna Research Center PARC

# Dynamics of Cyanobacterial Thylakoid membrane by Neutron Spin Echo Technique

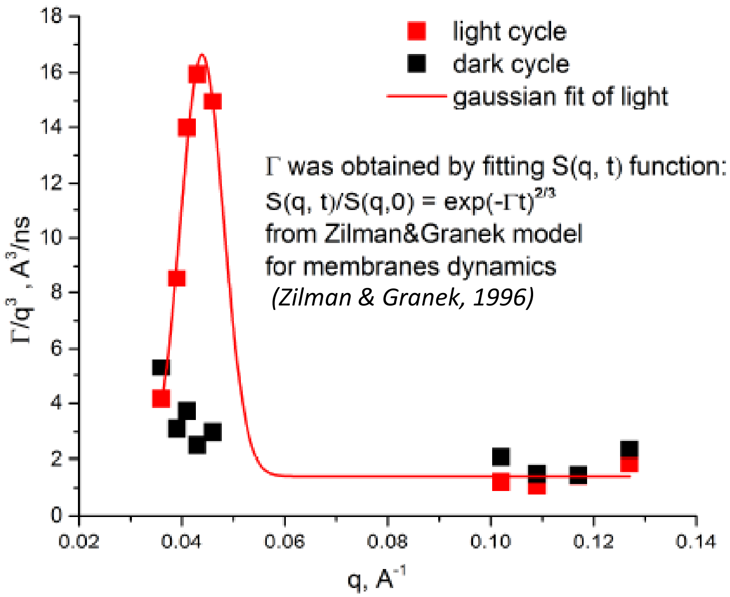



Fig.1 Relaxation rate Γ as a function of q from NSE measurements shows variation between dark and light states that could be correlated with the photosynthetic process.

H. O'Neill, V.S. Urban, M. Cochran, P. Zolnierczuk, L. Stingaciu, M. Ohl, M. Liberton, H.B. Pakrasi. Beamtime Proposal: "Dynamics of Cyanobacterial Thylakoid membrane by Neutron Spin Echo Technique", submitted Sept 11, 2013.

Work was performed at Oak Ridge National Laboratory

## Scientific Achievement

**Neutron scattering reveals changes in thylakoid membrane stiffness that accompany the re-arrangement of photosynthetic membrane layers as cyanobacteria respond to changes in illumination.**

## Significance and Impact

**Neutron Spin Echo spectroscopy (NSE) is uniquely able to measure the dynamics of biological membranes *in vivo* in response to changing environmental conditions that are crucial for understanding biological light harvesting and photosynthetic productivity.**

## Research Details

– NSE provides dynamics information specific to selected length scales and we therefore can explicitly attribute the observed changes in relaxation constants to the relative motion of the membranes, including changes in the thylakoid lumenal space.

– NSE observed increased stiffness of the bilayer membrane in response to light, apparently correlating with swelling of the lumenal space. A planned repeat of the experiment in the presence of a photosynthetic electron transfer inhibitor shall further corroborate the tie of membrane stiffness to the process of photosynthesis.

Jülich Centre for Neutron Science

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