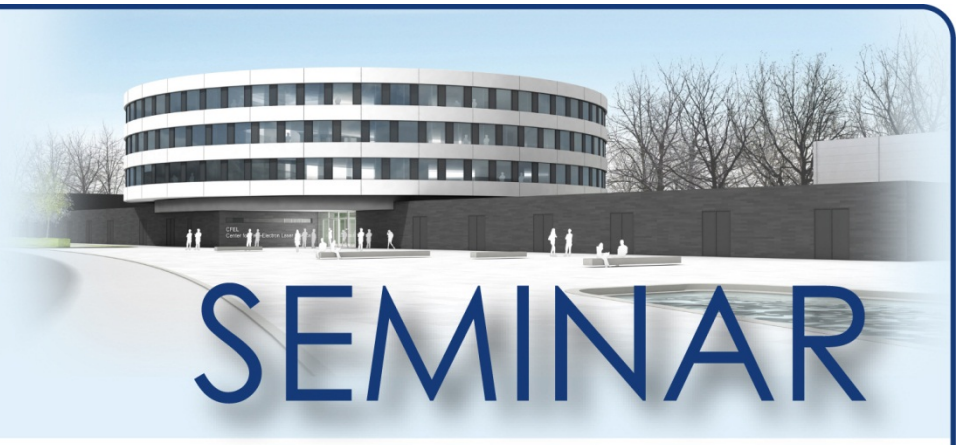
CFEL SCIENCE



SEMINAR

5th April 2011 - 14:15 pm

FLASH HALL (28c) - Seminar Room

Peter Metcalf

School of Biological Sciences, University of Auckland, New Zealand

Insect virus polyhedra, protein micro-crystals that contain virus particles

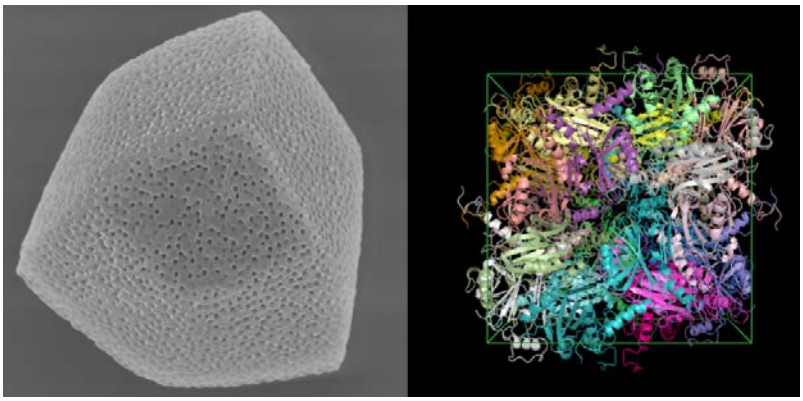
Small stable protein crystals that can be modified to incorporate other protein molecules may prove useful in future as sample substrates for femtosecond imaging. I will describe insect viral polyhedra, biologically functional micro-crystals that fit these criteria.

Larvae infected with insect polyhedrosis viruses become milky white, a result of the formation of masses of tiny intracellular protein crystals. The crystals, or viral polyhedra, consist of a cubic lattice of viral polyhedrin protein molecules together with embedded virus particles. Viral polyhedra are remarkably stable, and can remain infectious in soil for years for feeding larvae. Polyhedra survive conditions that would denature most protein molecules, but do dissolve at pH > 10.5 in the larval mid gut, releasing the embedded virus particles.

We are interested in learning why viral polyhedra are so stable, how they specifically incorporate virus particles inside cells and also in applications e.g. for polyhedra engineered to contain other proteins in place of the embedded virus particles. Working with C. Schulze-Briese (SLS) we developed micro X-ray crystallography techniques and determined the atomic structures of polyhedra produced by the dsRNA virus cypovirus(1) and the DNA virus baculovirus(2), the same virus used in the expression system familiar to molecular biologists. These are amongst the smallest protein crystals ever used for de-novo atomic structure determination. The talk will describe these results, and also our recent work with granulovirus, a type of baculovirus that forms tiny 400nm polyhedra with a crystalline polyhedrin layer only 7 unit cells thick surrounding a single virus particle.

1) The molecular organization of cypovirus polyhedra (2007) Coulibaly F, Chiu E, Ikeda K, Gutmann S, Haebel PW, Schulze-Briese C, Mori H. and Metcalf P. Nature. 446, 97-101

2) The atomic structure of baculovirus polyhedra reveals the independent emergence of infectious crystals in DNA and RNA viruses (2009) Coulibaly F, Chiu E, Gutmann S, Rajendran C, Haebel PW, Ikeda K, Mori H, Ward VK, Schulze-Briese C and Metcalf P. PNAS 106, 22205-10



Host: Henry Chapman – CFEL Coherent Imaging Group