

# *Seminar talk on May 2<sup>nd</sup>, 2012, 15:00*

WCRC, Building 14.51, "Aquarium" (room no. 3303)

## **High resolution X-ray microprobe and its applications**

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The speaker has been involved in several new projects, such as:

- (a) Transmission X-ray Microscopy (TXM):** recently we have performed experiments with the highest possible spatial resolution at Advanced Light Source (ALS) in USA and BESSY II in Germany. A 3-dimensional tomography has been performed on a single cell of coccolithophores with resolution down to 20 nm. Coccolithophores are marine unicellular algae, notable for the intricate calcite ( $\text{CaCO}_3$ ) structures (coccoliths) which surround each cell. Though tiny (diameter of ca.  $5\mu\text{m}$  for *Emiliania huxleyi*), they can form vast oceanic blooms, representing the largest class of calcifying organisms on the planet and constituting a fundamental part of the global carbon cycle through their carbon assimilation and calcification – the latter represents a major sink of carbon to the ocean floor sediments. Understanding the process of calcification and the formation of coccololiths is of fundamental importance to models of carbon fluxes in the oceans and global climate change.
- (b) TXM-IRM-CM beamline at the Australian Synchrotron:** this project is closely related with the proposed development of a new beamline at the Australian Synchrotron. This beamline will combine features of (a) Transmission X-ray Microscopy (TXM), (b) Infrared Microscopy (IRM) and (c) Confocal Microscopy (CM) and will create a unique facility for high resolution imaging.
- (c) Single Cell Irradiation Facility (SCIF):** high resolution X-ray microbeams have been developed using synchrotrons and laboratory-based systems for live cell irradiation. Recently we have been using a dedicated SCIF beamline BL27B at the Photon Factory in Japan with focused beams of  $5\times 5 \mu\text{m}^2$  of monoenergetic X-rays. We performed experiments on single cells and with different microbeam widths and separations to gain further insight into the underlying cellular response. Development of similar facilities has been planned in Australia.