



	Experiment title: Fine Structure of Isolated Mesoglea from Hydra Probed by Small Angle X-ray Scattering with Symmetric and Asymmetric Beam	Experiment number: SC-3330
Beamline: ID13	Date of experiment: from: 29.10.2011 to: 01.11.2011	Date of report: 27.02.2013
Shifts: 9	Local contact(s): Dr. Manfred Burghammer	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): M. Veschgini* (Univ. Heidelberg) W. Abuillan* (Univ. Heidelberg) A. Burk* (Univ. Heidelberg, Internship at ESRF June – August 2011) N. Frenkel* (Univ. Heidelberg) M. Tanaka (Univ. Heidelberg)		

Report:

The main goal of the previous experiments was to resolve the local fine structure of the extracellular matrix, mesoglea, of the freshwater polyp hydra. Hydras were provided by the group of Prof. Holstein (Univ. Heidelberg). Mesoglea was isolated from several hydras by a freeze-thaw process. After deposition on silicon nitride windows the mesogleas were allowed to dry on air.

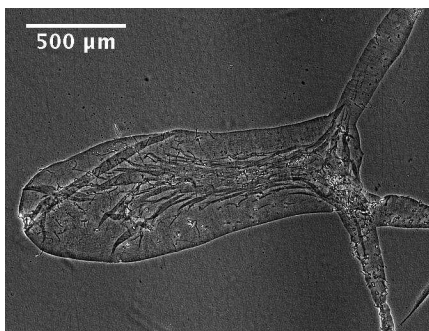


Figure 1. Phase contrast microscopy image of isolated air-dried hydra mesoglea

Grazing incidence small angle x-ray scattering (GISAXS) experiments were carried out at ID13. The samples were subjected to a symmetric nano-focused beam (200 nm) at an incident angle, $\alpha = 0.457^\circ$, beyond the critical angle of total reflection. Two sets of experiments were performed. In each set several two dimensional mesh scans were done. In the first part of the experiments the mesoglea main body axis was oriented parallel to the incident beam direction. In the second part the mesoglea was rotated 90° to align the main

body axis perpendicular to the direction of the incident beam. Figure 2 represents two of the recorded scattering patterns.

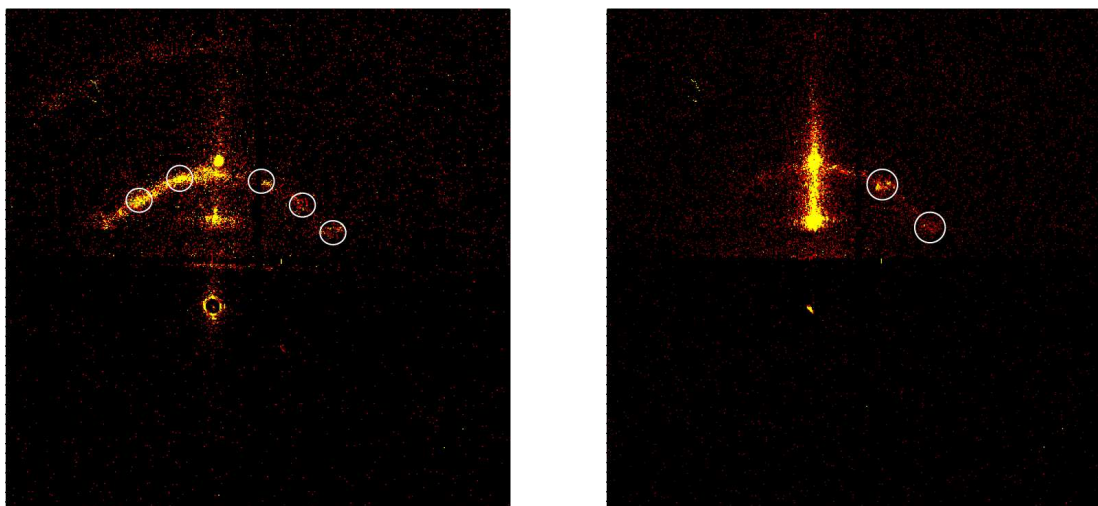
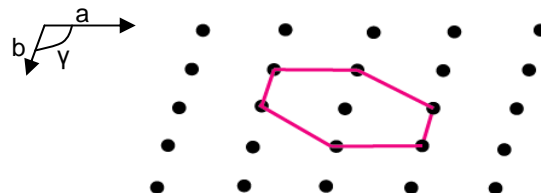


Figure 2. GISAXS scattering patterns of isolated mesoglea. Incident beam (a) parallel and (b) perpendicular to the main body axis. Satellite peaks are indicated with a white circle.

The reciprocal space lattice of collagen type I fibres in hydra mesoglea is deduced from the position of the observed Laue zones and satellite peaks in each pattern. Analysis of the reciprocal space revealed a distorted hexagonal packing order of collagen molecules in the fibres. The calculated real space lattice parameters are shown in table 1.



	a[nm]	b[nm]	γ[$^{\circ}$]
Beam parallel to body axis	15.5	4.4	98.2
Beam perpendicular to body axis	8.2	4.2	104.9

Table 1. Calculated lattice parameters of collagen type I fibres in hydra mesoglea