ESRF	Experiment title: **Compositional diversity of the sulphated glycoprotein matrices screted during the early growth stages of the cultivated pearls**	**Experiment number**: CH 2740
Beamline: ID 21	**Date of experiment**: from: 18 Sept 08 00 to: 23 Sept 08 00	**Date of report**: 11 11 08
Shifts: 15	**Local contact(s)**: Murielle SALOME	*Received at ESRF:*

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Report: Scientific background and Aim of the experiment

Quality of the cultivated pearls entirely depends on the composition of the complex set of macromolecules produced by a monolayer epithelium (the “pearl-sac”) during formation of the one to two millimeter thick pearl layer. Production of cultivated pearls is primarily based on a surgical operation, the "grafting", that consists in using a small fragment of living tissue cut from the mantle of a Pinctada (the pearl oyster) to produce new nacreous material onto a mineral sphere (the *nucleus*) deposited within the visceral cavity of an animal of the same species. By cutting the graft in the most actively mineralizing area of the mollusc mantle, the newly formed minerals are expected to be closely similar to the nacre (or "mother of pearl") that was produced by the shell from which the graft was cut.

But recent investigations have shown that the actual mineralization process in pearl formation is much more complex. During the few weeks during which the graft covers the whole nucleus surface to produce the "pearl-sac". After about one month the pearl-sac epithelium recovers a secretory activity, but the organic and minerals materials produced in these early stages are far from resembling the typical nacreous structures. Clearly, important metabolic changes have occurred in the pearl-sac epithelium. Instead of nacreous material, a great diversity of Ca-carbonate microstructures is developped in the basal part of pearl layer, including formation of prismatic structures (either calcitic or aragonitic). CH 2740 experiment was a contribution to understanding this process by correlating the sizes, shapes and crystallographic patterns of the

newly formed minerals data to the distribution of the biochemical compounds which drive the mineralization process.

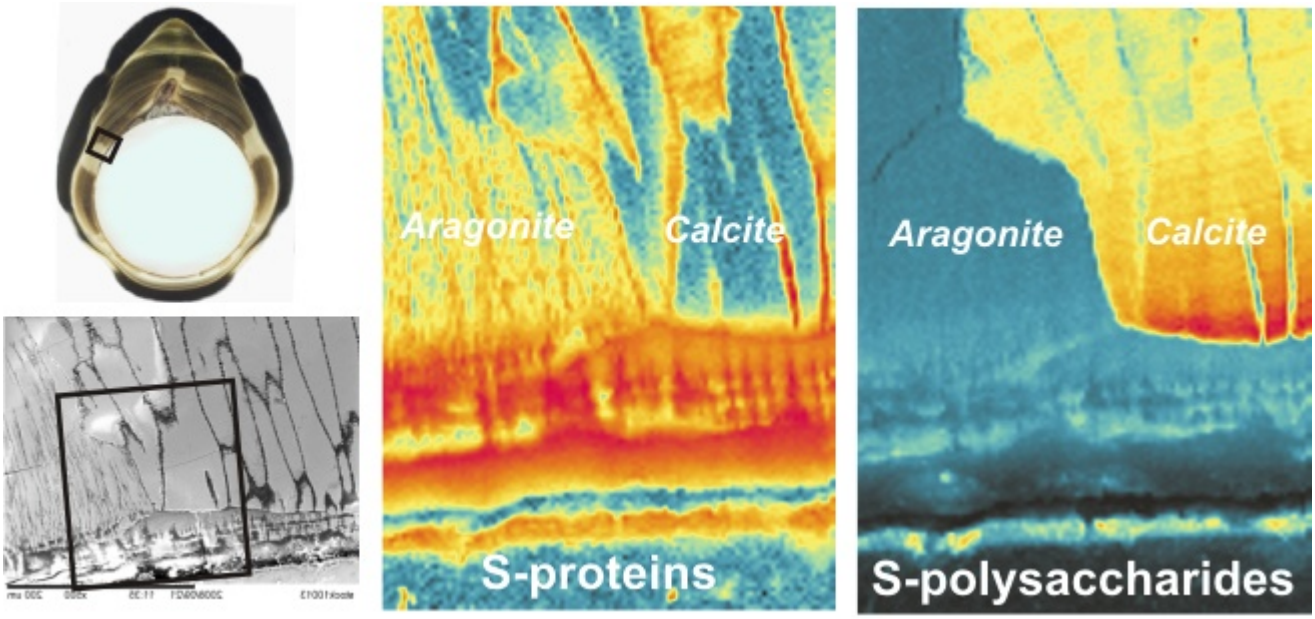
Materials and Method

A selection of pearls had been diametrally cut and diamond polished at the applicant's lab. Thanks to M. Salomé, technical setting and calibrations were all made at the beginning of the session. No beam or machine troubles occur during the session, enabling us to fully use the allocated beam time. A consistent series of maps and localized measurements was made, taking advantage of the newly installed multichannel collector.

The resulting data are going to be reworked through both Artemis or PyMCa imaging softwares.

Results

The surprizing occurrence of calcite and ragonite under prismatic form, with specific sizes,shapes and organic matrices compositions have been perfectly illustrated



Mapping ot a basal pearl layer using Xray fluorescence of sulphur ***In the basal pearl layer, distinct mineralogies are fully corrrelated to polysaccharide/protein ratio.***

Expected developments

These results allow a new investigation concerning pearl formation to be investigated. A series of experiments will be organized under responsability of the National School of Pearl Grafting and Cultivation at Rangiroa (French Polynesia), in order to correlate biochemical compositions of the mineralizing matrices in the pearl layer, environmental conditions and quality of the resulting products.

Recent relevant publication

CUIF J.P., BALL A.D., DAUPHIN Y., FARRE B., NOUET J., PEREZ-HUERTA A., **SALOME M**., WILLIAMS C.T., 2008 - Structural, mineralogical, and biochemical diversity in the lower part of the pearl layer of cultivated seawater pearls from Polynesia. *Microsc. Microanal.* 14: 405-417.