

## **On the relation between sample preparation, interpretation and scientific progress: The finding of optical active mesostructures in *Artemia franciscana***

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Cryopreparation for transmission electron microscopy (TEM) based on high-pressure freezing and freeze substitution (FS) has proven as superior for sample preservation when compared to chemical fixation and processing of cells and tissues at ambient temperature. To accelerate the otherwise notoriously slow substitution process we developed an agitation module that shortens the processing in an automatized FS unit from days to hours [1].

Recently, we adapted the FS under agitation to study the vitellogenesis and embryogenesis in the ovisac of the brine shrimp, *Artemia franciscana* [2]. This approach included the challenging task of preserving encysted eggs of the oviparous line of reproduction.

The talk introduces an instant and unique discovery that resulted from our methodological development, namely the finding of mesostructured intracellular inclusion in the ovisac lining of *A. franciscana*. The integrity of these 'zebra-striped' crystal-like flakes was maintained by means of cryopreparation, but not by conventional sample preparation at room temperature. Light microscopy, performed in cooperation with Thomas Schwaha, Dept. of Integrative Zoology, not only confirmed the existence of the striated flakes under native conditions; it also revealed the light dispersing activity of their striated superstructures. What is the function of the numerous intracellular 'optical gratings' during embryogenesis of the *A. franciscana*? What have these structures in common with mesocrystals that are currently in the focus of biophysicists and material scientists? The answers lie in interdisciplinary research that has to be linked with cryopreparation-based TEM.

[1] Goldammer et al. Protist. 2016;167(4):369-76.

[2] Hollergschwandtner. Msc-Thesis. 2016. University of Vienna