

Microstructural growth increments in the brachiopods *Liothyrella uva* and *L. neozelanica*: preliminary study of growth analysis and proxy calibration

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Brachiopods secrete low-Mg calcite shells in near equilibrium with the surrounding sea water, with respect to their secondary and tertiary layers. For this reason, in recent years they have been intensively studied as archives for oceanographic and environmental proxies. The primary layer has been shown not to be deposited in equilibrium with the ambient sea water, leading to a novel cleaning protocol proposed by Zaki et al (2015). In the spite of improving on existing proxies, the shell microstructure and growth has to be taken in to account in their applications. The secretion of the primary layer is known to be external of the shell, but in SEM investigations of *Liothyrella uva* and *L. neozelanica* we discovered that the primary layer has its origin within the fibres of the secondary layer. Furthermore, the primary layer calcite is not a continuum but instead it consists of a 'new' band for each major growth increment. There is overlap between the preceding and subsequent 'band' (or shingles) of the primary layer, which may extend into the secondary/tertiary layer. This finding may lead to more comprehensive knowledge of shell microstructure processes in *L. uva* and *L. neozelanica* that may be applied and extended to other modern and fossil brachiopods, including age dating of brachiopods. This discovery may make brachiopod archives more reliable and consistent proxies when applied to and interpreting their geological record.