

The presence of silicate grains in foraminiferal calcite tests suggests a novel biomineralization strategy in foraminifera

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We analyzed modern and fossil specimens belonging to the foraminiferal species *Melonis barleeanus* from the Arctic Ocean, the Mediterranean Sea, and the Tyrrhenian Sea. Scanning electron microscopy (SEM) and Energy-dispersive X-ray spectroscopy (EDS) revealed the presence of minute silicate grains (ca. 2 µm) inside the chamber walls of many of the tests examined. The analyses of other foraminiferal species from the Arctic Ocean (e.g., *Lobatula lobatula*, *Nonionella labradorica*, *Lenticulina* sp.) did not show the presence of these grains in the tests analyzed, suggesting this to be a main characteristic of *M. barleeanus*.

We note that the spatial distribution of silicate grains in *M. barleeanus* appears to be regular and well organized rather than random. In addition, the similar grain chemical composition and size suggest a relatively high degree of selectivity in both fossil and modern specimens. We interpret these results to be the evidence of a novel biomineralization strategy adopted by *M. barleeanus*. More specifically, we hypothesize that this species might agglutinate silicate grains prior calcite deposition during the formation of a new chamber. Considering that not all the specimens analyzed showed the presence of silicate grains, we think that this biomineralization mechanism might be adopted by *M. barleeanus* when the environmental conditions are not favorable to calcite precipitation (e.g., when pore water are undersaturated with respect to calcite). Because the isotopic and chemical composition of this species is widely used in paleoclimatic and paleoceanographic reconstructions, we think that it is important to consider its biomineralization strategy during the interpretation of geological records.