

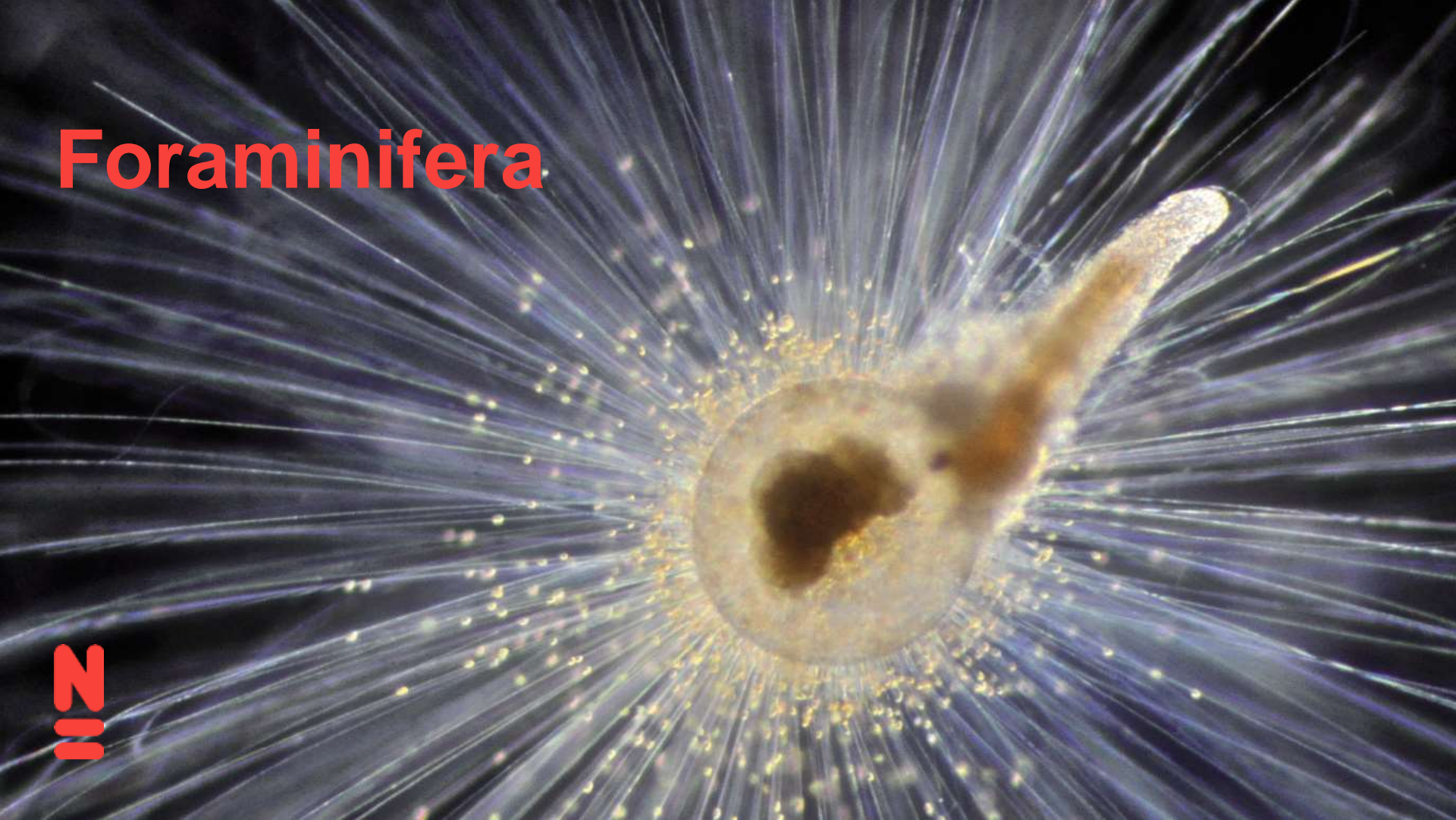
How adding a dimension transforms evolutionary thinking in microfossils

Willem Renema





Foraminifera



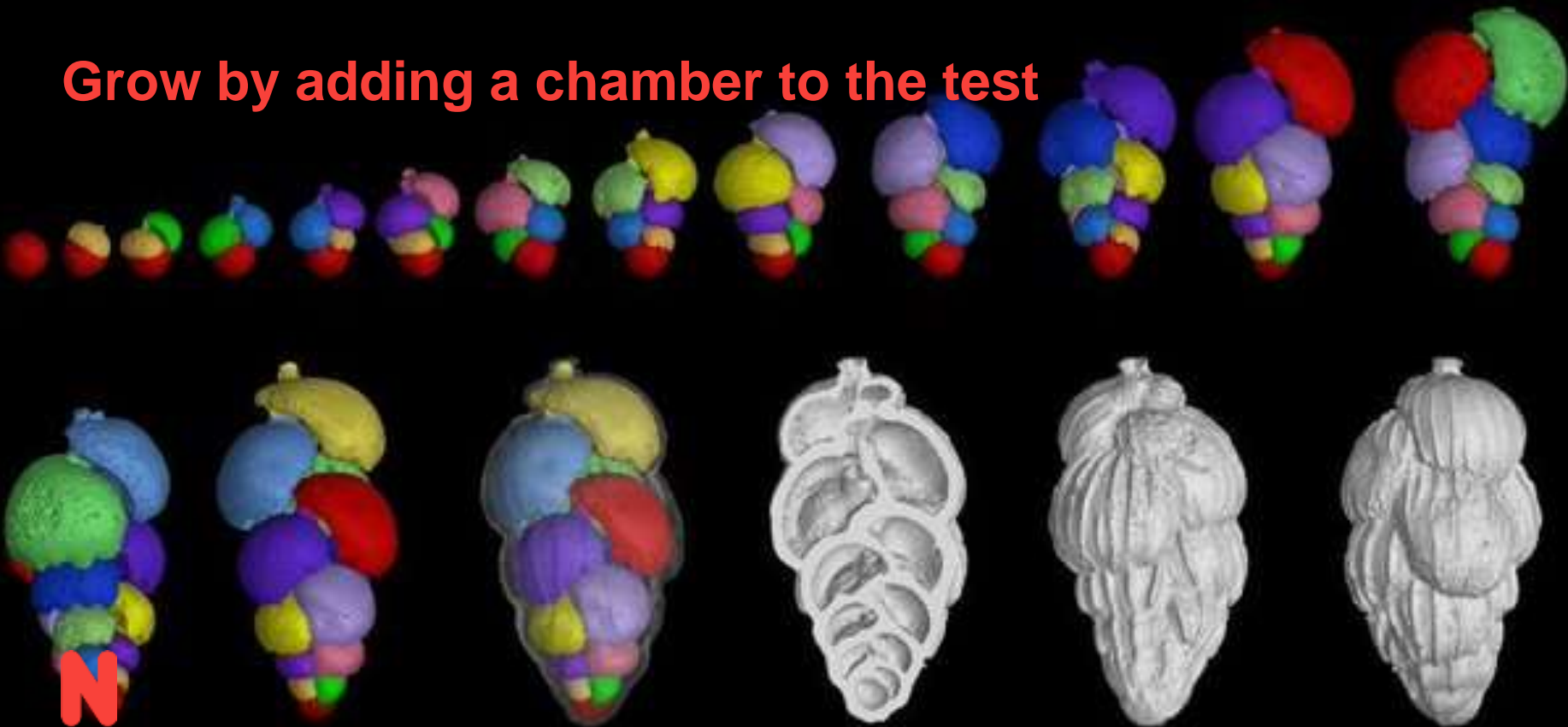
Benthic foraminifera

A close-up, high-magnification photograph of numerous benthic foraminifera. These small, multi-chambered organisms are light brown to tan in color and feature several sharp, radiating spines. They are densely packed and appear to be resting on a substrate of fine, white, crystalline particles, possibly calcium carbonate, with some green organic material visible.



IN

Grow by adding a chamber to the test



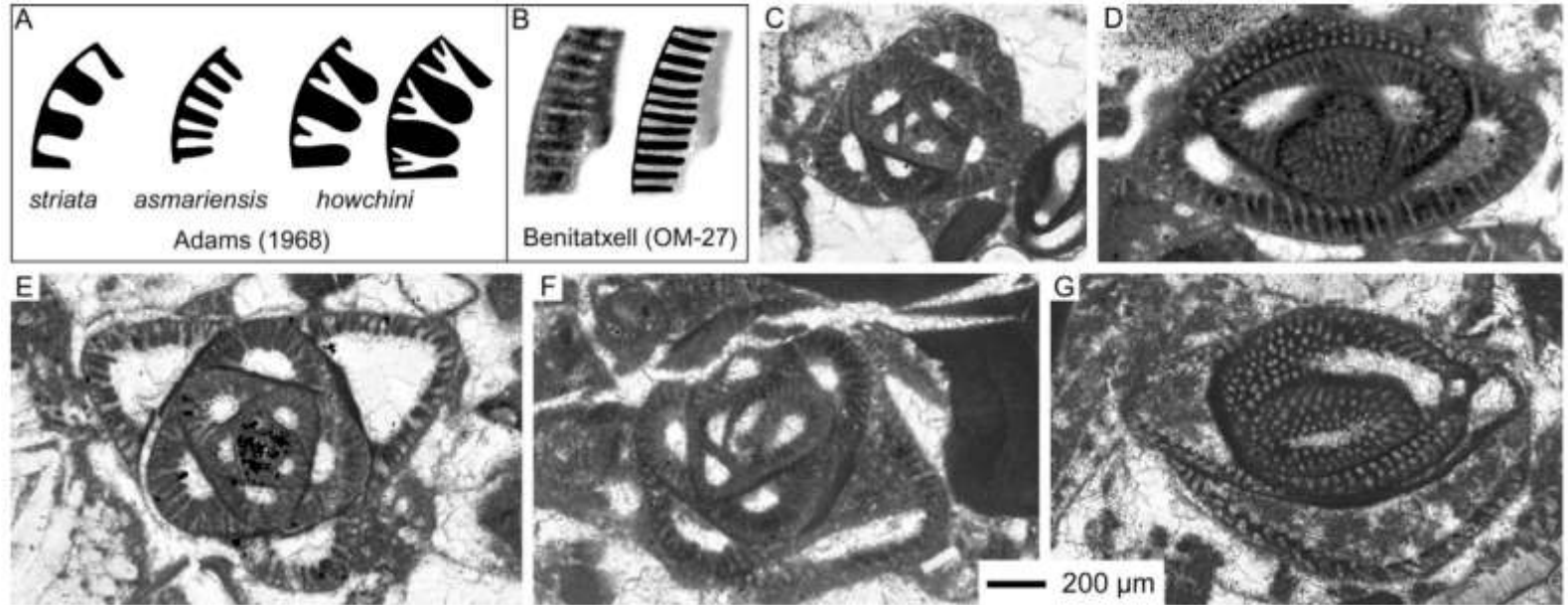
NIH

Image by Shaun Mahmood (AMNH)

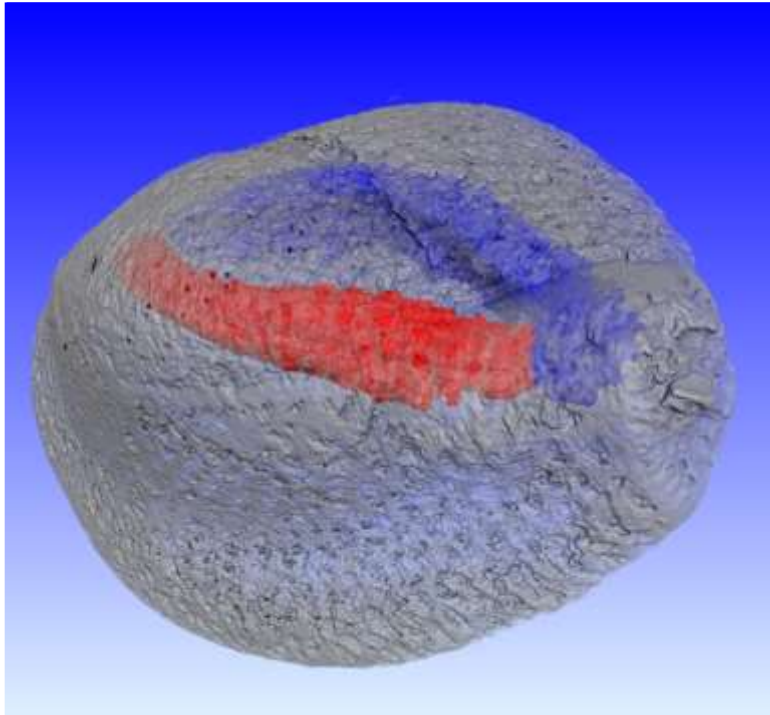
Austrotrillina

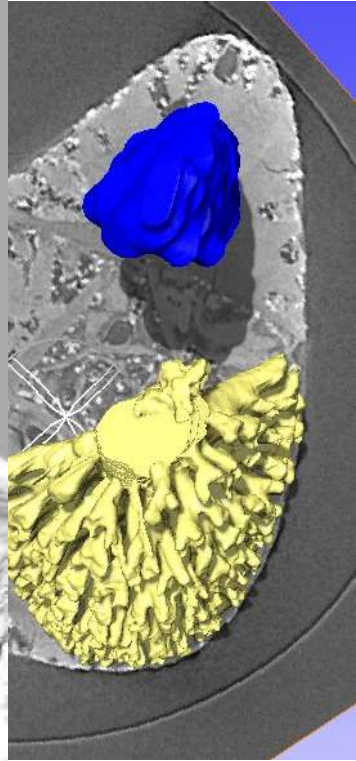
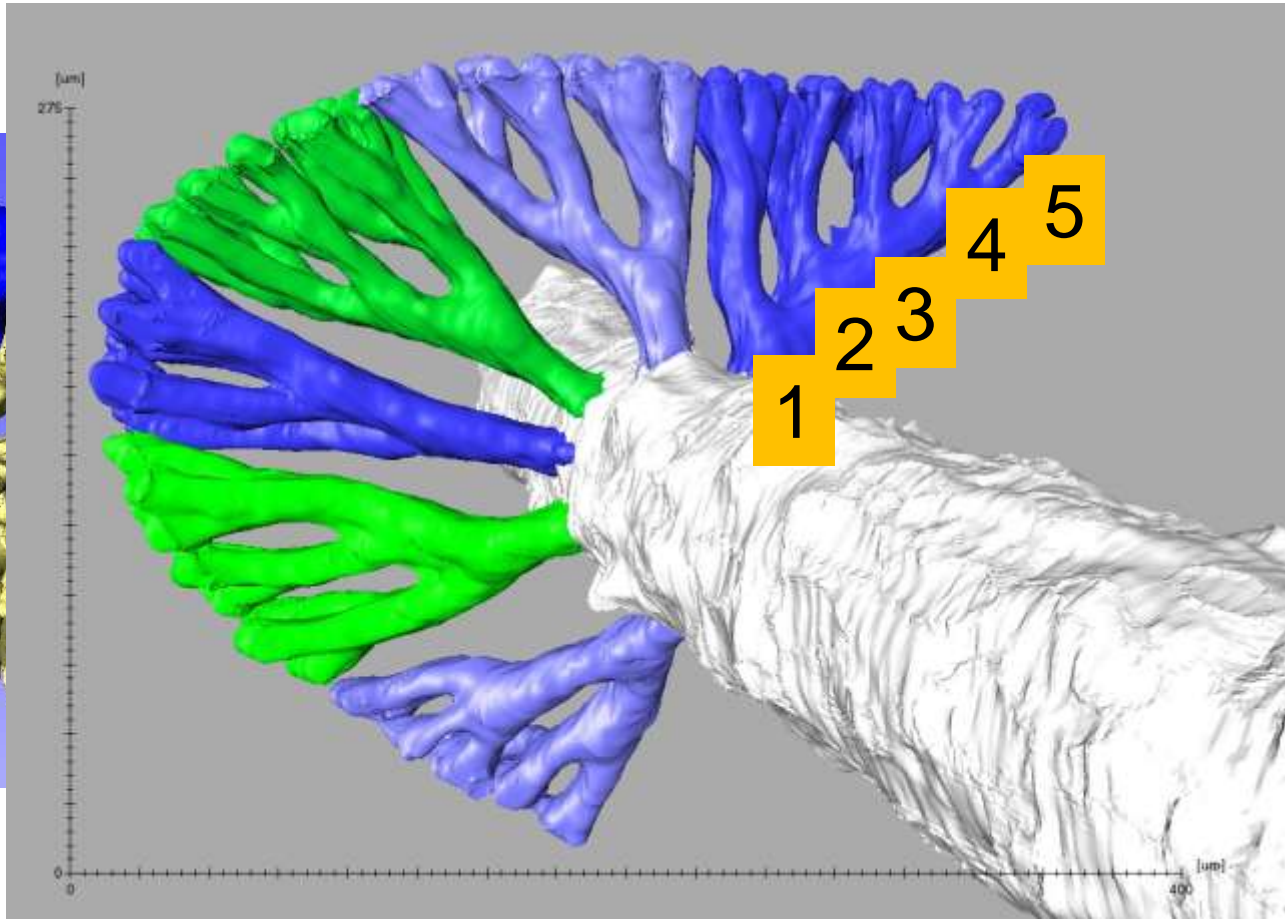


Austrotrillina

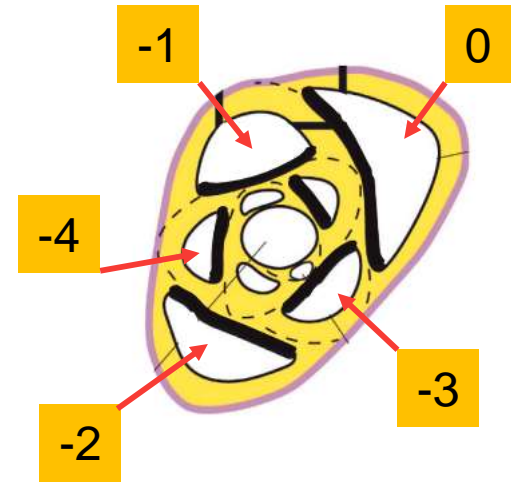
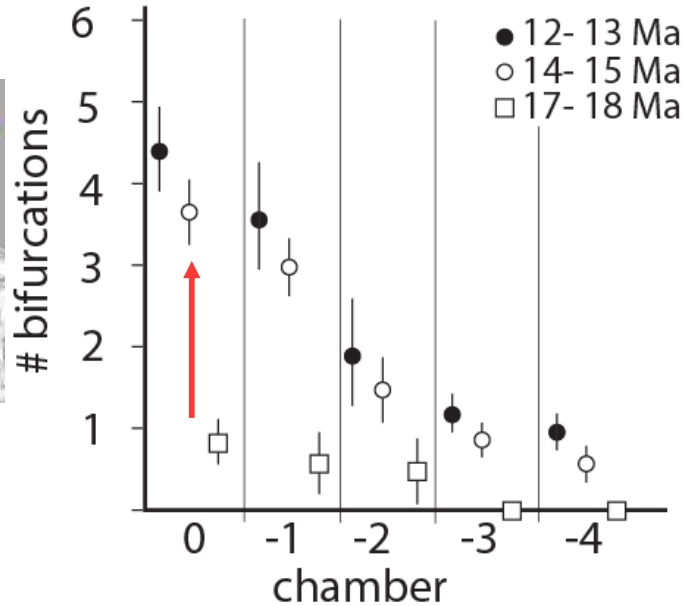
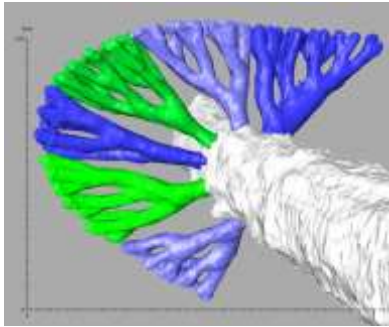


Austrotrillina

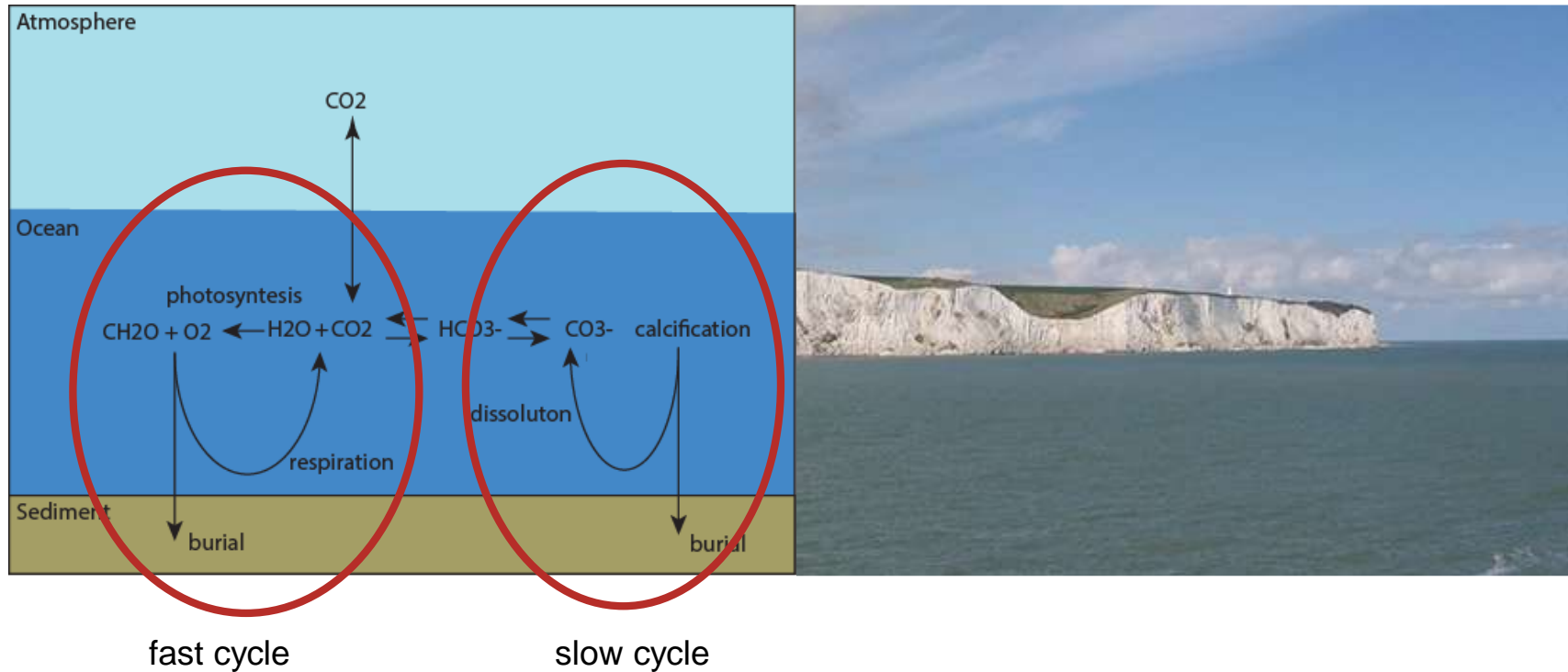




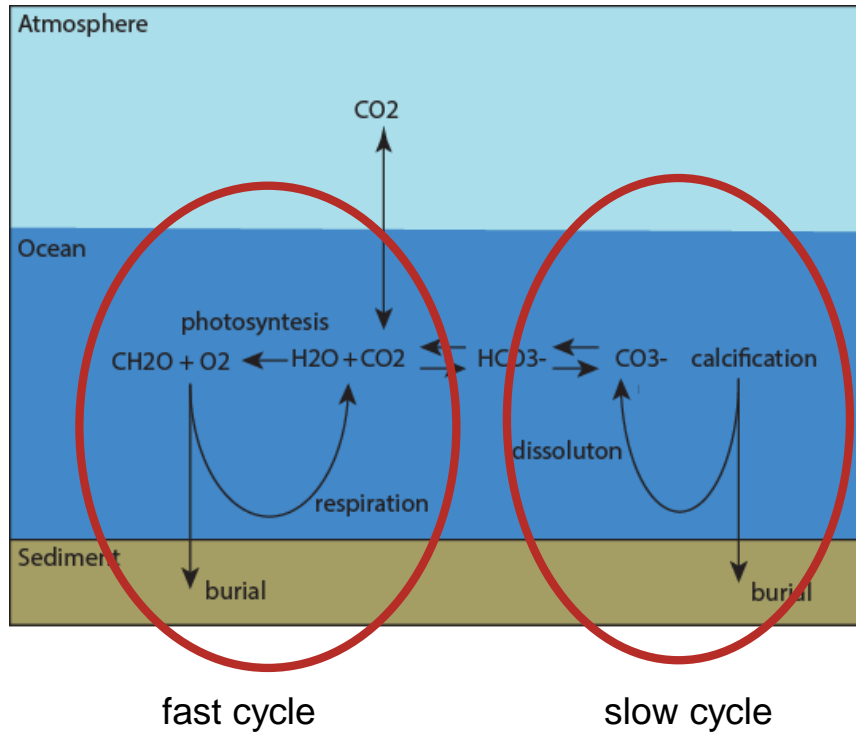
Evolution follows ontogeny



Carbon cycle

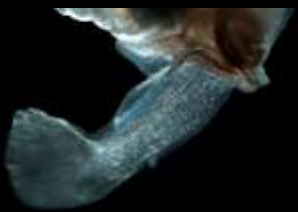
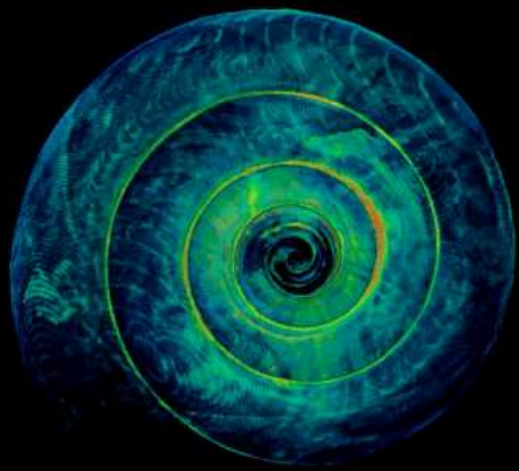
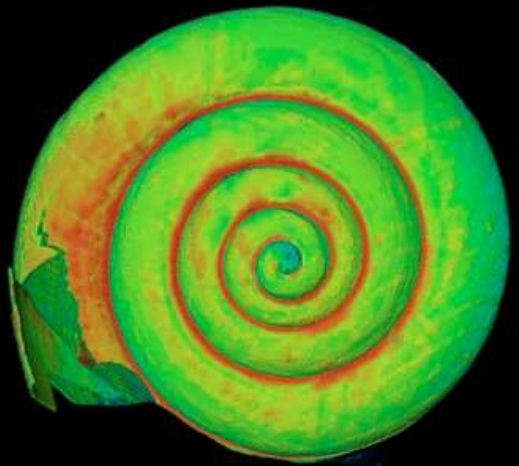


Carbon cycle

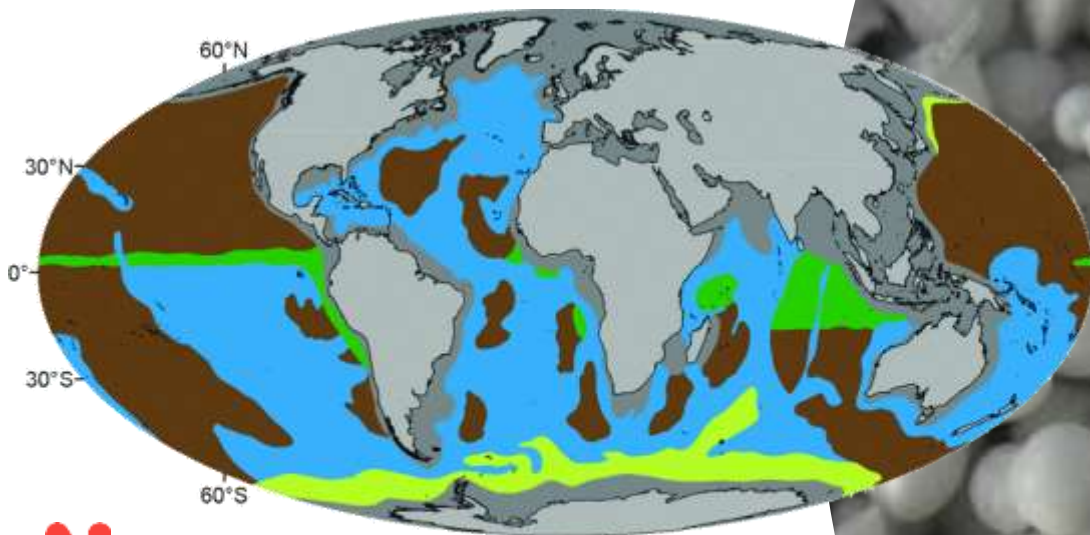


Carbon budget



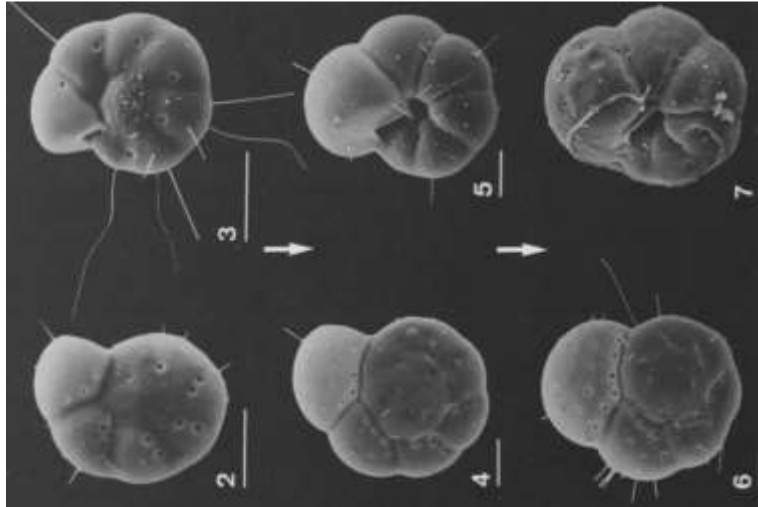


Planktonic foraminifera



Planktonic foraminifera

Carbonate production is all about test growth

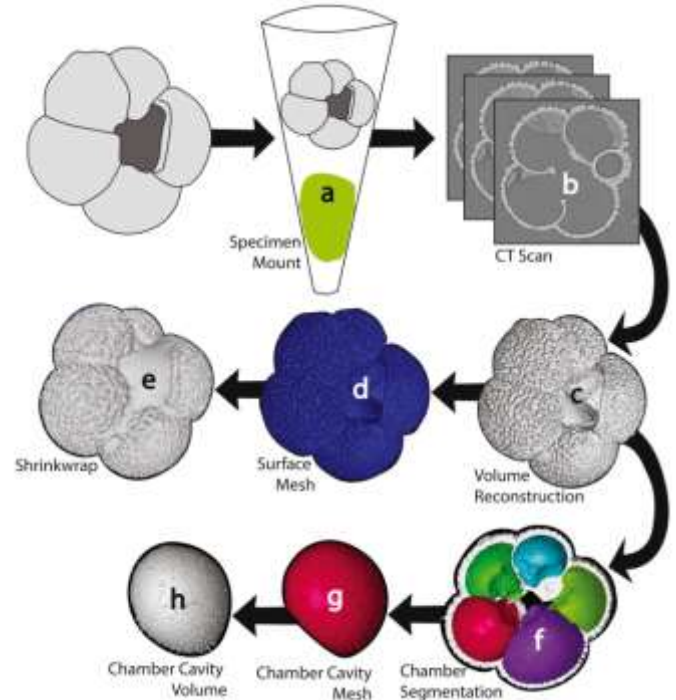
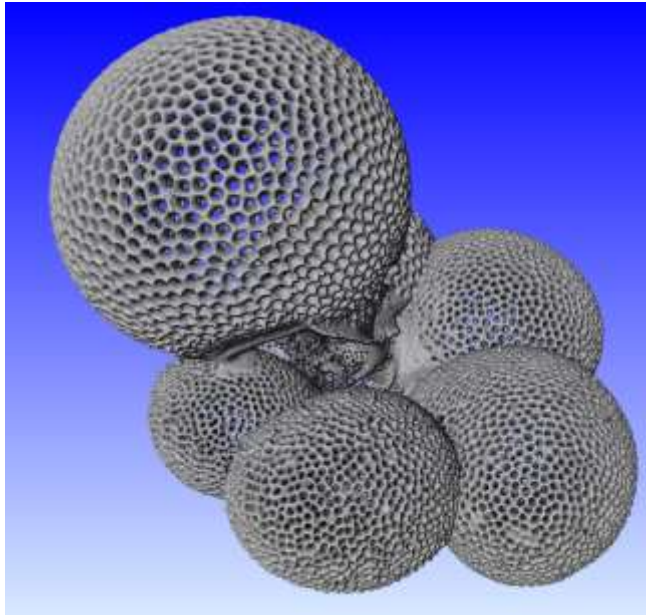


Outstanding questions:

- Ontogenetic changes
- Volume
- Porosity

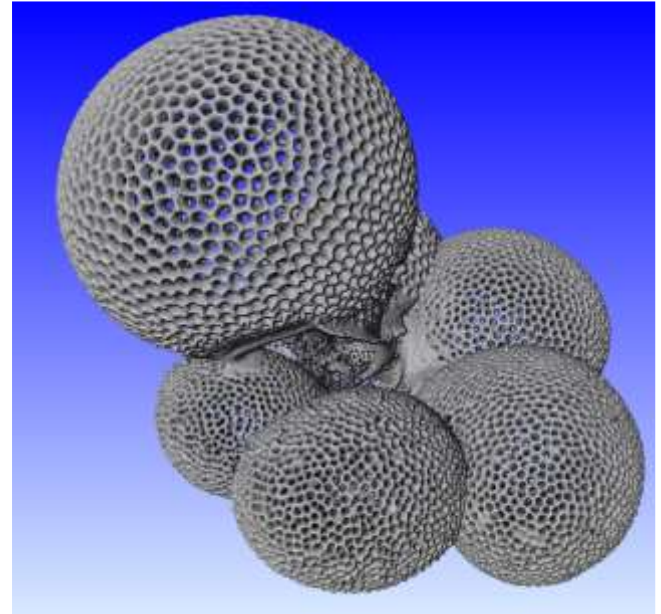
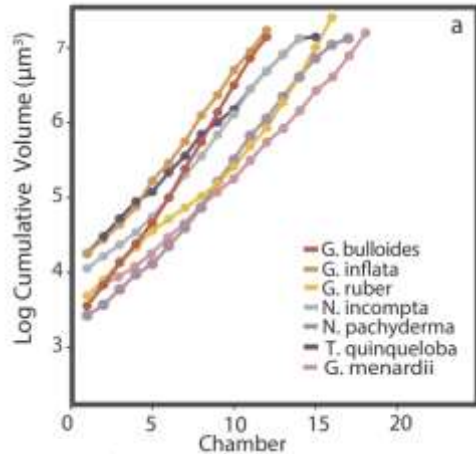
Planktonic foraminifera

Carbonate production is all about test growth



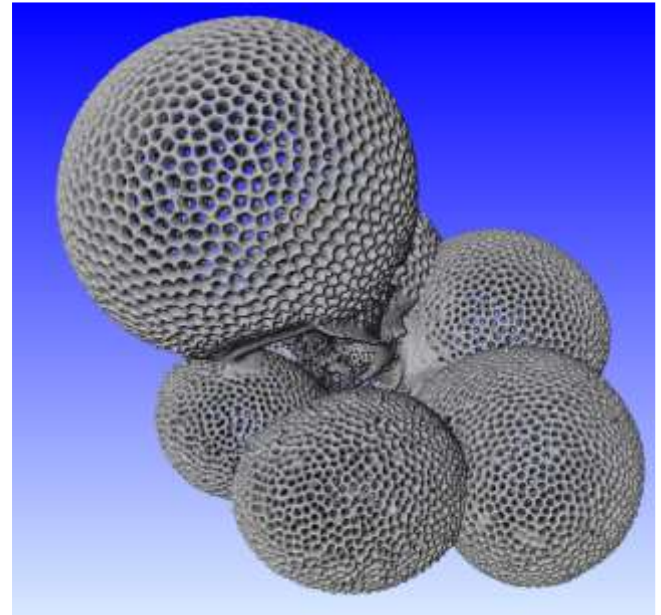
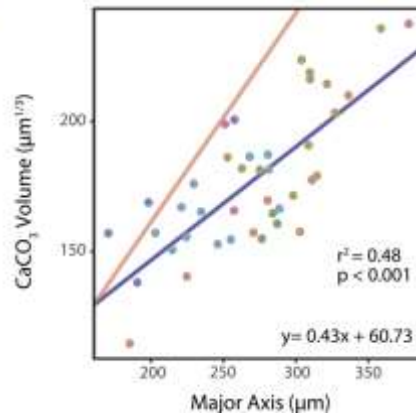
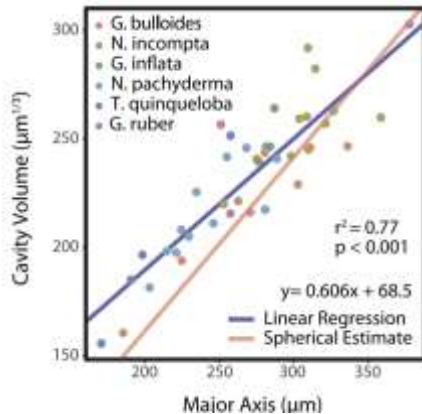
Planktonic foraminifera

- Log linear growth
- Interspecific variation
- Parameters are species specific

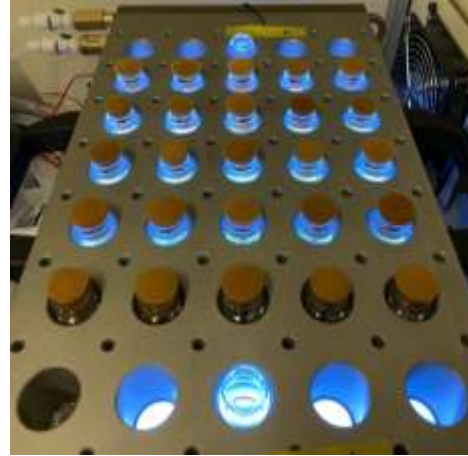
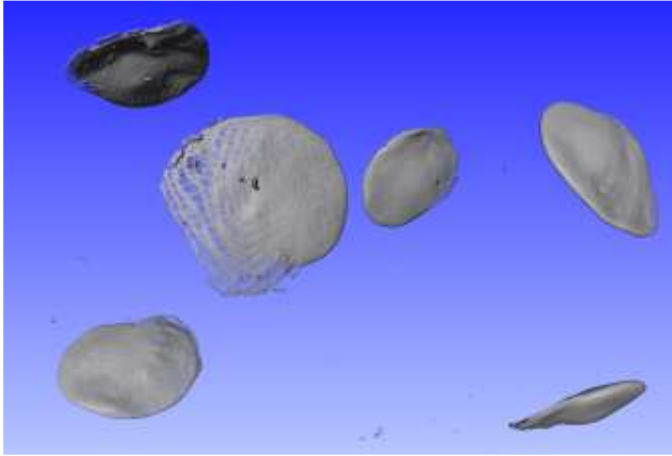


Planktonic foraminifera

Carbonate volume vs size does not differ too much between species



Where do we want to go next?



Pre-experiment, post-experiment comparison of individual growth



Where do we want to go next?



3D image segmentation and classification

