Using The Brasier Collection to explore the phylum Mollusca and its usefulness in biostratigraphy

What is a mollusc?

A mollusc is an animal belonging to the phylum Mollusca. This group is the second largest invertebrate phylum, with ca. 85,000 extant species now recognised, though many remain undescribed. They show great diversity not only in their morphology but life history. As such, it is difficult to provide a definition which describes them universally. Broadly, they are soft bodied animals that tend to be unsegmented, bilaterally symmetrical, with a coelom (a body cavity containing some key organs). Many species exude a calcareous shell from their mantle. The mantle is a dorsal body wall that also encases the mantle cavity which contains other key organs. Molluscs are a dominant group, occupying freshwater, marine, and terrestrial habitats. Most are herbivorous but some are carnivorous. Notable classes belonging to the phylum Mollusca are: Gastropoda (includes slugs and snails), Bivalvia (includes clams and mussels), and Cephalopoda (includes octopuses and squids).

Origins of molluscs and their usefulness in biostratigraphy

Molluscs have been around for a long time, though the exact time of their emergence and subsequent diversification remains hotly debated. However, there is evidence that ancestors to our modern day molluscs existed in the Cambrian period (which started ca. 540 million years ago). Unlike other animals, molluscs are well documented in the fossil record thanks to their calcareous shells which are often preserved during fossilisation.

The abundance and wide distribution of molluscs across the globe, along with their longevity in the fossil record, make them useful markers for biostratigraphy. The fossilised remains of molluscs (along with other taxonomic groups) can be used to establish the relative age of the rock surrounding them, thereby allowing scientists to correlate the succession of rock within and between localities. Beds of 'small shelly fossils' (SSFs) are often used for this purpose. SSFs tend to be small skeletal fossils that represent a diverse number of extant and extinct invertebrate taxonomic groups (including Mollusca). SSFs also provide useful information into the Cambrian explosion, a time period representing great diversification of animal life.

The Brasier Collection: a vital resource for understanding early animal life and biostratigraphy

The Brasier Collection housed in the Oxford University Museum of Natural History represents the lifelong work of the late Professor Martin Brasier, who was a pioneer in the study of early life. The collection comprises of priceless specimens (such as microfossils) and their associated documentation.

Microfossils are small fossils that can only properly be inspected with either a light or electron microscope (e.g. SEM). The microfossils stored in the collection represent the fragmentary remains of a diverse array of animal groups, some of which have modern descendants (e.g. Mollusca). The microfossils come from a number of localities around the world, such as Nuneaton (England), Maidiping (China), River Nemnekey (Russia), Bayangol Gorge (Mongolia), and Valiabad (Iran). The featured specimens (see below) are mainly from Iran.

As with SSFs, these specimens have been useful in identifying different rock layers and the order in which they are layered. This makes them helpful for identifying equivalent layers of rock (either in terms of age or position) in different parts of the world. The microfossils also provide clues in how some of these animal groups may have evolved and lived many hundreds of millions of years ago. However, information on both of these aspects is still quite limited. More research is therefore needed on these specimens if we are to understand the evolutionary and life histories of molluscs (as well as other important animal groups) better.

A selection of Cambrian Molluscs from The Brasier Collection.

Some of these specimens diverge greatly in their morphology, whereas others share morphological traits even though they come from different localities.

All specimens lived in marine environments. Many appear to have been slow-moving epifaunal detritivores (they lived on the surface of a submerged substrate and ate decaying animal or plant matter).