Geography and Environment

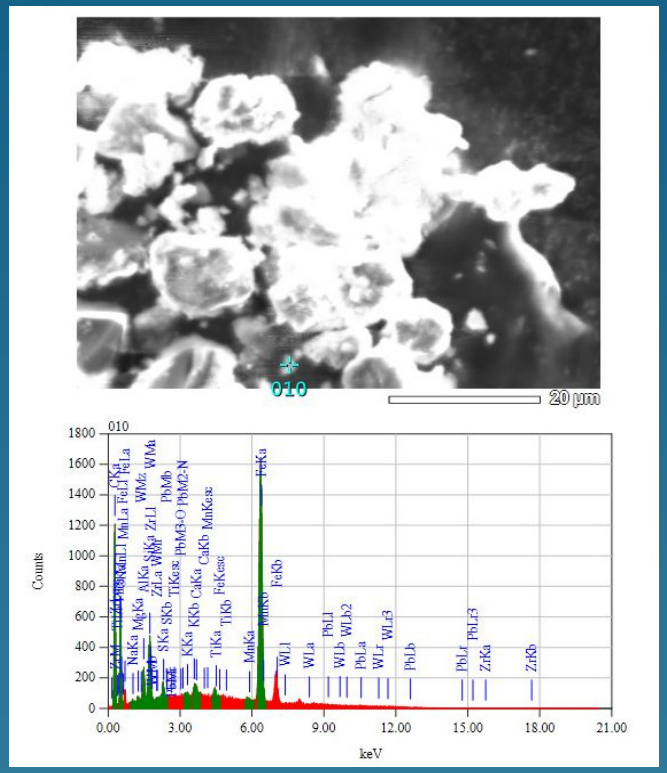
UNIVERSITY OF Southampton

Geography and Environment Laboratories

Scanning Electron Microscope (SEM)

Scanning Electron Microscope

The Scanning Electron Microscope is for imaging and Energy-dispersive X-ray spectroscopy (EDS) to investigate the chemistry of specimens. We are able to magnify samples up to 60 000 x their normal size which is far beyond the range of a normal light microscope. A light microscope works by reflecting light off of a sample, whereas the SEM reflects electrons which are fired at the sample by the machine. As the SEM uses electrons rather than light the images produced are in greyscale rather than colour.

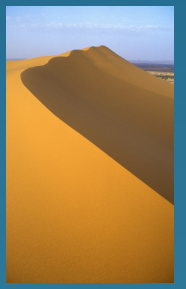


Energy-dispersive X-ray spectroscopy (EDS)

The Energy-dispersive X-ray spectroscopy (EDS) attachment of the SEM allows us to study the chemistry of samples by firing a focussed electron beam at the sample and measuring the energy that is returned.

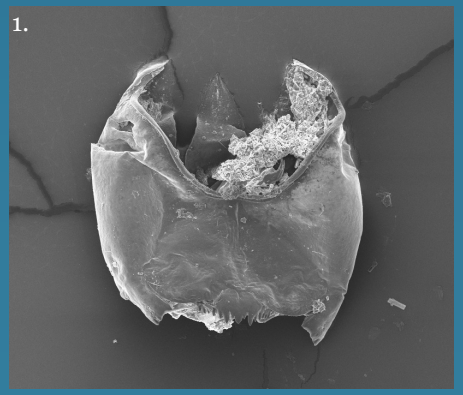
The SEM is often used to study tephra (volcanic ash) as it allows us to study the chemistry of the ash. From this we are able to work out which volcanic eruption it originated from as each eruption has a unique 'chemical fingerprint' .

The figure to the left shows data collected recently from dust deposits in the UK. The image at the top shows the dust particles, and the graph below is the EDS analysis showing the chemistry. Note that Iron (Fe) is high, suggesting the dust is of desert origin, possibly from the Sahara!

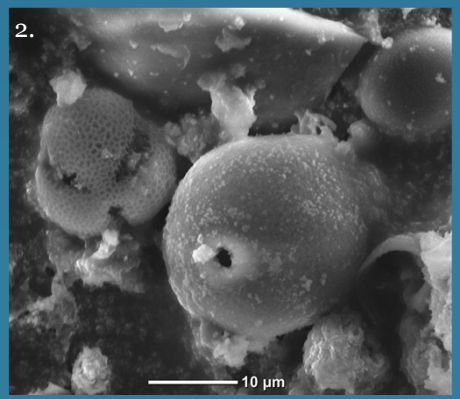


Imaging

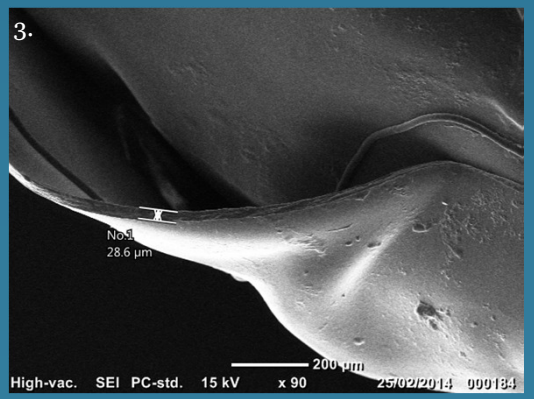
The images shown to the right are part of current research by Geography & Environment academics.
Image 1. is the head capsule of a chironomid, a non biting midge. These fossils found in lake sediments can help reconstruct the temperature at different times in the past as different species only live in certain conditions.
Image 2. shows fossil pollen, viewing pollen in 3-D is not possible with a light microscope. Different plants have different shaped pollen grains which we can identify.
Image 3. is of a salmon egg, the SEM allows the thickness of the wall of the egg to be measured which can provide information on breeding salmon populations.



SEM image of a Gold-coated Chironomid



Pollen under the SEM



SEM image of the wall of a fish egg

SEM image credits: 1. Thomas Bishop, 2. Tony Brown and 3. Jack Bloomer