The Airless Project

A project to combat pyrite oxidation at the NHM (London, UK) is currently in its second year. The project aims to undertake conservation treatments and store highest risk specimens in low oxygen microenvironments. An emergent benefit of the conservation-driven project has been the digitisation of specimens on the collection management system KE Emu, through the use of barcodes and web-based applications.

What is Pyrite Oxidation?

- When relative humidity exceeds 60%, pyrite reacts rapidly with oxygen: $4FeS_{2(s)} + 13O_{2(g)} + 2H_2O_{(l)} > 4FeSO_{4(s)} + 2H_2SO_{4(l)} + 2SO_{2(g)}$
- The decay products (ferrous sulphates) are highly sensitve to humidity and will form mineral hydrates at over 30% RH. These cause expansion cracks.
- Ammonia vapour and other treatments stabilise the decay products and "re-set" the RH sensitivity level to 60%, but the only way to prevent further decay is anoxia.

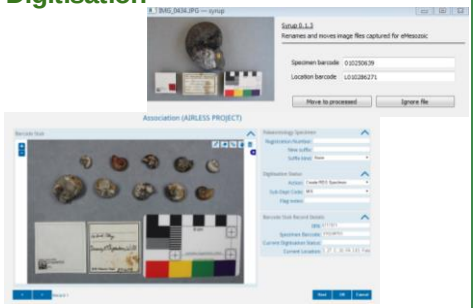
Assessing the Collections

The collections are surveyed to identify pyritic specimens and establish priorities according to severity of deterioration.

Remedial Conservation Treatment

Actively deteriorating specimens are dry cleaned and treated with ammonia gas. Repairs are undertaken using Paraloid B72 in Acetone.

Digitisation



Specimens are assigned a unique barcode, which is scanned and used to name digital images. Apps are then used to create digital records with image and location, and then to associate the data with existing catalogue records.

Re-storage

Specimens are re-stored in gas-barrier microenvironments created from NeoEscal® barrier film with RP System® K-type oxygen scavenging sachets.
The microenvironments range in size from 10cm to 100cm (like the pliosaur rostrum shown below).

So far over 2000 specimens have been re-stored and digitised. The digital records include location (also barcoded), digital images, condition data and treatment records. The completed collections include: plesiosaurs, pliosaurs, pterosaurs, ichthyosaurs, crocodiles and brachiopods. The team is currently working through the cephalopod collection, notably the Gault Clay, and completing surveys of fossil mammals, gastropods, fish and insects, in preparation for the next phase.

NATURAL HISTORY MUSEUM

by Lu Allington-Jones and Amy Trafford