

Project Airless: addressing the problem of pyrite oxidation in a large fossil collection

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The Natural History Museum in London holds around 7 million fossils, a diverse collection of huge scientific and historical importance. The Conservation Centre is responsible for a wide range of specimen care issues, including those affecting the palaeontology collections. One of the most serious of these problems is pyrite oxidation. Pyrite, a form of iron sulphide, can often be found in fossils or their surrounding matrix. Oxidation occurs when unstable pyrite, often in its microcrystalline form, reacts with atmospheric oxygen and water. This reaction is accelerated at relative humidity above 60%, and produces a variety of harmful by-products, usually comprising ferrous sulphate, hydrogen sulphide and sulphuric acid.

Airless, a three-year project that started in August 2015, aims to address this problem. The goal is to identify, treat and prevent pyrite oxidation in the Earth Science collections. A small team of conservation technicians are surveying the collections looking for signs of pyrite decay. Affected specimens are taken to a dedicated lab space where remedial treatments, such as dry brushing or ammonia vapour treatment, are carried out, before re-storage of specimens in anoxic microenvironments. These are individually hand-made using barrier film, with oxygen scavenging sachets added to remove oxygen from the sealed bag. In addition, the project has a digitisation aspect, with the use of web-based applications, improving the museum's database with high-quality photographs that partly compensate for the reduced physical access to the specimens. To date, the team has completed work on nearly 3000 specimens, including ichthyosaurs, plesiosaurs and pterosaurs.