How Rodin prepared his sculptures

Auguste Rodin, 1840-1917

When the Rodin museum was preparing the exhibition «Portrait-making. Rodin and his models », two busts were in such a bad state of conservation that it was impossible to handle them.

How Rodin prepared his sculptures

Georges Clemenceau bust by Auguste Rodin, 1911-1913

The Museum called upon a team of French scientists to identify the composition of the modelling materials used by Rodin to better understand the origins of the degradation.

How Rodin prepared his sculptures

Hanako bust - A. Rodin 1908-1912 (?)
before conservation

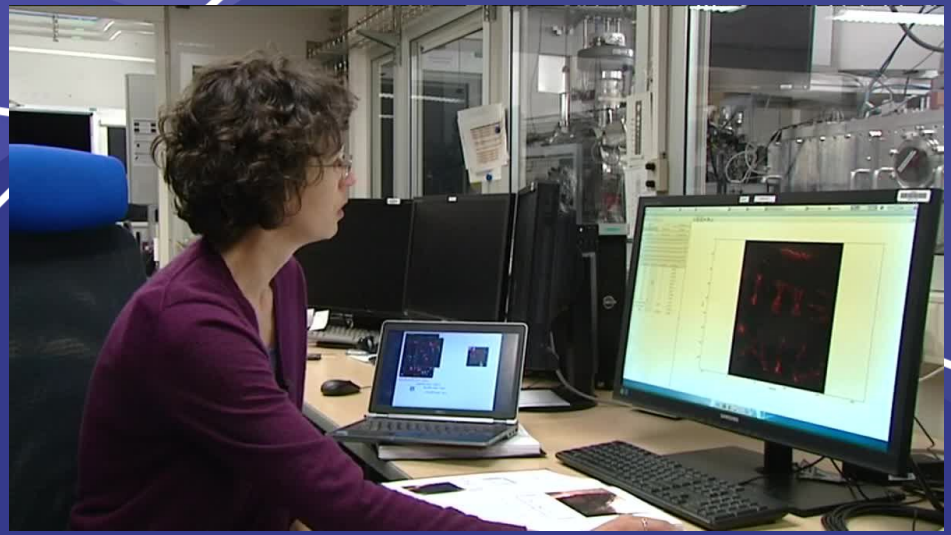
Tiny fragments of the material were analysed using the ESRF's ultra bright X-rays on ID21.
The studies revealed that Rodin used both paraffin and fatty matter filled with calcium carbonate.

How Rodin prepared his sculptures

Hanako bust before and after conservation

With this knowledge, the conservators were able to restore the busts and develop cleaning and conservation protocols for the restoration of such unusual materials.

How Rodin prepared his sculptures



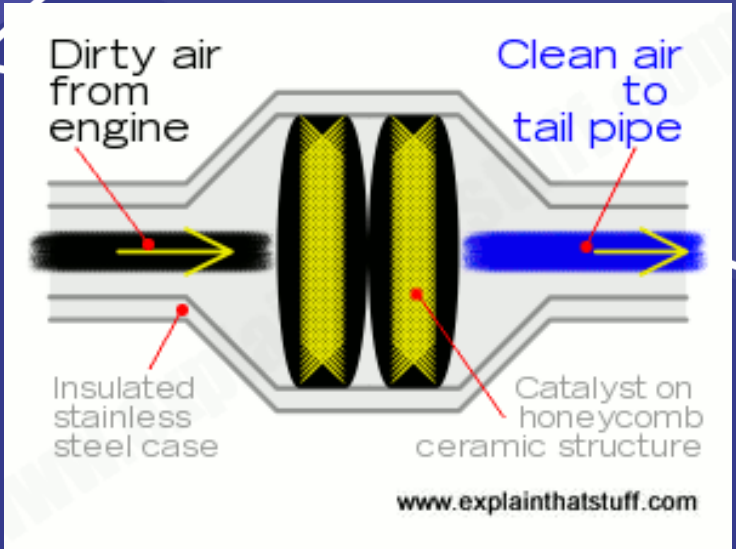
Marine Cotte, scientist in charge of ID21, working inside the beamline control cabin.

ID21 is particularly useful for such studies. It offers different techniques, in particular infrared spectroscopy and X-ray spectroscopy with sub micrometric resolution.

Tracking how catalysts deteriorate

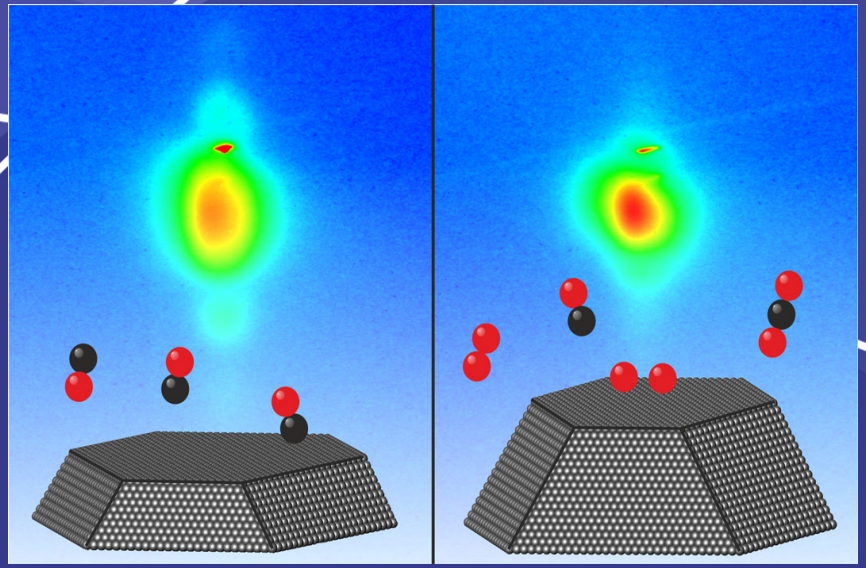
Catalytic converters are crucial for the conversion of harmful chemicals in car exhausts into harmless substances.
However, the catalysts deteriorate over time and become less efficient.

Tracking how catalysts deteriorate



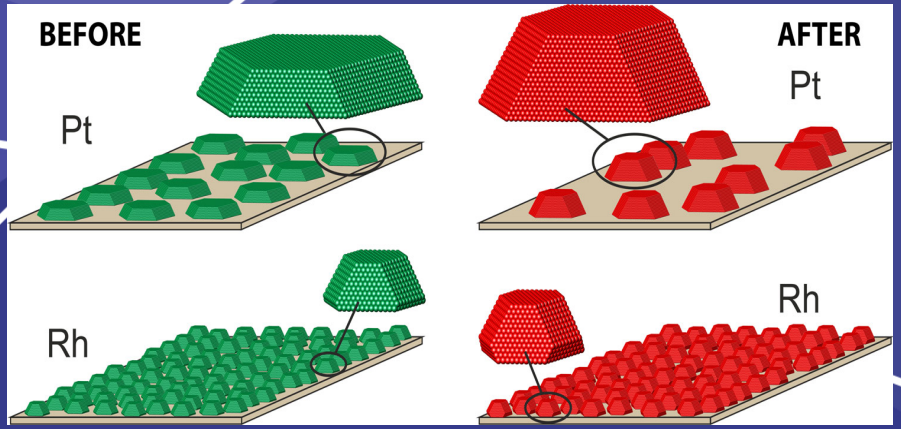
A team of scientists from Germany, Sweden and the ESRF used the high energy beamline ID15 to monitor the catalysts under real-life conditions during a catalytic reaction.

Tracking how catalysts deteriorate



The catalysts contain metal nanoparticles of rhodium, platinum or palladium.
The scientists discovered that during the process the particle size of platinum increases and reduces the surface area of the catalyst, making it less efficient.

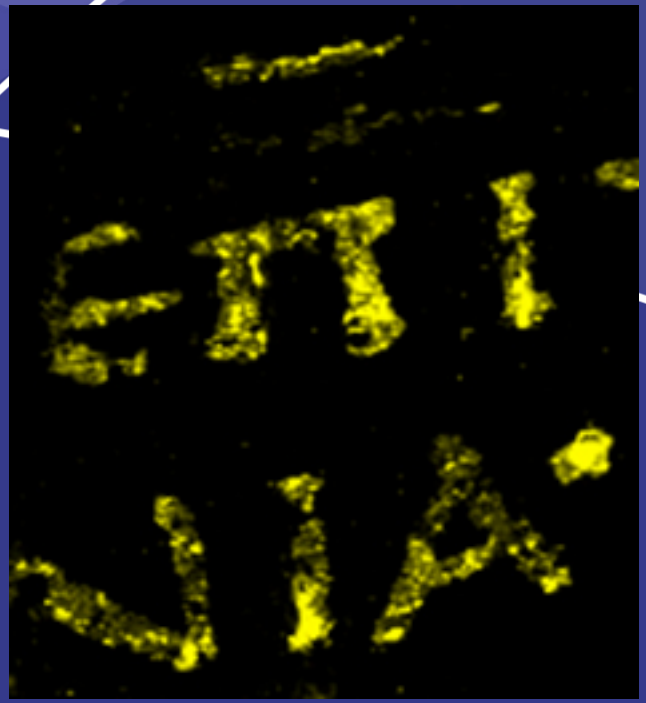
Tracking how catalysts deteriorate



Rhodium (Rh) particles kept their form during the catalysis process, whereas the platinum (Pt) particles fused together and grew substantially.

Rhodium and rhodium-rich particles did not react in the same way, suggesting that rhodium could be important for catalyst stabilization.

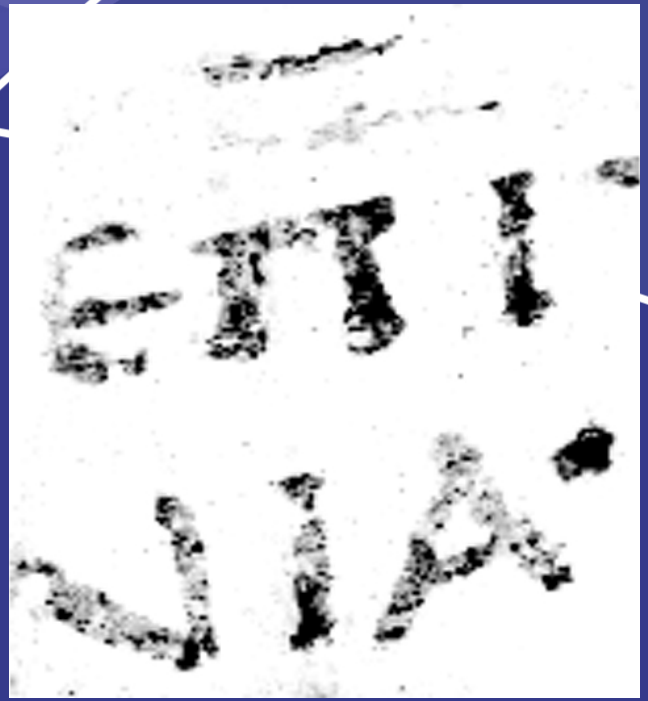
Metallic ink revealed in Herculaneum papyri



Scientists have discovered metal in the ink of two herculaneum papyrus fragments dating from the 1st Century.

It was previously thought that metal was only introduced into inks in the 4th Century

Metallic ink revealed in Herculaneum papyri

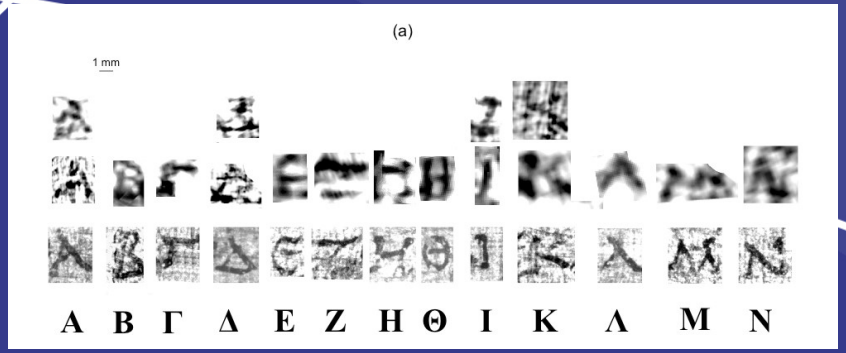


Using a combination of synchrotron techniques on beamline ID21, studies of the composition of the ink showed it to contain fairly high levels of lead.

Metallic ink revealed in Herculaneum papyri

The scrolls date from the 1st Century and were carbonised during the eruption of Mount Vesuvius in 79 AD.
Many attempts to decipher the content of the scrolls have been made since their discovery in 1754.

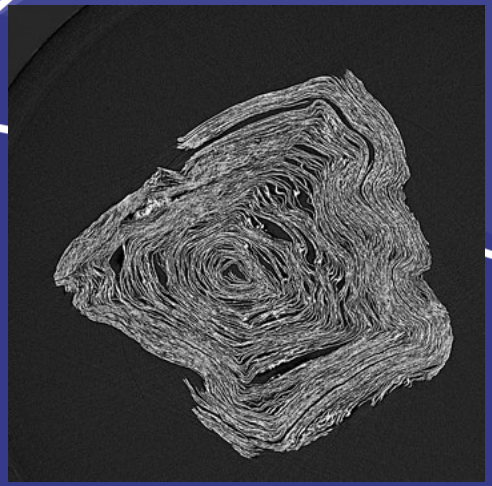
Metallic ink revealed in Herculaneum papyri



In 2015, using innovative imaging techniques at the ESRF, scientists were able to decipher for the first time the contents of the badly damaged and rolled papyrus scrolls.

They reconstituted almost all letters of the Greek alphabet.

Metallic ink revealed in Herculaneum papyri



A section of the rolled papyrus

It was during further experiments on these scrolls that the scientists determined the composition of the ink and discovered the presence of lead.

What will they find next?

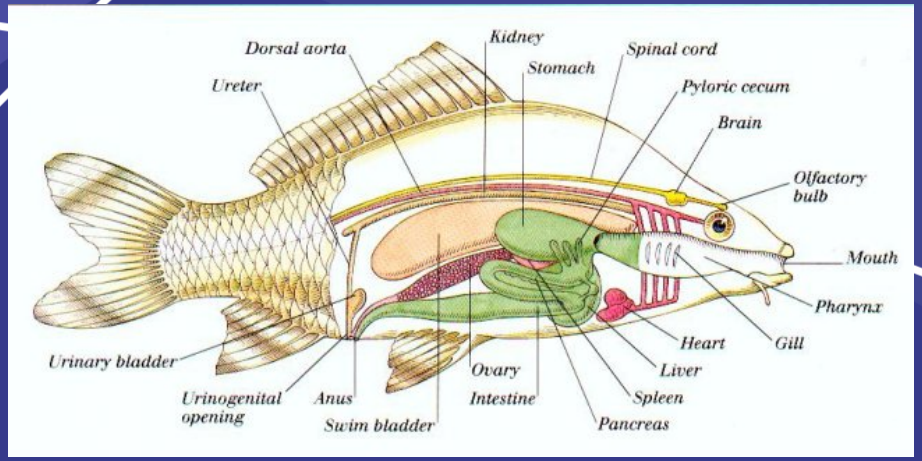
Getting to the heart of fossils

For the first time, a fossilised heart has been found in a fish dating from 119 million years ago. This breakthrough is helping to provide clues about cardiac evolution.

Getting to the heart of fossils

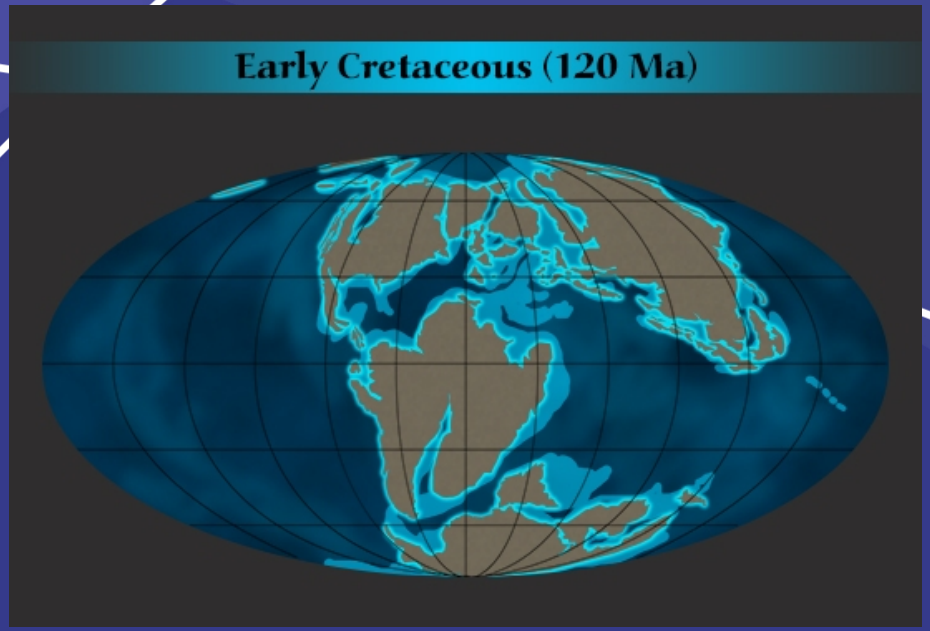
How the chambered heart evolved is a key point in the history of vertebrates. However, no cardiac structure has ever been described due to a lack of fossil evidence to study.

Getting to the heart of fossils



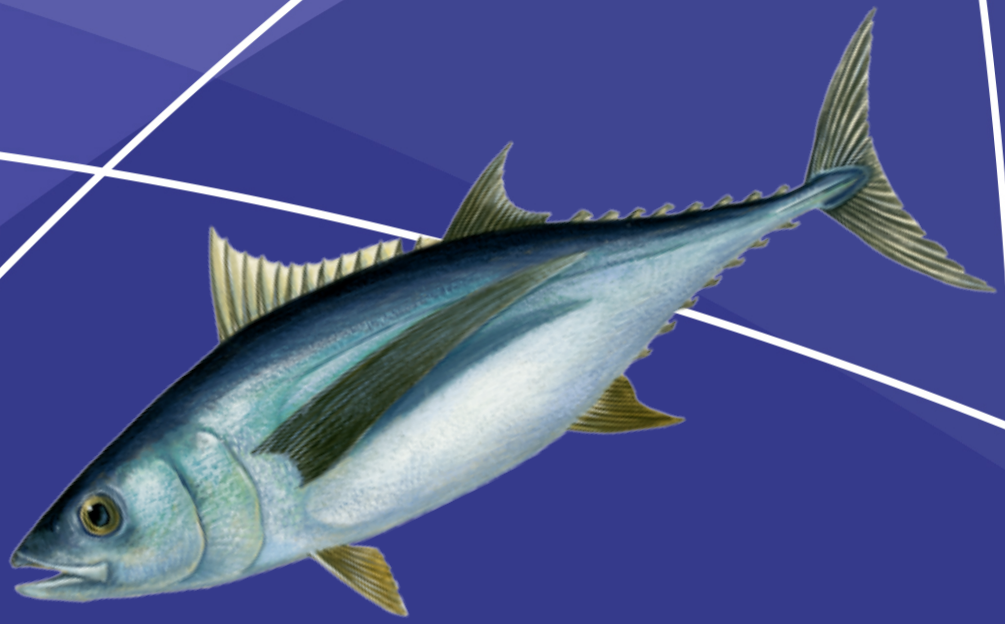
The heart is made from soft muscle tissue which decays fast after death. It is hardly ever preserved, unlike hard tissue such as bone.
The discovery of a 3D fossilised heart totally preserved is a major breakthrough.

Getting to the heart of fossils



The scientists from Brazil, Sweden and the ESRF tested around 60 fossils from the fish *Rhacolepsis buccalis* which lived during the Cretaceous period in the region of the world that is today Brazil.

Getting to the heart of fossils



Tuna: an example of a ray-finned fish.

Two of the samples contained fossilised hearts.
Observation of the heart architecture showed multiple valve rows in the extinct ray-finned fish compared to a single valve row in living fish of this lineage.

Getting to the heart of fossils

This intermediate state gives some insight into the reduction of the number of valves during the evolution of the heart in ray-finned fish, the largest group of vertebrates alive today with nearly 30 000 species.