

# Bad news for fake pearls

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A researcher is enlarging a drill hole of a pearl to gain organic matter for DNA analysis. Credit: Swiss Gemmological Institute SSEF

(Phys.org) —For the first time, a group of researchers has succeeded in isolating DNA from pearls and used their genetic material to identify the specific species of oyster that produced the pearl. In a parallel project, researchers used radiocarbon dating to analyze the age of pearls, opening up new avenues for determining the origin and age of pearl jewellery.

For a long time, it was thought impossible to isolate a [pearl](#)'s genetic material. Now, a Swiss research team has achieved this elusive goal. Scientists Joana Meyer, from the ETH Institute of Integrative Biology group headed by Prof. Bruce McDonald, and Laurent Cartier of the Swiss Gemmological Institute (SEEF), under the direction of Michael Krzemnicki, succeeded for the first time in extracting trace amounts of DNA from a variety of cultured pearls in an almost non-destructive way.

Using the genetic code, they were able to differentiate pearls from three different species of oysters vital to the jewellery trade. Their results were recently published in the scientific journal *PLoS ONE*.

The [genetic material](#) is likely embedded in organic matter found in the calcium carbonate matrix of the pearl, as well as in random pockets of organic matter enclosed in the pearl. The tiny amount of DNA recovered was sufficient to determine the species of pearl oyster that produced the jewel in question. The examined pearls were South Sea pearls originating from the species *Pinctada maxima*, Tahitian pearls from *Pinctada margaritifera* and pearls from *Akoya* oysters. This last group is one of the most important producers of both cultured and natural pearls (*Pinctada radiata*). These naturally formed gems can be very valuable and often come from the Arabian Gulf.

## **Non-destructive sampling**

An important part of the project was to develop a technique for isolating pearl DNA without destroying the commercial value of the jewels. The researchers used a fine drill to expand existing holes in a barely visible way. The resulting 10 milligrams of drilled-out material was sufficient to isolate enough DNA for the purpose of [species](#) identification.

A patent application has already been filed for the method developed by the research team. In the future, it will be possible to use it to differentiate between various kinds of pearls and to provide better documentation of historical specimens. This will give dealers and owners of pearl jewellery greater transparency and certainty regarding a pearl's source.

In a next phase, the researchers envision using the pearl DNA to determine a pearl's local origin, potentially allowing jewellers and owners to identify the region or even the specific lagoon in which a pearl

was produced.

## Age determination with radiocarbon dating

In a parallel research partnership between ETH Zurich and the SSEF, Irka Hajdas from the Laboratory for Ion Beam Physics at ETH Zurich and Michael Krzemnicki from the SSEF sought to determine the age of pearls using radiocarbon dating. This involved measuring the ratio of radioactive carbon ( $^{14}\text{C}$ ) to normal carbon ( $^{12}\text{C}$ ) in the nacre. This study, which was published in the scientific journal *Radiocarbon*, demonstrated how the true age of pearls can be determined using the  $^{14}\text{C}$  method. This method can help clarify whether a historical piece of jewellery is an antique or a forgery made of modern cultured pearls.

## Identifying forgeries

Pearls are among the oldest jewels used by humans. Natural pearls, which form randomly in the mantle tissue of molluscs, are especially valuable. It is often necessary to break open thousands of shells to find a single natural pearl. Cultured pearls have been commercially available only since 1910, but have been produced in massive quantities since then. In 2012, China alone produced more than a billion pearls for the jewellery market, most of which were cultured pearls from freshwater molluscs.

Determining the type of pearl in a piece of [jewellery](#) and its age and origin are becoming increasingly important for the trade in both historical natural pearls and modern cultured pearls. These new technologies will make it easier to expose frauds and forgeries.

**More information:** Meyer, J. et al. (2013) DNA Fingerprinting of Pearls to Determine Their Origins, *PLoS ONE* 8(10): e75606. [DOI](#):

[10.1371/journal.pone.0075606](https://doi.org/10.1371/journal.pone.0075606)

Krzemnicki MS, Hajdas I. (2013) Age Determination of Pearls: A New Approach for Pearl Testing and Identification, *Radiocarbon*, Vol 55, No 2–3 (2013). [DOI: 10.2458/azu\\_js\\_rc.55.16389](https://doi.org/10.2458/azu_js_rc.55.16389)

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