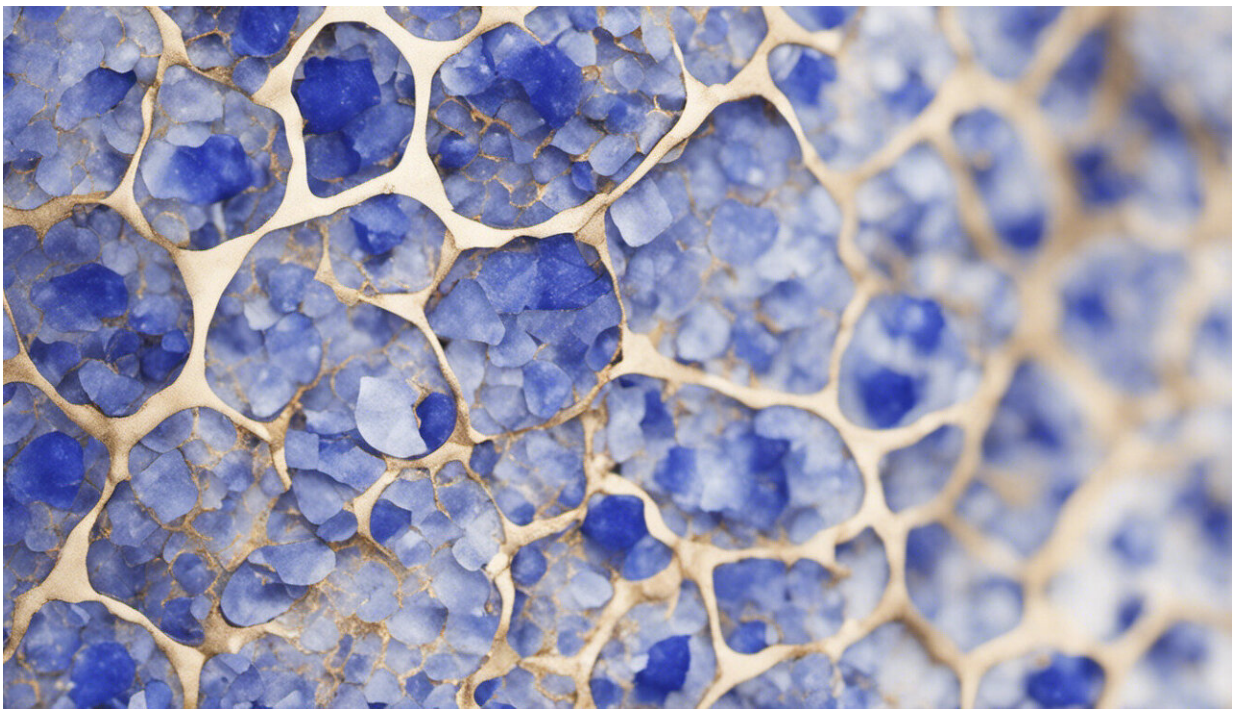
We found lapis lazuli hidden in ancient teeth – revealing the forgotten role of women in medieval arts

January 11 2019, by Anita Radini, Christina Warinner And Monica Tromp



Credit: AI-generated image (disclaimer)

We recently and unexpectedly revealed direct archaeological evidence of involvement of medieval women in manuscript production, challenging widespread assumptions that male monks were the sole producers of

books throughout the Middle Ages.

We did so by identifying particles of blue pigments in the fossilised dental plaque of the remains of a medieval woman as lapis lazuli, a stone more precious than gold at her time. The finds are the first of their kind and strongly suggest it will be possible to increase the visibility of ancient female artists in the historical and archaeological record – by analysing their dirty teeth.

This discovery was made possible by applying technological advances in the field of archaeological science to an understudied "deposit" on teeth known as dental calculus, which is mineralised dental plaque (tartar). In most societies today, oral hygiene practices are part of our daily routine, meaning that dental plaque is regularly removed and doesn't have a chance to build up on our teeth. This was not the case in the past. Plaque built up and mineralised over the course of people's lives. This solid deposit has unique archaeological potential.

A key characteristic of dental plaque is that while it forms it has the ability to entrap a wide range of microscopic and molecular debris that comes into contact with a person's mouth. When dental plaque becomes "tartar" it can entomb and preserve these particles and molecules for hundreds or thousands of years – potentially even millions. This provides us with a unique glimpse, at the individual level, of the diet and living conditions of ancient people.

The majority of scholarly work conducted on ancient tartar has been centred on reconstructing diet, but, besides deliberate ingestion of food, the human mouth is subject to a constant influx of particles of different types directly from the environment. Tree and grass pollen, spores, cotton and bast fibres, medicinal plants, as well as diatoms, sponge spicules and micro-charcoal have all been reported among the finds from ancient tartar. Despite this promising evidence, the value of dental

calculus as environmental evidence has not, so far, been much exploited.

The tartar of the female individual known as B78 can be seen deposited on her teeth. Credit: Tina Warinner, Author provided

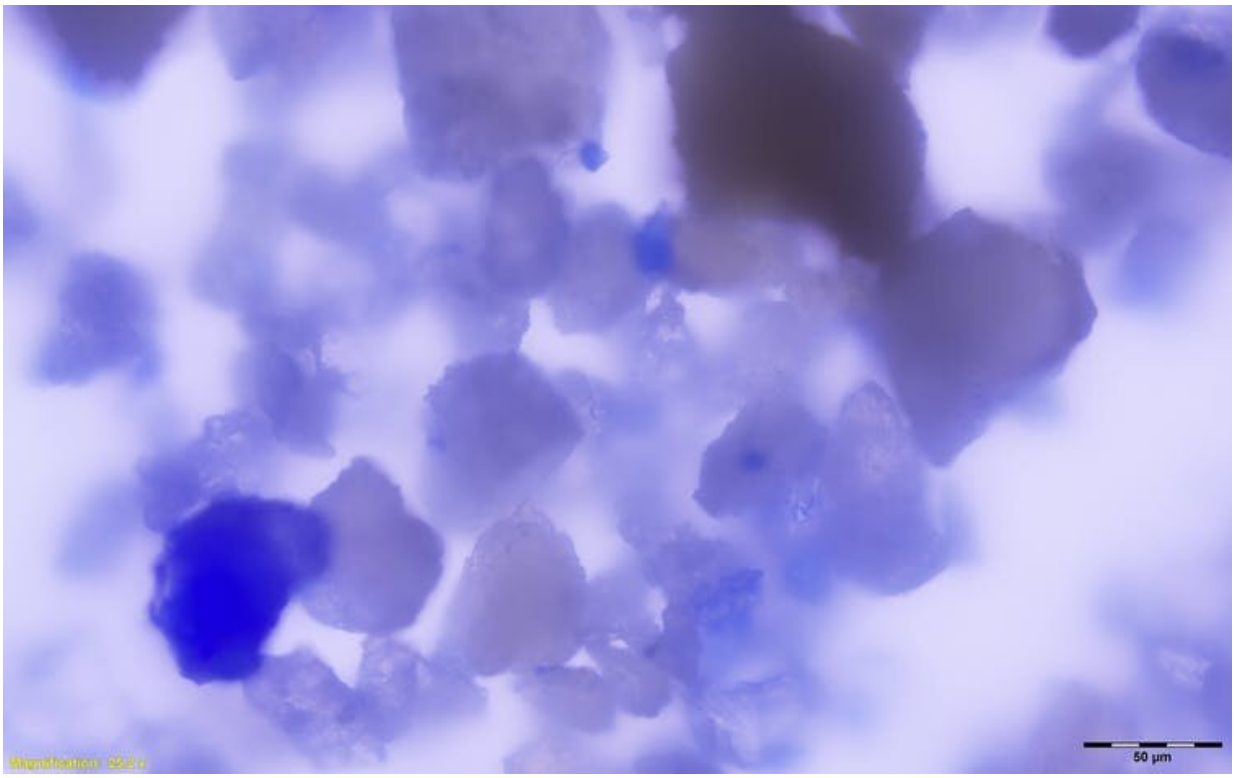
But in our recent study, made possible by multidisciplinary international collaborations, we demonstrated the potential for human dental calculus to reveal an unprecedented level of insight into the lives and working conditions of our ancestors.

Lapis lazuli

We analysed the skeletal remains of a female individual (known as B78) who lived in the 11th-12th century. She was buried on the grounds of a former women's monastery in Dalheim, Germany, that is in ruins today, but was occupied by various Catholic religious orders for around a thousand years.

We found well over 100 bright blue particles, in the form of small crystals and individual flecks, scattered throughout her tartar, which was still preserved on her teeth. Her skeletal remains had not suggested anything particular about her life, besides a general indication that she probably did not have a physically demanding life. In contrast, the blue particles were an unprecedented find – not only for their colour, but for the sheer number of them. It suggested a repeated exposure to an unknown blue dust or powder.

To securely identify the bright blue powder trapped in the woman's tartar, a range of microscopy and spectroscopy techniques were used. All techniques provided the same identification: the blue specks were lazurite, the blue portion of the lapis lazuli stone. Lapis lazuli was more precious than gold in Medieval Europe. Afghanistan was the only source of the stone at the time, and the preparation of the pigment took great skill.



Lazurite in calculus of female B78. Credit: Monica Tromp, CC BY-NC

Craftswomen

So how did this precious material end up deposited on this woman's teeth? A variety of reasons were possible, from painting to accidental ingestion during pigment preparation, or even the consumption of the powder as a medicine.

But the way in which the blue particles were found in tartar – single flecks in different areas – pointed to a repeated exposure, not a single ingestion. And creating a vivid blue pigment from lapis lazuli required an Arabic method of oil flotation that did not appear in European artist manuals until after the 15th century. So it's more likely that ultramarine

pigment was imported into the region as a finished product.

The most likely explanation, then, is that this was an artist who repeatedly used her lips to shape her brush into a fine point in order to paint intricate detail on manuscripts, a practice attested in the historic record of the time.

This finding suggests that women were more involved in the production of books throughout the Middle Ages than tends to be thought. This assumption partly derives from the limited evidence from surviving books: before the 12th century fewer than 1% of books can be traced to the work of women.

Dalheim archaeological site in Germany, where individual B78 was buried. Credit: Tina Warinner, Author provided

Additionally, artists are largely invisible in both the historic and archaeological records as they rarely signed their work before the 15th century and there have hitherto been no known skeletal markers directly associated with producing art.

But now, we have a way of identifying earlier historical artists. Our work strongly points to the possibility of using microscopic particles entombed in ancient tartar to track the artists of ancient times. It also suggests that it may be possible to track other "dusty" crafts using this method and thereby reveal the invisible workforce behind many forms of art.

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