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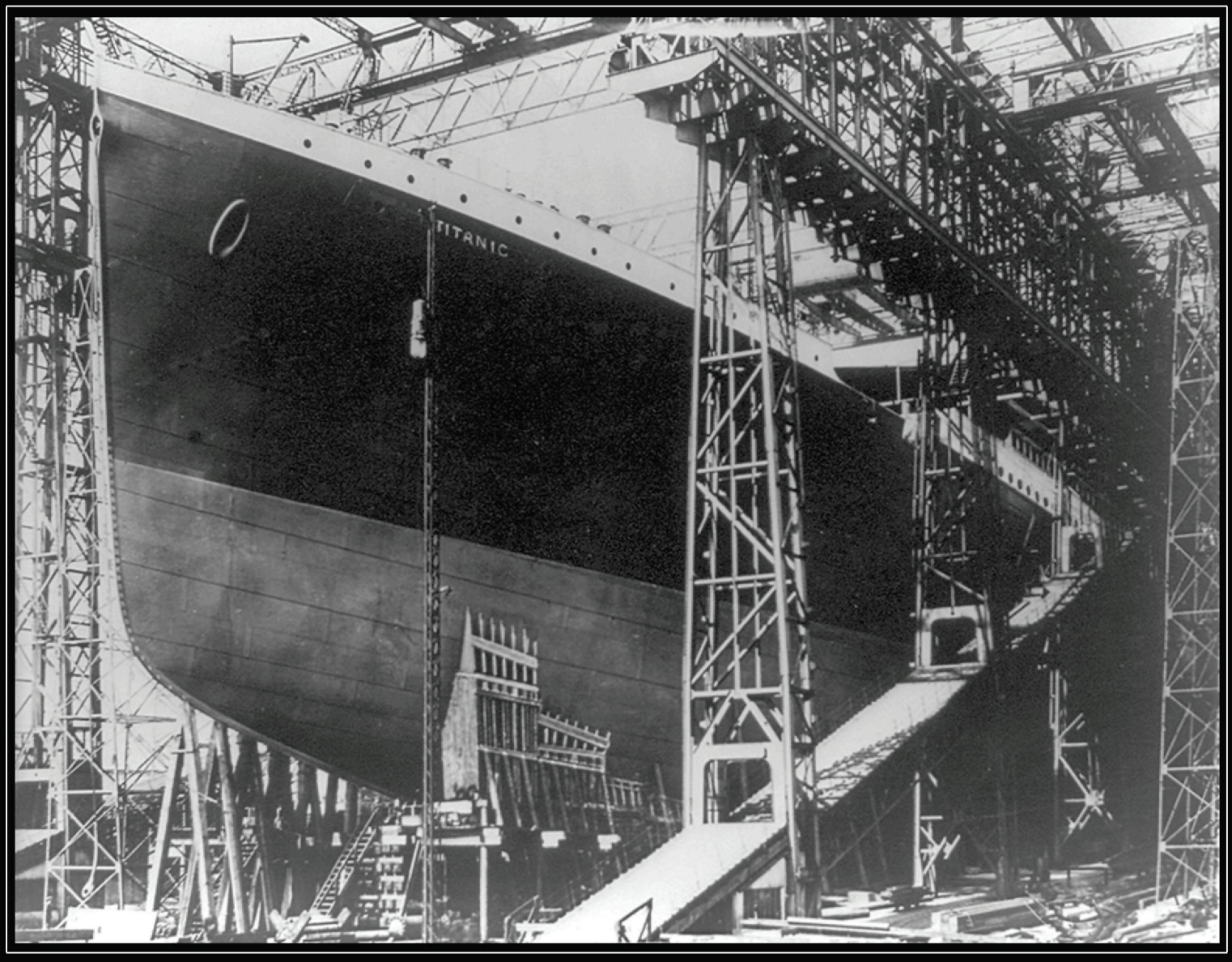

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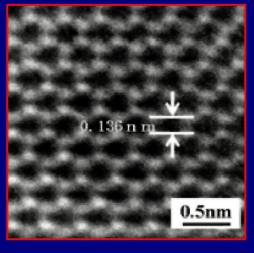

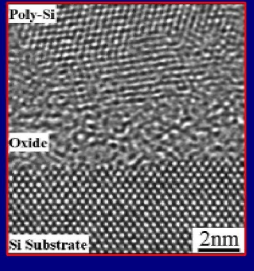

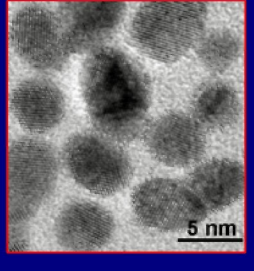

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Microscopy Reveals Early Neolithic Dentistry

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Many people dread the visit to their dentist when they have their teeth drilled, but how long has this been going on? The most ancient evidence to date was recently described by Alfredo Coppa, Luca Bondioli, Andrea Cucian, David Frayer, Catherine Jarrige, Jean-François Jarrige, Guivron Quivron, Massimo Rossi, Massimo Vidale, and Roberto Macchiarelli and microscopy provided the convincing proof.[2] The specimens were recovered from Mehrgarh, Pakistan, an area known to be occupied by farmers as long as 9,000 years ago. They identified four females, two males, and three individuals of undetermined gender who had a total of eleven drilled permanent teeth, all from adults. No drilled teeth from children were found. Four of the teeth were from the maxilla and seven from the mandible. All the drilling had been in the first or second molars. This led Coppa *et al.* to conclude that the drilling was not done for decorative purposes because on these teeth the holes, with or without decorative material inserted into them, would have been hardly visible.

Light microscopy, scanning electron microscopy, and microtomography (with a micro-computed tomography instrument) were used on the specimens, and/or on replicas of the specimens that revealed the drill holes as projections. The holes were conical, cylindrical, or trapezoidal in shape, 1.3 to 3.2 mm in diameter, and 0.5 to 3.5 mm in depth. Some of the walls of the holes had concentric ridges left by the drilling tool. In all cases, the margins of the holes were smoothed, indicating that the drilling was performed on living people who continued to chew using the drilled teeth. Pieces of flint were found at the same site, along with beads of bone, shell, turquoise, lapis lazuli, and other material that had been drilled, presumably to be fashioned as jewelry. Coppa *et al.* used models of these drill tips and demonstrated that a bow-powered device used with a flint-tipped drill could produce a hole of similar dimensions in human dental enamel in less than a minute.

Four of the teeth had signs of decay associated with the hole, suggesting that the intervention could have been therapeutic or palliative. Some of the holes exposed sensitive tooth structure, so it's possible that some type of filling may have been placed in the cavity, but there was no evidence to confirm this. Whereas it is certainly tempting to conclude that this early dental intervention was done for the same reasons such interventions are done today, the motives for these Neolithic dental procedures remains unclear.

The cemetery where these specimens were recovered was used from 9,000 to 7,500 years ago. This extends the evidence for the drilling of human teeth about 4,000 years earlier than previously recorded. Interestingly, a nearby grave site that was used after the site where the drilled teeth were recovered had no evidence of drilling, although there is evidence of poor dental health from the more recent site, which is a "Copper age" grave site. Why this practice of drilling teeth existed for 1,500 years and then ceased is an intriguing mystery, but it could be linked to changes in the systematic use of metal and other changes in craft traditions.

Coppa *et al.* suggest that artisans who drilled beads during this period of 1,500 years performed a form of "proto-dentistry" on their contemporaries. We don't know if these ancient "patients" dreaded their experience with these early "dentists" but it couldn't have been a pleasant experience! ■

1. The author gratefully acknowledges Dr. Roberto Macchiarelli for reviewing this article.

2. Coppa, A., L. Bondioli, A. Cusina, D.W. Frayer, C. Jarrige, J.F. Jarrige, G. Quivron, M. Rossi, M. Vidale, and R. Macchiarelli, Early Neolithic tradition of dentistry: Flint tips were surprisingly effective for drilling tooth enamel in a prehistoric population, Nature 440:755-756, 2006.

INDEX OF ARTICLES

ABOUT THE COVER

The cover shows the port bow of *RMS Titanic* at the Harland and Wolff shipyard in Belfast, Ireland shortly before her launching on May 31, 1911. The Titanic was one of three near identical sister ships built in these yards. The other two were *RMS Olympic*, launched in October 1910 and operated for 24 years without serious mishap, and *RMS Britannic*, launched in 1914 and sank during WW1 two years later. The Titanic struck the ice berg on the mirror-image starboard bow. Please see the article beginning on page 6 by Hooper-McCarty and Foecke on the metallurgical analysis of Titanic's rivets.