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# THE SECRET HISTORY OF ANCIENT TOILETS

*By scouring the remains of early loos and sewers, archaeologists are finding clues to what life was like in the Roman world and in other civilizations.*

BY CHELSEA WALD

Some 2,000 years ago, a high-ceilinged room under one of Rome's most opulent palaces was a busy, smelly space. Inside the damp chamber, a bench, perforated by about 50 holes the size of dinner plates, ran along the walls. It may have supported the bottoms of some of the lowest members of Roman society.

Today, the room is shut off to the public, but archaeologists Ann Koloski-Ostrow and Gemma Jansen had a rare chance to study the ancient communal toilet on the Palatine Hill in 2014. They measured the heights of the benches' stone base (a comfortable

43 centimetres), the distances between the holes (an intimate 56 cm), the drop down into the sewer below (a substantial 380 cm at its deepest). They speculated about the mysterious source of the water that would have flushed the sewer (perhaps some nearby baths). Graffiti outside the entryway suggested long queues, in which people had enough time to write or carve their messages before taking a turn on the bench. The underground location, combined with the plain red-and-white colour scheme on the walls, implied a lower class of user, possibly slaves.

In 1913, when Italian excavator Giacomo Boni excavated this room, toilets were an

unmentionable topic. In his report, he seems to mistake the remains of the holey benches for something much more sensational: part of an elaborate mechanism that, he speculated, would have pumped water and provided power for the palace above. Boni's prudish sensibilities wouldn't let him recognize what was before his very eyes, says Jansen. "He couldn't imagine it was a toilet."

A century later, toilets are no longer such an unacceptable research topic. Koloski-Ostrow, at Brandeis University in Waltham, Massachusetts, and Jansen, an independent archaeologist based in the Netherlands, are

An ancient Roman public latrine in the ruins of Timgad, Algeria.

shining light on the lost loos of history, from ancient Mesopotamia to the Middle Ages, with a particular focus on the Roman world.

Their investigations have provided a new way to learn about the diets, diseases and habits of past populations, especially those of the lower classes, which have received scant attention from archaeologists. Researchers have inferred that Roman residents ventured into their toilets with some trepidation, in part because of superstition and also because of very real dangers from rats and other vermin lurking in the sewers. And although ancient Rome is famous for its sophisticated plumbing systems, modern studies of old excrement suggest that its sanitation technologies were not doing much for the residents' health.

"Toilets have a lot to tell us about — far more than how and where people went to the bathroom," says Hendrik Dey, an archaeologist at Hunter College in New York.

#### QUEEN OF LATRINES

Although studies of ancient latrines are no longer off limits, they do take a certain amount of fortitude. "You have to have a very strong sense of self and of humour to work on this topic because one who works on it is going to get ribbed by friends and enemies," says Koloski-Ostrow. She got started on the topic nearly a quarter of a century ago, when classicist Nicholas Horsfall called her over in the library at the American Academy in Rome. "Latrines. Roman latrines," he whispered conspiratorially. "No one has done them properly." She took up that challenge, and now, she says, "I am known widely on my campus as 'the queen of latrines'."

The invention of some of the first simple toilets is credited to Mesopotamia in the late fourth millennium BC<sup>1</sup>. These non-flushing affairs were pits about 4.5 metres deep, lined with a stack of hollow ceramic cylinders about 1 metre in diameter. Users would have sat or squatted over the toilet, and the excrement would have stayed inside the cylinders with the liquids seeping outwards through perforations in the rings.

Until recently, scholars had little interest in these toilets, says archaeologist Augusta McMahon at the University of Cambridge, UK. "Archaeologists in Mesopotamia have looked at them like, 'this is a problem: it's a pit that's cut into the stuff I'm really interested in.' As far as she knows, no one has carefully excavated a Mesopotamian toilet yet — something she's hoping to do when she finds a good candidate and funding.

Mesopotamians themselves also seemed to show little enthusiasm for this revolutionary technology. Although the toilets would have been convenient to use, and cheap and easy to

among a growing number of archaeologists, infectious-disease specialists and other experts who are

install, they were uncommon, says McMahon, who surveyed the number of latrines in different neighbourhoods for a chapter in a book published last year<sup>1</sup>. "The number of houses that have toilets is very, very low — one out of five or two out of five," she says. Everyone else probably used a chamber pot or simply squatted in the fields.

So the health benefits of the technology would have been limited, McMahon says. Although the pit toilets would have successfully separated people from their waste — the measure of a good sanitation system because it prevents the faecal–oral spread of disease — studies by the US Agency for International Development say that some 75% of a population must have access before there are widespread improvements in health.

About 1,000 years later, the Minoans on the island of Crete in the Mediterranean improved the toilet by adding the capacity to flush — although only for the elite. The first known example<sup>2</sup> was in the palace at Knossos, says Georgios Antoniou, a Greek architect who has studied ancient sanitation in that country. Water was used to wash the waste from the toilet into the sewer system of the palace.

From there, toilet technology took off. In the first millennium BC, ancient Greeks of the Classical period and, especially, the succeeding Hellenistic period developed large-scale public latrines — basically large rooms with bench seats connected to drainage systems — and put toilets into ordinary middle-class houses. "The society had become more prosperous, and they were dealing more with comfort in everyday living," Antoniou says.

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The Romans were unprecedented in their adoption of toilets. Around the first century BC, public latrines became a major feature of Roman infrastructure, much like bathhouses, says Koloski-Ostrow. And nearly all city dwellers had access to private toilets in their residences. Nonetheless, archaeologists know very little about how these toilets worked and what people thought of them, she says. One reason is that in Roman times, few people wrote about toilets, and when they did, they were often satirical, making it hard to interpret their meaning.

But Koloski-Ostrow and Jansen show that

it is worthwhile taking the topic seriously. For a forthcoming book on toilets in the Roman capital, they and some two dozen other archaeologists have analysed more than 60 toilets scattered throughout the city, most of which had not been described before. That includes toilets for guards in the city wall, and a two-person toilet in an apartment block. "I guess it will be news to a lot of archaeologists who have worked on all kinds of Roman buildings that some of these buildings actually had toilet facilities," Koloski-Ostrow says.

Roman public latrines looked much like their Greek predecessors: rooms lined with stone or wooden bench seats positioned over a sewer. The toilet holes are round on top of the bench, and a narrower slit extends forward and down over the edge in a keyhole shape. These slits probably allowed users to insert a sponge-tipped stick for cleaning. Small gutters often run parallel to the seats along the ground; researchers suspect that people probably washed the sponges in water running through those gutters. There are no signs of barriers between the toilet seats, but people probably had a measure of privacy thanks to their long garments and the limited windows, says Koloski-Ostrow.

Private toilets were different, Jansen says. In residences, commodes were often in or near kitchens, which was practical because they were also used to dispose of food scraps. Although people flushed the toilets with buckets of water, the loos were rarely connected to sewers. When the pits filled up, they were probably emptied, either into gardens or fields outside the town, Jansen says.

Sewers — long thought to be a crowning achievement of Roman civilization — were in fact less widespread than once thought and might not have been very effective, says Koloski-Ostrow. In a book published last year<sup>3</sup>, she considered whether Roman sewers would have adhered to any of the modern principles of sanitation engineering, including regular aeration and features to control the deposition of solid waste, which would reduce the stench as well as improve flow. To a great extent, the sewers didn't meet the standards. Her own recent explorations of the Cloaca Maxima, the great sewer under Rome, revealed that some channels could get completely blocked with silt in less than a year. At the very least, they would have required regular cleaning — dirty and dangerous work.

And Roman toilets also had a number of deficiencies. One major problem was that there were no traps — or S-shaped bends — in the pipes beneath toilets to keep out flies. Environmental archaeologists Mark Robinson at the University of Oxford and Erica Rowan, now at the University of Exeter, UK, analysed the well-preserved contents of a closed sewer that was connected to several toilets in an apartment block in Herculaneum, a Roman city destroyed by an eruption of Mount Vesuvius. Among the faecal matter and other rubbish thrown down there, Robinson found lots of fragile mineralized



Communal toilets at the Roman site, Ostia Antica (left). The goddess Fortuna (right) was believed to protect latrine users from dangers.



RIGHT: IMAGEBROKER/REX SHUTTERSTOCK; LEFT: LUIGI SPINA/ELECTA/MONDADORI/GETTY

fly pupae. With easy access to human waste, flies could have transferred faecal matter and pathogens to people.

To look at the benefits of ancient sanitation systems, palaeopathologist Piers Mitchell at the University of Cambridge analysed published studies of parasites found at archaeological sites from several eras<sup>4</sup>. Contrary to his expectations, the prevalence of intestinal parasites such as roundworm and whipworm — which cause problems such as malnutrition — did not decrease from the Bronze and Iron ages to the Roman period; they gradually rose. That might be because the Romans used human waste as fertilizer, which would have transferred the parasite eggs to food. “Toilets and sewers and things didn’t seem to improve the intestinal health of the Roman population,” he says.

#### DIET DETAILS

The practice of throwing kitchen rubbish down toilets was unhygienic for the ancient Romans, but the remnants of that refuse are now a rich source of information. Rowan was surprised by the quality and variability of the foods in the Herculaneum sewer, especially because it was connected to an apartment complex that housed a large number of mostly poorer people. “We always think that anyone non-elite in the ancient world is not eating a very diverse or interesting diet,” she says. But the evidence from Herculaneum shows that people across the class spectrum were eating dozens of different types of food, most commonly figs, eggs, olives, grapes and shellfish. They flavoured their meals with seasonings such as dill, mint, coriander and mustard seeds<sup>5</sup>. “It would be quite healthy, and they’d be getting all their essential nutrients.”

Rowan also used the sewer contents to glean insights into the broader food and energy economy. The large amount of kitchen scraps suggested that the residents cooked more at home than previously thought<sup>5</sup>. From the quantity of fish bones found, she concluded that the regional fish trade was

probably much larger than scholars had suspected<sup>6</sup>. Such discoveries are part of a broader trend in Roman archaeology, says Dey. Until recently, most scholars focused on the monumental structures occupied by elite residents. But attention has shifted to lower down the class ranking. “Roman archaeologists started to realize that you can’t understand how a society works if you only study the 1%,” he says. “The study of toilets is part of the broader effort to understand how Roman society worked, which includes — especially — studying how the non-glamorous parts of society worked.”

For Koloski-Ostrow and Jansen, latrines provide a window onto the beliefs of that society. Romans perceived demons everywhere, and some Roman literature refers to ones that lurked in toilets. “The demons can cast a spell on you, and when you have this spell you die or you get sick,” Jansen says.

The Roman writer Claudius Aelianus tells a story in his *De Natura Animalium* about an octopus that swam up through a drain in a toilet and ate the pickled fish in the pantry night after night. That story is probably apocryphal, but rodents, insects and other creatures could have lurked in toilets and invaded homes. And excrement-filled water could have flowed upwards during flooding.

Explosive gases might also have been a problem. “You might walk in and actually see a flame burst out of one of those holes because of the methanic gases that built up in the sewer underneath the toilet,” Koloski-Ostrow speculates.

This pervasive fear of toilets could explain the mystery of why there’s less graffiti inside public latrines than in the rest of the Roman world, Jansen says. Nobody wanted to spend more time there than necessary. The same fear could also explain why many latrines have small shrines to the goddess Fortuna. Jansen argues that she was thought to protect toilet-users from illness-causing demons, as well as the other bad things that could happen there<sup>7</sup>.

More discoveries about ancient lifestyles will come as researchers expand their toilet studies to other parts of the globe. Rowan is studying a site in Turkey, and Mitchell has recently examined evidence from a 2,000-year-old toilet in China. But progress has been slow and archaeologists are not rushing into toilet studies. Although the topic is no longer considered fringe, funding is hard to come by, and Mitchell says that “no one else seems to be that bothered” to work on it. One reason could be that the lack of written sources and the limited physical evidence make it daunting.

But for researchers such as Koloski-Ostrow, the recent work raises all kinds of questions about ancient societies. Did women use public toilets? Were they chatty, social places or silent? What were the foreign influences on Roman toilets, and how did the toilet culture propagate between the capital and the distant states? These questions will be hard to answer, she says, but asking them no longer seems as weird as when she started.

Rowan agrees: toilets have finally gone mainstream. “If somebody finds a latrine now, they know to sample it, to excavate it carefully. They know there’s going to be a lot of value in it, as opposed to being, like, oh, it’s just a toilet.” ■

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**CORRECTION**

The News Feature 'The secret history of ancient toilets' (*Nature* **533**, 456–458; 2016) incorrectly said that roundworms and whipworms cause dysentery — they cause problems such as malnutrition.