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In Nagano, an excavation of an ancient giant

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It's a Saturday in late March and many residents and tourists in Nagano Prefecture are savoring the last snows atop the region's world-class ski resorts. Along the shores of Lake Nojiri, however, all eyes are fixed on the cold, gritty soil.

Therein lies a lost giant: Naumann's elephant, a species that roamed Japan over 40,000 years ago.

The cherry blossoms may be blooming elsewhere but, on this frigid afternoon, the high country winter clings on. Listless, chilly fog curls around Nojiri's mountainous parapet, regularly delivering rain and icy gusts to the excavators below. Behind them a torii gate sits far offshore, barely visible through the haze.

Ranging in age from 8 to 80, the hunters pay little mind to Nojiri's breathtaking scenery, nor does the foul weather dampen their enthusiasm.

"It's exciting!" exclaims Sae Okoushi, a second-year geology student at Yamaguchi



University, up to her ankles in mud. She says her findings have the potential to change the course of Japanese biology — maybe even Japanese history.

The director of the Nojiriko Naumann Elephant Museum, Yoichi Kondo, agrees. If this archaeological dig can uncover fossils that prove people hunted the animal, it might mean humans arrived in Japan much earlier than previously thought.

Statues of Naumann's elephant in Shinano, Nagano Prefecture, near the Nojiriko Naumann Elephant Museum
TALISKER SCOTT HUNTER

Historical implications aside, the fossilized remains of this Japanese giant have yet more to offer. Aside from nurturing the next generation of scientists, Nojiri's ragtag crew of elephant hunters are uncovering valuable knowledge to aid Japan's ongoing struggles with climate change.

A bygone giant

Naumann's elephant — named for the German geologist who recorded the first fossils in the Meiji Era (1868 to 1912) — stood between 2 and 2.8 meters, roughly the same height as today's Asian elephant. Unlike its contemporary cousin, the woolly mammoth, Naumann's elephant was not covered in thick hair, although, like mammoths, it had a protruding forehead and flourished long, curved tusks.

Fossils belonging to Naumann's elephant have been reported across 300 sites throughout Japan: from Hokkaido to Kagoshima and even beneath Nihonbashi Station in Tokyo. But most of them, Kondo says, have been found near Nojiri.

The oldest of these fossils date to around

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In Nagano, an excavation of an ancient giant

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350,000 years ago, when it is believed the elephant's ancestors migrated across a prehistoric land bridge between Japan and mainland Asia.

Ancient vegetation found alongside these fossils suggests the elephant inhabited forests and wetlands not unlike those found among Japan's high country today. The creature was uniquely adapted to Japan's terrain, sporting thick limbs that allowed it to scale mountains.

Kondo says this adaptation is an example of what makes Naumann's elephant fascinating.

"It evolved in Japan, it only resided in Japan and it became extinct in Japan," Kondo says, adding that it is the largest creature to have walked solely among the Japanese islands.

"It's interesting because it interacted only with the Japanese environment," he says. "It's a really valuable piece of Japanese history."

Nojiri's elephants lived alongside several other mammals, including the aforementioned woolly mammoth, a species of giant deer and quite possibly humans.

The scientific consensus is that humans arrived in Japan between 30,000 and 35,000 years ago. This places humans in the archipelago at the same time as Naumann's elephant, which went extinct around 26,000 years ago.

Humans may have interacted with Naumann's elephant and possibly even hunted the creature. However, Keiichi Takahashi, director of Shiga Prefecture's Lake Biwa Museum, dedicated to Japan's oldest and largest lake, notes that this is still up for debate. For one, both populations would have been quite small during this period of crossover, he says.

As the debate continues into 2023, all eyes are on Lake Nojiri. In past excavations, scores of what appear to be tools were unearthed alongside elephant remains, some of which are 40,000 years old. These suggest humans not only hunted Naumann's elephant, but that they also inhabited Japan 10,000 years earlier than previously thought.

However, Takahashi is quick to point out that an array of spearhead-shaped stones is not enough to prove such profound conclusions.

Ichiro Sasagawa, the director of this year's excavation, says decisive evidence could include strategic cut marks on bones in addition to findings that are clearly tools—including knives and sharpening implements—discovered in or directly alongside elephant remains.



People take part in an excavation looking for fossils related to Naumann's elephant in Shinano, Nagano Prefecture, on March 25.
TALISKER/SCOTT HUNTER

So far, hundreds of excavations have failed to unearth such clear evidence. Sasagawa hopes that this dig will be different, although any "eureka moment" may not come until scientists have had time to examine this year's findings.

Unearthing an elephant

In winter, Nagano satisfies its energy demands by draining Lake Nojiri into the region's hydroelectric dams—come spring, the lake is several meters lower than usual. In 1948, this process revealed the area's first

Naumann's elephant fossils and has since made subsequent excavations possible.

The eighth day of the dig, comprising a hodgepodge of tents and muddy pits behind a collapsed hotel, is a hive of excitement. Some 60 raincoat-clad onlookers—among them academics, museum staff, teachers and children—huddle around a collection of dark patches at the bottom of a trench. Wrestling with a microphone and an extending pole for pointing, a presenter tells the assembled crowd that these marks are likely the footprints of giant deer.

Sasagawa says these footprints are preserved in ash from a volcanic eruption some 40,000 years ago. A great find, he adds, but not what he was hoping for.

"We're trying to find a kill site," he says, explaining that, because their prehistoric quarry weighed several tons, early humans would have had to butcher Naumann's elephants where they fell. Signs of a kill site include stone tools, unnaturally arranged remains and x-shaped marks on fossils—a telltale sign that someone sought to break bones to get at the marrow within.

Finding such evidence might not only extend Japan's human history by several millennia, it could also help definitively solve another mystery surrounding Naumann's elephant: how it became extinct.

"There are several hypotheses for this," explains Takahashi, stressing this extinction was not the result of a single cataclysmic event. Rather, he says, a series of gradual changes reduced the population of Naumann's elephant to the point where it could no longer sustain itself.

Takahashi believes environmental changes led to the deaths of the last Japanese elephants.

"The temperature changes and corresponding vegetation changes during the time when Naumann's elephant lived in Japan have been well studied," he explains. "These temperature changes are known as Milankovitch cycles, which are caused by the periodic changes in Earth's orbital path."

The most recent of these temperature changes, also known as the Ice Age, drastically altered Japan's environment. The earlier start of harsher winters disrupted annual migration patterns, making it harder for the elephants to find ever-scarcer food and even rarer mates. By the time this era reached its chilly zenith around 20,000 years ago, the last of Japan's native elephants had died.

Kondo, however, believes humans also played a key role. "This kind of cooling and heating of the planet has happened four or five times, and (Naumann's elephant) always managed to survive until the last time," he says. "There's no doubt that when the climate became harsher... the number of the elephants got smaller and smaller. So in that time, they would usually gather together and have refuge... When they took refuge and the numbers were low, it's possible that humans came into the picture as well."

Somewhere like Lake Nojiri, a sheltered alpine bowl offering both plentiful food and fresh water, would have made an ideal refuge. Perhaps the last beleaguered elephants were set upon by a hunting party, 40,000 years ago, along Nojiri's tranquil, muddy shoreline.

Even if that were true, the scale of human influence is hard to discern. According to Sasagawa, while humans may have played a role in the extinction of Naumann's elephant, it was likely very small.

"It's possible that humans were one of the main influences, but it's not very likely, because the number (of humans) wasn't that great yet," he says, just as the rain picks up again. Behind him, a 6-year-old boy in a Minions beanie, undeterred by the deluge, digs a small muddy hole several meters from the dig site.

Lessons from a lost giant

Like Naumann's elephant, the world is now staring down a climate catastrophe. According to Takahashi, the only thing that has so far prevented us from joining our long-gone cohabitants in extinction is the ability to modify Earth to guarantee our survival.

At its peak, the period of global cooling that is believed to have pushed Naumann's elephant to extinction was just 5 degrees Celsius cooler than the present. This seemingly trivial, single-digit change in global temperature eliminated a species that confidently roamed Japan for over 200,000 years. Today, scientists warn that a similarly small temperature change—just 2 degrees of warming—could cause catastrophic damage to human society and the ecosystems we rely on.

The central government is pursuing a series of efforts to curtail Japan's emissions and preserve biodiversity. From pledging to attain carbon neutrality to saving the Japanese giant salamander, the fight against man-made climate change calls for a host of efforts informed by a comprehensive understanding of our planet.

In this regard, the study of Naumann's elephant is relevant and valuable. "Understanding why this elephant went extinct could potentially help us understand why animals go extinct and how they interact with climate change," says Kondo.

How the dig is forging Japan's future scientists

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The dig for Naumann's elephant, which roamed Japan over 40,000 years ago, at Nagano Prefecture's Lake Nojiri is unique because, unlike many such archeological excavations throughout Japan, anyone is allowed to participate. When asked if he is concerned about unpracticed hands spoiling fragile data, Ichiro Sasagawa, the director of this year's dig, says the benefits easily outweigh the drawbacks.

"It creates an interest in science for children," he says.

"There are very few cases where young people can participate alongside specialists in sciences like biology," he explains. "Now they get an interest because they are able to participate here."

The presence of the general public and children brings more perspectives, adds Yoichi Kondo, director of the Nojiriko Naumann Elephant Museum, recalling how children have frequently identified potential finds that scientists overlooked.

This kind of excavation also helps the wider community.

Tetsuya Watanabe, a member of the local Shinano assembly, says that people have been coming to Nojiri in search of fossils for decades.

"There are very big benefits for the economy and tourism," he says. "The dig and findings appear in school textbooks. Children from all over Japan find out about (Lake Nojiri) and (Naumann's elephant), which in turn brings many people with the intention of going to the local museum."

Sae Okouchi, a second-year geology student at Yamaguchi University involved in the excavation, was one such visitor. "I was an elementary student when I first participated. I had nothing but good memories of when I participated, so that's why I chose to come today," she says.

Tomoko Watanabe, a geology enthusiast from Matsumoto, Nagano Prefecture, feels similarly. She brought her son to the dig and has herself been attending the Lake Nojiri excavations since she was young.

"The fact that not only researchers and people of academia can participate, but also kids and everyone can participate, is one of the best things about Lake Nojiri," she says. "Not just the dig but the support staff, you know, like making tea and that sort of thing. That's one of the fun aspects—everyone can help."

Aruto, a fifth grader, also from Matsumoto, says that while science and history may not be his favorite subjects in school, he has so far enjoyed his fossil hunt.

"Digging around the fossils and making them visible was a lot of fun," he says. "Just being able to reveal the finds and what was underneath the ground was very interesting."

His brother, Haruki, seems to agree. "Digging is fun!" he declares, before getting back to work.

The day's excavations are winding down and Sasagawa still hasn't unearthed what he was hoping for. Nonetheless, he says this year's efforts have been a success.

