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Environment

Birthplace of the Anthropocene

Humanity has left a geological mark on Earth – now we need to decide where it begins

Adam Vaughan

A BAY in south-west Japan could become the place on Earth used to officially establish the start of the Anthropocene, a new epoch shaped by human impact.

Thanks to research showing a decline in sardine scales due to fishing and other evidence revealing our growing influence on the planet, Beppu Bay has now formally joined 10 other sites being considered by researchers trying to find the best candidate for a "golden spike", a clear signal in Earth's geological record that can designate this epoch.

In 2016, scientists on the Anthropocene Working Group (AWG) voted to define a new epoch starting around the middle of the 20th century, on the grounds that humanity's nuclear weapons testing, fossil fuel burning, plastic pollution and other activities were of sufficient scale to push the world into a new geological age.

But the Anthropocene remains just an idea rather than an official epoch until approved by the International Commission on Stratigraphy, the arbiter of geological timescales.

Gaining approval will require AWG researchers to provide evidence from one location with enough markers to demonstrate the start of the Anthropocene. Radionuclides from nuclear weapons tests are thought to be the most obvious marker. However, the group is seeking a location with multiple indicators to serve as the golden spike, or the so-called global boundary stratotype section and point (GSSP).

Fewer sardine scales in sediment could mark the start of the Anthropocene

An ice core from Greenland marks the GSSP for the end of previous epoch, the Pleistocene, and the start of the current one, the Holocene.

Now, a flurry of research from Japan means Beppu Bay is the 11th potential GSSP, up against sites such as an Italian cave, a Chinese lake and a coral reef off Australia. "Beppu Bay is a spawning site for sardines in the western Pacific and researchers have managed to match very nicely the density of sardine scales in the sediment core with written records of sardine catches in Japan over many centuries," says Colin Waters at the University of Leicester, UK.

LISA TOP/ALAMY

Simon Turner at University College London says there are a variety of records showing how humans have influenced the sediment record in the bay, notably the acceleration of the use of PCB chemicals post-1950 and the presence of caesium-137 from nuclear weapons tests. Analysis of plutonium isotopes at the bottom of the bay could provide more evidence, he says.

Speaking at the virtual European Geosciences Union general assembly on 28 April, Turner gave an update on the other 10 potential GSSP locations. Teams working on sediment cores from the Baltic Sea and from Searsville Lake in the San Francisco Bay area are two of the furthest ahead for completing work on Anthropocene markers.

He says geologists are "on track" to propose a start for the Anthropocene based on one of the 11 sites by next year. ▮

Materials science

Your finger can feel the change of one atom in a material

THE human fingertip can distinguish between materials that have minuscule chemical differences – even a substitution as small as a single atom.

Generally, what we feel with our fingers are physical bumps in a material's surface structure. Charles Dhong at the University of Delaware and his colleagues set out to find whether it would be possible to feel a chemical difference in which the internal molecular structures of two materials slightly vary but their surfaces are equally smooth.

They did this by taking a silicon wafer and attaching a layer of a simple compound that was just one molecule thick. They tested several compounds, each only slightly different from the others.

Out of six pairs of compounds, human testers could distinguish between three. With one pair, where the team only substituted a single carbon atom for a nitrogen one, the testers could tell the two apart with 68 per cent accuracy (*Soft Matter*, doi.org/f9mc).

"When we make our samples, physically they're almost identical, the differences are on a sub-nanometre scale," says Dhong. "But when test subjects felt them, some people said that some felt a little gritty and other ones were more pleasant and velvety."

The chemical difference between the two compounds that the testers were best able to tell apart caused a slight change in how much friction they felt when running a finger over them. This alteration wasn't due to bumps in each material, but rather the way their molecules fitted together.

"It may be possible to create a texture on a screen like running your hand across velvet or a wooden table"

Dhong says this could be useful for people with visual impairments or to make textures in virtual reality that feel real. "If you wanted to create a texture that feels like running your hand across really nice paper or soft velvet or a wooden table, how can you do that with something like a screen? This gives us a lot more options to really expand this toolbox," says Dhong. ▮

Leah Crane