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# Hunting the Anthropocene's dawn

If we are in a new geological epoch, we need to find a site that offers the best view of the moment it began – and the search is almost over, finds **Adam Vaughan**

A LONG-RUNNING effort to declare that the global impact of humans is enough to establish a new geological epoch will come to a head this year, when a decision is made on the best site to officially mark the beginning of the Anthropocene.

The past 11,650 or so years form a geological unit of time known as the Holocene, considered a climatically benign epoch in the planet's history that allowed human civilisation to flourish.

But some scientists think there is now sufficient evidence to suggest that we have left the Holocene. They argue that the environmental presence of radionuclides from nuclear weapons, ash from coal-burning, plastics in sediments and other phenomena is enough to clear the bar for designating that we are in a new human-dominated epoch, which started in the 1950s.

In December, a group will announce a specific site somewhere on Earth that it thinks offers the clearest evidence of the dawn of the Anthropocene. This site will then be put forward for official consideration as the "golden spike" marking the epoch's start, formally known as a Global Boundary Stratotype Section and Point (GSSP).

GSSPs are being established for every boundary between named geological time periods. Each provides one or more clear signals of a significant and lasting change to Earth's biosphere: the extinction or appearance of a key species, for instance, or a significant chemical signature. As an example, a cliff face near the town of El Kef in Tunisia is the GSSP for the end of the Cretaceous, 66 million years ago, because it preserves a particularly clear iridium signature from an asteroid that triggered a major extinction.



WILDERPIX/LAMY

**Radioactive fallout, plastic and fish scales in Crawford Lake in Canada show human impacts on the planet**

**Radiation from nuclear tests, here in 1952 on the Marshall Islands, has changed Earth's chemistry**



BETTMANN ARCHIVE/GETTY IMAGES

"I suspect that there will be several sites that will be very strong candidates," says Jan Zalasiewicz at the University of Leicester, UK.

Which one wins will depend partly on what a team of 34 researchers on the Anthropocene Working Group (AWG) – established by a subcommittee of the International Commission on Stratigraphy (ICS) – decides should be the primary marker, or the main signal of humanity's fingerprint worldwide. The choice is due in the second half of this year.

There is a strong move towards making this indicator plutonium from nuclear weapons testing. This is because it has such a clear absence and then appearance, says geologist Colin Waters, secretary of the AWG. But choosing a marker will involve weighing the clarity of the signal versus how much it has affected the world.

"The bomb spike from radionuclides is very pristine,

a very clear signal," says Waters, but it doesn't change the planet, whereas burning fossil fuels does because of climate change. Ice cores are another candidate because they contain a methane record that shows the advent of widespread fossil fuel use and large changes to the biosphere.

There are 12 sites in the race to be declared the golden spike (see map, right). They include the mud in a Japanese bay, which records a signature of atomic bomb testing

**12** sites are in the running to mark the dawn of the Anthropocene

and also contains fish scales showing the intensification of human fishing practices. Mud in Crawford Lake in Canada, coral on the Great Barrier Reef and mineral deposits in an Italian cave all preserve evidence of atomic bomb testing. Crawford Lake also holds microplastics and fish scales.

Teams of researchers, funded by German cultural institute Haus der Kulturen der Welt (House of World Cultures), are racing to assemble their stratigraphic data for an exhibition at the institute in Berlin this May.

The findings will then be published in journals and a database later this year so the AWG can pore over them. A smaller circle of the group, comprising 22 members, will then vote in November on which site to put forward as the best candidate for the dawn of the Anthropocene. The point when the primary marker first appears at that site will be the GSSP.

So far, the 1950s have been proposed as the rough start of the Anthropocene. But the site and marker together should give a specific year, a remarkable level of precision in geology, where error bars for units of time can be in the thousands or even millions of years. It may be even more precise. “It’s feasible with things like the corals we could tell you a specific season, and in some cases it may even be possible to link back to a specific [nuclear] detonation event and date,” says Waters.

## Major milestone

Deciding on a candidate site and primary marker this year would be a major milestone for proponents of the idea of the Anthropocene. But it doesn’t mean a new epoch is guaranteed to be officially declared. The choice of GSSP will first be voted on next year by a subcommission of the ICS, the arbiter of the geological timescale. The ICS itself would then need to approve the existence of the Anthropocene, which could happen in 2024.

But it isn’t guaranteed to do so. Some people disagree with the



WITOLD SKRYPCZAK/ALAMY

**Europe’s Sudetes mountains, left, and the Gulf of Mexico, below, are both on the shortlist for places that could mark when the Anthropocene started**



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## Where did the Anthropocene begin?

12 shortlisted places that show human influence on the planet



- Anoxic marine mud (e.g. microplastics)
- Estuary or coastal mud (e.g. mercury pollution)
- Coral (e.g. atomic bomb signature)
- Lake mud (e.g. coal ash)
- Peat (e.g. lead pollution)
- Ice (e.g. microplastics)
- Cave limestone (e.g. atomic bomb signature)
- Human-made landfill site (e.g. mercury pollution)

idea of adding the Anthropocene to the geological timescale, and establishing a specific time and place it began, arguing that it would be better considered an ongoing event that emerged gradually over time. “Almost nobody questions that we are in the Anthropocene. Is there a utility to defining a precise time when this begins? I think no,” says Erle Ellis at the University of Maryland.

Mark Maslin at University College London says that while a date around 1950 fits with the

**“The official declaration of the Anthropocene could be a catalyst for people making positive changes”**

idea of a great acceleration in human activity around then, “it misses out major processes and impacts that occurred before 1950”.

That is unlikely to deter the researchers who hope the ICS will designate the Anthropocene on the basis of the GSSP they pick this year. But will it happen? “I think the odds are low,” says Ellis, although even he concedes it is plausible the ICS could approve it.

Maslin says it would be significant: “It will be a formal scientific statement that humans have altered the world so much that we have entered a new human-dominated period.”

Simon Turner at University College London says that while it is easy to be pessimistic about the Anthropocene, its official declaration could be a catalyst for people making positive environmental changes.

“People understand we are a geological agent,” he says. “You always hope people will suddenly realise this is the only planet we have.” ■