



## Define the Anthropocene in terms of the whole Earth

Researchers must consider human impacts on entire Earth systems and not get trapped in discipline-specific definitions, says Clive Hamilton.

**D**o we live in the Anthropocene? Officially, not yet — although the debate about whether to declare a new geological epoch will resurface later this month at the International Geological Congress in Cape Town, South Africa. The concept of the Anthropocene has become well known and is much discussed, but often in a way that undermines the seriousness of the issue.

The Anthropocene was conceived by Earth-system scientists to capture the very recent rupture in Earth's history arising from the impact of human activity on the Earth system as a whole. Read that again. Take special note of the phrases 'very recent rupture' and 'the Earth system as a whole'. Understanding the Anthropocene, and what humanity now confronts, depends on a firm grasp of these concepts, and that they arise from the new discipline of Earth-system science. Earth-system science takes an integrated approach, so that climate change affects the functioning of not just the atmosphere, but also the hydrosphere, the cryosphere, the biosphere and even the lithosphere. (Arguably, anthropogenic climate change is more an oceanic than an atmospheric phenomenon.)

In the canonical statement of the Anthropocene, the proposed new division in the geological timescale is defined by the observation that the "human imprint on the global environment has now become so large and active that it rivals some of the great forces of Nature in its impact on the functioning of the Earth system" (W. Steffen *et al.* *Phil. Trans. R. Soc. A* 369, 842–867; 2011). As such, the Anthropocene cannot be defined merely by the broadening impact of people on the environment and natural world, which just extends what we have done for centuries or millennia.

Yet this is how many scientists are trying to define it. And this is because much discussion of the Anthropocene — its essential idea, its causes, its timing — is bedevilled by readings through old disciplinary lenses, which don't account for the true implications of humankind taking the planet into a new epoch.

Probably the most obvious example of scientific misinterpretation of the Anthropocene is the debate about its starting date. Discussions on rival starting dates may seem to have scientific merit, but they distort and dilute the message and the implications of the Anthropocene.

The original suggested onset was the end of the eighteenth century, when the European industrial revolution's large-scale coal-burning triggered rising concentrations of carbon dioxide in the atmosphere. More recently, members of the Anthropocene Working Group have proposed — I think correctly — 1945 as an unambiguous beginning for people causing a shift in the functioning of the Earth system.

But peering through the narrow lens of landscape ecology, others have interpreted the new geological epoch as another name for the continued impact of people on the terrestrial biosphere. Changing

vegetation and landscapes may bear the hallmarks of human behaviour, but these cannot have sufficient impact on the Earth system to bring about a new geological epoch.

Others misconstrue the question from the outset and argue that the Anthropocene's starting date depends on when human societies first began to play a significant part in shaping Earth's ecosystems. The very last letter, the 's' in ecosystems, gives it away. The Anthropocene began not when humans first played a significant part in those, but when they first changed the functioning of the Earth system. With a similar sleight of hand, others insert archaeology into the debate, so that the Anthropocene can be traced to the first domestication of plants and animals some 10,000 years ago. And some go further still and insist the Anthropocene is the most recent phase of a process that started 50,000 years ago with human geographic expansion.

Geographers and soil scientists have also claimed the Anthropocene for themselves. The start of the new epoch is 1610, the geographers say, based on a complex narrative covering the colonization of South America, introduced diseases, depopulation, forest regrowth, trans-continental trade, species exchange and pollen counts. Soil scientists put the date more than 1,000 years earlier, with evidence for anthropogenic modification of soils.

One thing all these misreadings of the Anthropocene have in common is that they divorce it from modern industrialization and the burning of fossil fuels. In this way, the Anthropocene no longer represents a rupture in Earth history but is a continuation of the kind of impact people have always had. This thereby renders it benign, and the serious and distinct threat of climate change becomes just another human influence.

That so many scientists, often publishing in prestigious journals, can misconstrue the definition of the Anthropocene as nothing more than a measure of the human footprint on the landscape is a sign of how far Earth-system science has to go to change the way many people think about the planet. The new geological epoch does not concern soils, the landscape or the environment, except inasmuch as they are changed as part of a massive shock to the functioning of Earth as a whole.

Some scientists even write: "Welcome to the Anthropocene." At first I thought they were being ironic, but now I see they are not. And that's scary. The idea of the Anthropocene is not welcoming. It should frighten us. And scientists should present it as such. ■

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