CLIMATE SCIENCE

Seeking the Anthropocene

Wolfgang Lucht examines a book linking the contested epoch to early globalization.

In 1864, palaeontologist Édouard Lartet made a stunning discovery. At La Madeleine in southern France, workers had unearthed a few fragments of mammoth ivory engraved with a vividly detailed depiction of the animal itself. Here, finally, was proof that humans had seen the mammoth. The artefact also implied something more disturbing: that Earth's climate is not as stable as had been thought, and that species coexisting with humans can become extinct.

In *The Human Planet*, geographer Simon Lewis and geologist Mark Maslin provide a compelling narrative, stretching from the emergence of hominins from Earth's long history some 3 million years ago, to our position today, as a species with planetary reach. Explaining the many ways in which we are now profoundly altering Earth, from polar melt to deforestation, they provide convincing evidence that we should indeed dub our new epoch the Anthropocene. Trying to understand our era, they observe, means parsing "a heady mix of science, politics, philosophy and religion linked to our deepest fears and utopian visions".

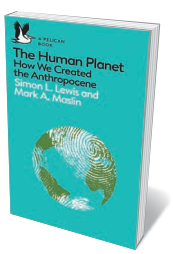
The geological division of time into epochs, as they note, "is a human construct, created to help make sense of the world we find ourselves in". The Anthropocene is largely uncontested as a phenomenon. But formalizing it — its definition and when it began — is hotly debated, a conversation Lewis and Maslin have been involved in for some time (S. L. Lewis and M. A. Maslin *Nature* **519**, 171–180; 2015). The debate has raged since Earth-system scientist and Nobel laureate Paul Crutzen established the idea of the Anthropocene almost two decades ago, following on from much older considerations of a human-dominated geological era. Also party to the protracted skirmish are

A Svalbard reindeer on drifting Arctic ice.

OLE JORGEN LIODDEN/NATUREPL.COM

geologists representing the Subcommission on Quaternary Stratigraphy of the International Union of Geological Sciences.

Indeed, designating the Anthropocene scientifically is a formidable task. Any marker for the beginning of major human impacts on the planet needs to be globally synchronized in the geological record. It also has to describe a process that casts a long shadow into the future history of Earth — enough to produce rock strata that mark a turn in Earth's planetary trajectory.



The Human Planet: How We Created the Anthropocene
SIMON L. LEWIS & MARK A. MASLIN
Pelican (2018)

The designation of the Holocene complicates the debate. This universally agreed current epoch started around 12,000 years ago; as Maslin and Lewis point out, geologically it is just one more interglacial period in a series reaching back 2.6 million years. However, it does coincide with the rise of human civilization, and the environmental impacts that eventually followed. Given that we are now an emerging meta-civilization with planetary consequences, should the Holocene have been called the Anthropocene? And if so, when, precisely, did the Anthropocene begin — and how might that beginning be visible in future geological deposits?

Lewis and Maslin aim to clear the mists by establishing criteria for the Anthropocene's status as a geological epoch. They first outline four crucial revolutions in the evolution of civilization that could be signature events for our progressive dominance of the planet. Two of these are the rise of agriculture from 11,000 to 5,000 BC, and of industrialization from the eighteenth century to today. These both greatly increased access to energy and resources; yet they also locked societies into consumption-related dependencies and feedbacks that are not readily broken. And the rise of capitalism amplified trade and the flow of information, causing revolutions that boosted first ecological homogenization, then socio-cultural globalization. Together, these processes led to the vast environmental shifts we see today.

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The authors point to a hallmark incident of one of these revolutions, the first contact between Europe and the Americas, as the event that produced a suitable marker for the start of the Anthropocene. By 1610, a small but pronounced dip in atmospheric carbon dioxide concentration had occurred, detectable in Antarctic ice cores. This, they argue, was triggered by a chain of events over the previous century, starting with the collapse of indigenous American populations in the face of introduced diseases and violent suppression. Much land then went uncultivated; forests regrew and more carbon was sequestered.

The 1610 geoscientific signal is significant in context because it also marks a turning point in human-driven homogenization of the global ecology. Before European explorers reached the Americas, ecosystems had been separated by the Atlantic and Pacific oceans. Suddenly they were linked, leading to extensive exchanges of species, with evolutionarily significant consequences that will be reflected in the geological layers.

From a scientific standpoint, Lewis and Maslin paint their picture with an often amazingly broad brush. The jury is still out among carbon-cycle experts (see M. Rubino *Nature Geosci.* **9**, 691–694; 2016) on whether the 1610 dip really is a signal of the environmental impact of European contact. It occurred during the Little Ice Age, a phase of planetary cooling that could have led to similar shifts in the atmosphere's carbon balance.

Equally, not all readers may be convinced by the authors' idea that males among early humans had lower testosterone levels than Neanderthals, and that this helped to make *Homo sapiens* society more cooperative, and allowed them to prevail over Neanderthals.

Readers wishing to dig deeper might turn to Clive Finlayson's *The Humans Who Went Extinct* (2009). This portrays *Homo sapiens* more convincingly, as a species that got lucky by being well adapted to ecological niches such as the steppes (which were extensive during the last ice age), just as Neanderthal populations fragmented. Those wishing to consider the palaeoanthropological foundations of the Anthropocene might wish to consult Clive Gambles's important *Origins and Revolutions* (2007). That examines how material culture has ever expressed human identity; there have been no 'revolutions' in culture, but rather a continuous process. Or they might access Steven Mithen's 1996 *The Prehistory of the Mind*, on how a fusion of social and technological mental capacities led to fluid intelligence. The unsurpassed 'Earth System Analysis — The Scope of the Challenge' by Hans Joachim Schellnhuber (a chapter in the 1998 *Earth System Analysis*, which he edited) offers a deeply co-evolutionary view of sustainability. And Tim Lenton and Andrew Watson's *Revolutions that Made the Earth* (2011) reveals Earth's history as a staggering interplay of planetary biogeochemistry and evolutionary transitions.

Nonetheless, *The Human Planet* is immensely readable and introduces important concepts. I agree with the authors' insistence that it would be wrong to base the Anthropocene on a largely climatic definition that depends on whether or not Earth's near-future state still qualifies as an interglacial. The changes we are imposing on the biosphere are the most long-lasting and troubling impact humans will have on Earth.

The Anthropocene debate is profoundly about how we see ourselves, and what we might do next. If we believe that scientific knowledge is universal, it is uniquely suited to informing a story applicable to all of humanity. We might do well to become '*Homo geosapiens*' by drawing conclusions from that story. ■

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