Commentary on Braje in *Antiquity*

Jan Zalasiewicz[1] & Colin N. Waters[2]

[1] *Department of Geology, University of Leicester, University Road, Leicester LE1 7RH, UK (Email: jaz1@le.ac.uk)*

[2] *British Geological Survey, Environmental Science Centre, Nicker Hill, Keyworth, Nottingham NG12 5GG, UK.*

It is useful to have Todd Braje's perspective on the Anthropocene. As he states, it is a concept that has spread widely and that has had various interpretations (within not just the sciences, but the arts and humanities too) in the 15 years since Paul Crutzen proposed the term. Various suggestions are made in Braje's paper: perhaps foremost, that the Anthropocene should be retained as a loosely defined term to focus on the nature and effect of human activities, to be a 'rallying cry' for better planetary stewardship. He suggested, indeed, that precise characterisation and formalisation as a stratigraphic unit may hinder such use, causing (for instance) all humans—rather than specific socio-economic groups—to be held equally responsible for the degradation of planetary systems.

Crutzen and Stoermer (2000) explicitly suggested the term Anthropocene as a geological time unit, arguing that the Earth system had changed from conditions that had characterised most of the Holocene (and previous interglacial states of the Quaternary Period). It was in this sense, too, that it was quickly adopted by the Earth system science community, which he (as an atmospheric chemist) was working within, prior to its wider dissemination among other communities. This specific identity is not consistent with the combined Holocene/Anthropocene epoch that Braje suggests.

For the Anthropocene to function as a geological time unit (i.e. a geochronological unit), it must also be recognisable as a material unit of strata (i.e. a chronostratigraphic unit): thus, as an Anthropocene Series laid down during the proposed Anthropocene Epoch. This is the only reasonably objective way to compare it with earlier episodes of Earth's history, and hence to assess the scale and significance of the phenomenon. That does not, as Braje suggest, neglect human history and socio-cultural processes, but writes it in layers of sediment and ice, rather

than in the pages of a book. The course of human impact may be read surprisingly clearly by this means.

Our participation in this stratigraphic assessment suggests that the Anthropocene does indeed form a distinct element with regard to both Earth history and stratal character. Hence, both an Anthropocene Epoch and the parallel Anthropocene Series are scientifically justifiable, and are therefore 'real' phenomena; this is true regardless of whether or not the International Commission on Stratigraphy ultimately decides to formalise the term. A number of the changes—notably, many biospheric ones—are already effectively irreversible.

If a scientific phenomenon is real and distinct, it is useful to give it a name. And, while synonyms have been suggested (e.g. Anthrocene, Myxocene, Homogenocene), it would seem to us perverse not to apply the term Anthropocene in this sense, given the effective justification of Crutzen and Stoermer's (2000) hypothesis, and the widespread use of this term in more or less its original sense (while we recognise its use in other senses by other communities).

Geological time units need to be precisely defined via practically valid boundaries in order to provide effective communication between all communities. We suggest that such clarity is appropriate for the Anthropocene too. On current evidence, the optimal placing of the boundary seems to be somewhere in the mid-twentieth century, as deposits formed later than this contain an array of proxy signals not present in earlier strata. That date, too, reasonably approximates to the time when human influence to the Earth system became over-riding.

But that does not mean that events before that are irrelevant to or somehow 'excluded' from consideration of the Anthropocene. As with every other geological time unit, it has deep roots and cannot be understood without full consideration of *all* relevant evidence, both above and below the boundary. Geological boundaries are simply part of a time framework put in place to help analyse an Earth history that we know to be immensely complex in time and space, thereby enabling us to understand the entire phenomenon better. They are not there to 'include' or 'exclude' events within or outside of certain chosen time units.

Although the Anthropocene is characterised by human forcing of key Earth processes, there is no implication that 'all humanity' has an equal share in the ongoing planetary perturbation, any more than 'volcanism in general' precipitated the Permo-Triassic mass extinctions. In each case, the *specific* patterns of cause and effect, worked out in

as much detail as possible, are key to understanding the impact of different environmental forcings.

We suggest that clear definition of the term best reflects its reality as a distinct phase of Earth's history. This may also help rather than hinder effective stewardship of the planet. Discussion of potential formalisation (a related but separate issue) is set to begin this year, as the working group passes on its findings to the Subcommission on Quaternary Stratigraphy, prior to consideration by the International Commission on Stratigraphy.

Acknowledgements

Colin Waters publishes with the permission of the Director of the British Geological Survey.

Reference

CRUTZEN, P. & E. STOERMER. 2000. The 'Anthropocene'. Global Change Newsletter 41: 17–18.