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The Anthropocene

In 2001 the atmospheric chemist, Paul Crutzen, proposed that human activity was impacting natural environmental conditions to the extent that we had effectively left the natural stable conditions of the Holocene and moved into a new interval that he named the Anthropocene. In response to this suggestion, the Anthropocene Working Group (AWG) was established in 2009 on the initiative of Phil Gibbard (PLG: the then chair of the Subcommittee on Quaternary Stratigraphy; SQS). The remit of the Working Group was to examine the evidence for human induced climate change as reflected in the recent geological record, and to determine whether this was sufficiently compelling for a new stratigraphic unit to be included in the Geological Time Scale (GTS) and, if so, at what rank. The Working Group, initially led by Jan Zalasiewicz (JAZ) and latterly by Colin Waters (CW), deliberated for 15 years before finally submitting a report to the SQS in late October 2023. The proposal was that the Anthropocene should indeed be a new chronostratigraphic unit; that it should be of series/epoch status; that it should begin not in the mid-18th century but rather in the 20th century (~1950) where a range of proxy indicators marked a significant increase in human impact (the 'Great Acceleration'); and that it should be underpinned by a GSSP. A GSSP or a Global Stratotype Section and Point indicates the internationally-recognised base of a chronostratigraphic unit, marked by a 'spike' in a succession, usually of rock, and is the start of geological time for that unit. The AWG initially comprised a small group of geoscientists but grew rapidly to include many non-geoscientists, including interested colleagues from geography, ecology, archaeology, the humanities and even from the legal community, such that it eventually included over 30 members. The mid-20th century start date was promoted through a large number of published papers, through press releases and media interviews, and through various conference presentations. Hence although the formal report has only very recently been presented to the SQS, the details of the proposal have been known for some considerable time and have been widely discussed at conferences and in the scientific and popular literature. This means that discussion of the proposal has been effectively conducted over a much longer time period than is normally the case with proposals submitted to the ICS.

While there can be little doubt that the term Anthropocene is now well established in the public domain, and will no doubt continue to be used in popular and scientific discourse, it has not been without its critics. Some have pointed to the fact that anthropogenic effects on the Earth's environmental and climate systems long predate the mid 20th century (e.g. early agriculture; the industrial revolution in western Europe, the colonisation of the Americas and Pacific, etc) and hence the Anthropocene has much deeper roots in geological time. Others have expressed unease about a new unit in the GTS that truncates the Holocene but with a span of less than a single human lifetime, it sits uncomfortably within the GTS where the units span thousands or even millions of years. A third cause for concern is that the human effects on global systems are time-transgressive and are also spatially and temporally variable, so that their onset cannot be adequately represented by an isochronous horizon as reflecting a single point in time. An alternative narrative has therefore arisen in which the Anthropocene is not considered as a series/epoch (i.e., a

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chronostratigraphic unit and the corresponding geochronologic unit) but rather as an event, similar to the great transformative events in Earth history such as the Great Oxygenation (2.4-2.1 Ga), the Cambrian Explosion, or the Great Ordovician Biodiversification events.

None of these major transformative events in Earth history are represented as chronostratigraphic units, and hence there has been no requirement for formal ratification. If so, the Anthropocene could be considered as an informal non-stratigraphical term.

Despite several years of discussion within the AWG, and a large number of publications from the group, by 2018 the ICS executive was becoming increasingly concerned that no report had been prepared for and submitted to the SQS, and so both Professor David Harper (DH: chair ICS) and PLG (then ICS Secretary General) requested that the group focus solely on generating a proposal that could be put to a formal vote by the subcommission. It was also agreed that only geoscientists within the AWG would be eligible to vote on the proposal. The response from the AWG leadership was that more time was needed to finalise the site selected for a reference GSSP, and this was reluctantly agreed by ICS. The process was finally completed in the autumn of 2023, although the group stated that further time was still required to include yet more analytical results from the 15 cm of lake sediment from the selected type site of Crawford Lake in southern Ontario, Canada. However, in subsequent discussion within the SQS (see below), the reaction by the voting membership was that consideration of additional samples was not necessary, the evidence already being clear from the results that were included in the October proposal.

Following standard ICS procedure, it was expected that there would be 30 days allotted for the discussion of the AWG proposal, to be followed by 30 days for voting. Because of a possible conflict of interest, JAZ and MAH recused themselves from the administration of the voting process (although both participated in the discussion), and the discussion and ballot were conducted by the 1st vice-chair Professor Liping Zhou (Beijing University: LPZ) and Professor Adele Bertini (University of Firenze: AB), and who ensured that the process adhered strictly to the rules of ICS. However, when the discussion period ended and the Secretary moved to call a vote, both JAZ and MAH objected saying that the discussion period had been of insufficient length and that additional information on the Anthropocene proposal had been excluded. This did not find favour with a substantial number of SQS members who were anxious to move forward to the ballot. In order to meet the request for more time, however, LPZ and AB agreed to extend the discussion period, which was initially expected to end in late December, until the end of January. Voting finally began on 4th February, in spite of further objections from JAZ and MAH based on their view that adequate time was not allowed for discussion. It ended on 4th March at which point the results were declared.

The outcome was a decisive rejection of the Anthropocene proposal: 4 votes in favour; 12 votes against; and 3 abstentions. Three members did not vote, including JAZ and MAH, who then began a campaign questioning the legitimacy of the vote on procedural grounds and alleged contravention of the ICS statutes. It is important to stress that there was no question of impropriety against either LPZ or AB, both of whom acted with complete integrity throughout a difficult process and who carried out their duties fully in accordance with the statutory requirements of ICS. Nor can the integrity of the SQS membership be called into question. All who participated in the process are geological scientists of the highest calibre, from a range of countries, and with wide expertise in Quaternary stratigraphy and chronology. It is clear from the comments that were made during the course of the discussion period, that many were unconvinced by the arguments in the AWG proposal, and their misgivings are clearly reflected in the decisive nature of the voting outcome.

The vote of the SQS has been recognized as valid by the ICS Executive, and that recognition has been near unanimously supported (15 yes, 1 abstention, 1 conflict of interest) by the chairs of the seventeen IUGS subcommissions, who are the ICS voting members. Although their proposal has been decisively rejected, the AWG has performed an important service to the scientific community by assembling a wide body of data on human impacts on global systems, and this database will be an essential source of reference well into the future. Moreover, the Anthropocene as a concept will continue to be widely used not only by Earth and environmental scientists, but also by social scientists, politicians and economists, as well as by the public at large. As such, it will remain an invaluable descriptor in human-environment interactions. But it will not be recognised as a formal geological term but will more usefully be employed informally in future discussions of the anthropogenic impacts on Earth's climatic and environmental systems.