



**International Commission on Stratigraphy
Subcommission on Quaternary Stratigraphy**

1 September 2008

Prof. Stan Finney, Chair
International Commission on Stratigraphy

Dear Stan,

Formal request to ICS that the base of the Quaternary System/Period be lowered to the Gelasian Stage GSSP (at 2.588 Ma), and that the base of the Pleistocene Series be lowered to the same position.

Following the public forum discussion meeting held at the 33rd IGC in Oslo, the International Subcommission on Quaternary Stratigraphy formally requests to the incoming ICS that the base of the Quaternary System/Period be lowered to the Gelasian Stage GSSP (at 2.588 Ma) and that the base of the Pleistocene Series be lowered to the same position. The Quaternary is already recognised by the IUGS as having System/Period status and succeeding the Neogene, but with its base currently defined by the Pleistocene System GSSP at Vrica (at 1.806 Ma). The specific details of this request are that:

1. The base of the Quaternary System be lowered to the GSSP of the Gelasian Stage (currently the uppermost stage of the Pliocene Series) at the base of Marine Isotope Stage 103, which has a calibrated age of 2.588 Ma.
3. The base of the Pleistocene Series be lowered to coincide with that of the Quaternary System boundary (the Gelasian GSSP).
4. The Vrica GSSP (the present Quaternary and Pleistocene basal boundary) be retained as the base of the Calabrian Stage, the second stage of the revised Pleistocene Series.

This request follows a previous ICS proposal, dated 13 May 2007, which was supported by a separate request directly to IUGS by the INQUA Executive Committee. It was subsequently supported by a unanimous vote of the INQUA General Assembly at the INQUA Congress held in Cairns, in Australia in August 2007.

Supporting case.

Thank you for this opportunity to present our final case for the Quaternary as a period/system with its base defined by the base-Gelasian GSSP at Monte San Nicola, Sicily, which has an astronomical age of 2.588 Ma. On hierarchical as well as scientific grounds, this definition requires that the base of the Pleistocene Epoch/Series be lowered from its present GSSP at Vrica, Calabria, Italy (dated astronomically at 1.806 Ma) to the GSSP at Monte San Nicola. The Vrica GSSP would, however, remain to define the base of the ‘Calabrian’ Age/Stage. This proposal moreover reflects widespread current and historical usage of the term Quaternary, and is supported by INQUA, the SQS, and the outgoing ICS for 2004–08. This position has been summarised recently by Head, Gibbard & Salvador (2008) and Ogg & Pillans (2008) (attached) and is highlighted below. We welcome this opportunity also to address opposing views by Lourens (2008) and Hilgen *et al.* (2008) including their desire to extend the Neogene to the present day.

1. The Quaternary was first proposed as a concept by Arduino in 1759 and was used formally by Desnoyers in 1829, predating both the terms Pleistocene (Lyell in 1839) and Neogene (Hörnes in 1853).
2. The traditional and current view (and that of the IUGS) is that the Neogene represents the Miocene and Pliocene, and that the Quaternary represents the Pleistocene and Holocene, as any wide perusal of the current literature will show. Maps displayed in the exhibitors’ booths at the 33rd IGC in Oslo offered a snapshot of absolutely current usage. Of 29 maps inspected, representing geological surveys and NGOs from around the world, just three depicted the Neogene extending to the present day, the overwhelming majority illustrating a Neogene below the Quaternary.
3. Claims that the Neogene should be extended to the present day are based on flawed historical interpretation. Hörnes was vague about where his Neogene should end but it is clear that he did not intend it to extend to the present day or indeed include parts of the Pleistocene (Walsh, 2008).
4. Assertions that the Holocene should be treated as a subdivision of the Pleistocene, rendering the Quaternary superfluous, deny the unique qualities of the Holocene and its pervasive use in the literature. Furthermore, the argument is now moot – the Holocene having been ratified as an epoch /series within the Quaternary Period/System by the IUGS earlier this year.
5. Ratified in 1983, the base-Pleistocene is defined by the Vrica GSSP at a position now dated astrochronologically at 1.806 Ma. This position was incorrectly thought to represent the first climatic deterioration in the Italian Plio–Pleistocene. For example, the ostracod *Cytheropteron testudo*, a ‘northern guest’ singled out as having special significance for recognising the Vrica GSSP, has since been recorded at 2.4 Ma within the Monte San Nicola section in Italy (Aiello *et al.*, 1996). Consequently, the Vrica GSSP has poor potential for correlation and, in retrospect, provides an arbitrary rather than descriptive means to subdivide geological time. This boundary is inappropriate and unworkable for defining the base of an epoch, let alone a period.

6. The first significant cluster of cooling events within the Italian Plio–Pleistocene and elsewhere extends from 2.7 to 2.4 Ma. Earlier cooling events, such as the Mammoth cooling event (3.3 Ma), are best viewed as precursor occurrences. Fundamental changes to the Earth’s climate system and associated biotic response make this episode the logical start of the Quaternary. The Monte San Nicola GSSP dated at 2.588 Ma occurs conveniently at the approximate mid-point of this cooling interval, and within 1 m of the Gauss–Matuyama Chron boundary. The fact that this GSSP occurs in a warm stage (MIS 103) has little overall consequence for the widely agreed concept of the Quaternary, namely the onset of major glaciation in the Plio–Pleistocene. The wide support for this boundary recognises that the Quaternary must be defined by scientifically meaningful as well as practical criteria.

7. Although it coincides with a period of significant global cooling, the Gelasian GSSP, which will serve to define the base-Quaternary and base-Pleistocene boundary, was selected and approved as a globally correlative chronostratigraphical horizon by marine geochronologists of the Neogene Subcommittee (Rio *et al.*, 1998). Thus, the Quaternary and Pleistocene, if redefined at this boundary, will not be climatostratigraphical units as some have suggested but biochronologically defined divisions.

8. INQUA and common usage both assert the need for the Quaternary to remain at its present IUGS-sanctioned rank of period/system; a status confirmed twice by formal ICS votes in 2005 and 2007. For reasons of hierarchy and common sense, the base of the Pleistocene should therefore be lowered to that of the Quaternary. Although the Vrica GSSP was re-ratified in 1999 (by minority vote), there has been unremitting dissatisfaction with this boundary from a substantial community since its inception in 1983 and indeed before. As has been demonstrated by the voting of the INQUA members, most recently and unanimously at the 2007 INQUA Congress in Cairns, an overwhelming majority of Quaternary / Pleistocene workers want the units changed. Moreover, because INQUA now has adopted the definitions proposed here, which currently differs from that accepted by ICS and IUGS, the present situation generates great confusion.

The vague term “Plio–Pleistocene” has become the legacy of the existing Vrica boundary which has little meaning beyond the local Mediterranean area. Lowering the base-Pleistocene to the Monte San Nicola GSSP will align it with the base-Gelasian and base-Quaternary. This also brings the lowered Pleistocene into better accord with the 1948 IGC decision that the Pleistocene should include the Villafranchian regional mammal stage, the base of which is now known to extend beyond 1.806 Ma.

9. A base-Quaternary boundary at 2.6 Ma will strengthen recognition within terrestrial as well as marine sections owing to major global changes in the terrestrial biota, including humans, and in sedimentation particularly with respect to loess deposition across northern Eurasia. Such major global changes are lacking around 1.8 Ma.

10. Although the SQS and SNS are equal members under the ICS, and IUGS and INQUA equal members under the International Council for Science (ICSU), the user base for the geological time scale should also be considered carefully. The current INQUA-SQS position

has the overwhelming support of users – the large global population of Quaternary scientists that have resulted in INQUA being the only geological period to have its own union under the ICSU.

11. The suggestion by Lourens (2008) to lower the base-Quaternary and base-Gelasian to 2.72 Ma (rather than our 2.6 Ma) would weaken its potential for correlation owing to a significantly increased distance from the Gauss–Matuyama Chron boundary. Furthermore, relegating the Quaternary Period to be a subperiod of an extended Neogene Period runs counter to an enormous literature and the weight of current opinion, and would be unnecessarily disruptive. Moreover, termination of the Neogene at 2.6 Ma is logical given the fundamental changes to Earth's climate system at around this time.

12. Sanctioning two independent geological time scales, one for the Quaternary and another showing an extended Neogene, as suggested by Hilgen et al. (2008, p. 30), would be confusing, divisive and only defer a decision that should be made now. It would be the worst of all possible compromises. INQUA, SQS and the 2000–2004 ICS have accepted an existing GSSP (the Monte San Nicola GSSP) to define the base-Quaternary as a compromise in the interests of expediency and stability.

13. The proposed changes will affect both the Quaternary and Neogene communities. However, since Quaternary workers have long favoured the 2.6 Ma boundary, and many indeed have applied this boundary for decades already, the impact for them will be slight. For Neogene workers the effect will be greater because of the reattribution the Gelasian Stage to the Quaternary, but this stage was ratified only 10 years ago by the Neogene community in acknowledgement of important changes occurring at *ca.* 2.6 Ma. Hence, we consider any confusion regarding the reallocation of the Gelasian to be short lived.

We hope these points will be useful to the ICS in making its recommendation to the IUGS, and we look forward to ending finally a debate that began exactly 60 years ago (the London IGC in 1948) to resolve the status and duration of the Quaternary.

Philip Gibbard
Martin J. Head
Subcommission on Quaternary Stratigraphy

References

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Attachments

As pdfs: Head *et al.* (2008) and Ogg & Pillans (2008).

Acronyms used

GSSP = global stratotype section and point
 ICS = International Commission on Stratigraphy
 ICSU = International Council for Science
 IGC = International Geological Congress
 INQUA = International Union for Quaternary Research
 IUGS = International Union of Geological Sciences
 MIS = marine isotope stage
 NGOs = non-governmental organizations
 SNS = Subcommittee on Neogene Stratigraphy
 SQS = Subcommittee on Quaternary Stratigraphy