

Editorial

# Quaternary Highlights (December 2018–February 2019)

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Editorial summaries of selected papers relevant to Quaternary science published in high-impact multidisciplinary journals between December 2018 and February 2019. Other relevant Quaternary papers published in the same journals are also listed.

## 1. Mediterranean Hominins: Older or Clever than Usually Thought?

The oldest (ca. 2.6 Ma) stone tools associated with butchery practiced by hominins known to date are from East Africa (Olduvai, Tanzania). According to the available evidence, this technology did not appear in the Mediterranean area of northern Africa until 1.8 Ma (Ain Hanech, Algeria), after hominin dispersal from East Africa. However, Sahnouni et al. [1] reported stone artifacts and cutmarked bones as old as ca. 2.4 Ma from another Algerian locality (Ain Boucherit), which is the oldest evidence of hominin butchery from the Mediterranean region. According to the authors, this new evidence suggests that either East-African butchery technology—and, hence, part of the oldest East-African hominins—migrated to the Mediterranean region much earlier than previously thought or, alternatively, the same stone technology originated independently in both East and North Africa, at similar times.

## 2. Afromontane Tropical Forests Noted but Resisted the Last Glaciation

It has been proposed that, during the last glaciation (LG), equatorial African rainforests were fragmented into isolated refugia within a grassland-dominated landscape due to unfavorable climatic conditions. This refuge hypothesis (RH) has been invoked to explain the high richness and endemism levels of such rainforests. However, paleoecological records to test the RH are still insufficient. Lézine et al. [2] studied a 90,000-year long sedimentary record from Lake Bambili (Cameroon) containing most of the LG interval and the Holocene. Pollen analysis revealed that present Afromontane forests persisted during the whole record in spite of continued climatic changes. Significant shifts were recorded in the upper treeline in response to climate instability but their lower elevational limit remained remarkably stable, which challenges the RH paradigm of forest fragmentation. According to the authors, climatically-driven ecological instability could have been the main driver of forest diversity.

## 3. The Bering Strait and the Latest Global Climatic Revolution

A major climatic transition occurred ca. 900 ky BP, characterized by an intensification of glacial cycles and a lengthening of their periodicity, from 40 to 100 ky BP. The absence of significant changes in the Milankovitch forcing points towards earth's internal feedbacks leading to secular atmospheric CO<sub>2</sub> reduction as the more likely cause of this mid-Pleistocene transition (MPT). Several mechanisms have been proposed but there is no conclusive evidence for a definite assessment. Kender et al. [3] studied organic carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotopes in an IODP (International Ocean Discovery

Program) core from the Bering Sea to reconstruct changes in ocean productivity around the MPT. They found that during the MPT, nutrient upwelling was significantly reduced, which favored CO<sub>2</sub> sequestration into deep ocean waters, thus causing the atmospheric depletion of this gas and a significant global cooling trend. According to the authors, reduced upwelling was the result of the expansion of sea ice and North Pacific intermediate water (NPIW) as a consequence of the closure of the Bering Strait.

#### 4. Are We Losing Neandertal Ancestry?

It has been estimated that up to 2% of the genome from present-day non-African humans is of Neandertal origin as a consequence of interbreeding between modern humans and Neandertals that occurred ca. 55,000 years ago. It has also been suggested that the amount of Neandertal DNA in modern humans was higher after the initial interbreeding and has progressively been reduced by negative selection due to deleterious introgression. Petr et al. [4] reexamined estimates of Neandertal ancestry in ancient and present-day modern humans and found no evidence for long-term genome-wide removal of Neandertal DNA. The authors consider that previous results were an artifact resulting from the failure to consider gene flow between West Eurasian and African modern human populations. Selection against Neandertal ancestry has occurred primarily on non-coding DNA, suggesting that Neandertals may have differed from modern humans in their regulatory variants, rather than in protein-coding sequences.

#### 5. A Single Full-Range Calibration Set for Radiocarbon Dating

Changes in atmospheric <sup>14</sup>C linked to cosmic rays shielding represent a handicap for <sup>14</sup>C dating that can be corrected by calibration against a calendar time scale. Dendrochronology has demonstrated to be an excellent calibration tool for the last ca. 10,000 years, but is insufficient for the whole range of <sup>14</sup>C dating methods (ca. 54,000 years). The development of <sup>230</sup>Th dating methods, mainly on corals and speleothems, allowed extending calibration until Late Pleistocene times by using composite calibration sets. Cheng et al. [5] demonstrated that coupled measurements of <sup>14</sup>C/<sup>12</sup>C and <sup>230</sup>Th in stalagmites from the Hulu Cave (East China) may extend the calibration to the full range of the <sup>14</sup>C method using one single record. When comparing the Hulu Cave with the currently available calibration compilation (IntCal13), the first showed less uncertainty and resolves previously unknown fine-scale structure for the portion older than 30 ky BP. The authors attribute the millennial-scale variations in <sup>14</sup>C/<sup>12</sup>C to changes in the earth's magnetic field and the oceanic carbon cycle influenced by climatic shifts.

#### 6. Holocene Aridity and Societal Outbreak in the Middle East

The influence of past climatic changes on societal disruption is a controversial topic. A classic example to illustrate this point is the demise of the Mesopotamian Akkadian Empire that occurred at ca. 4.2 ky BP, for which the occurrence of a coeval climatic outbreak remains uncertain. Carolin et al. [6] carried out high-resolution geochemical analysis of a 5.2 to 3.7 ky old (U/Th dating) stalagmite from an Iranian cave and found two century-scale phases of Mg/Ca increase at 4.51 and 4.26 ky BP, coinciding with gradual increases in stable oxygen isotope ratios (δ<sup>18</sup>O). Mg/Ca peaks were interpreted in terms of increased dust flux from the Mesopotamia region as a result of two significant aridity shifts. The 4.26–3.97 ky BP event was particularly intense and of regional extent, and coincided at decadal level with the massive abandonment of human settlements from Northern Mesopotamia. According to the authors, this strongly supports the association between climatic and societal change.

#### 7. Other Relevant Papers

For further relevant readings, see references [7–28].

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