Multi-element isotope studies on hominid tissues

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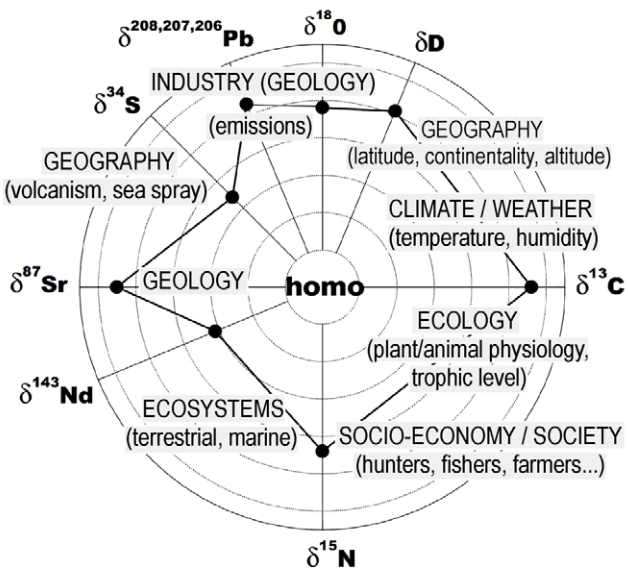
According to experiences gained mainly through isotopic provenance determinations of contemparaneous food-stuff and beverages, we currently analyse several elements' isotopic signatures (see diagram) on well preserved hard tissues of fossil hominids as well as on soft tissues of mummies, and of recent corpses.

Tissues that we analyse are – in the order of decreasing resistance against decomposition under conditions of burial in most climates – enamel and collagen, dentine, bone, hair, nails, skin flesh and muscles – the analytical techniques used are IRMS and TIMS.

In that tissues choosen from individuals for analyses have variable formation times and/or turnover rates, their isotopic signatures allow, in principle, to infer preferred, or available, diets of different periods of life, and changes of residence, respectively.

Controlled blind isotope studies on recent corpses (with well-known life-histories) provide us with estimates on the quality of our efforts to reconstruct some aspects of recent individuals' gone lifes – and, by implication, of our fossil ancestors.

Results from case studies will be presented together with considerations on analytical and interpretational successes and difficulties.



Significance of sea-floor barite cements in Marinoan-age post-glacial cap carbonates

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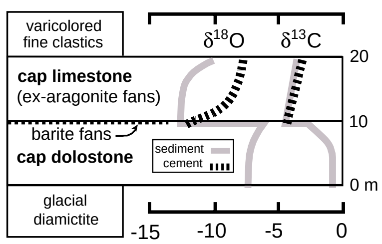
Cap carbonates of the younger Neoproterozoic glacial event in Australia, Namibia and Canada are strikingly similar (Kennedy et al., 1998; Hoffman and Schrag, 2002). Shelves and inland seas were first blanketed by several meters of pale peloidal dolostone ('cap dolostone'), deposited mostly above storm wave base. The dolostone ends abruptly at a marine flooding surface, overlain by hundreds of meters of varicolored allodapic limestone and/or fine clastics. Reef-like masses of sea-floor cement, pseudomorphic after aragonite, adorn the flooding surface at shelf edges (James et al., 2001). In the northern Canadian Cordillera, up to 7 cm of primary barite cement precedes meters of ex-aragonite cement, and both were unequivocally precipitated at the sediment-water interface synchronous with allodapic carbonate sedimentation. Kennedy (1996) describes identical barite crystal fans from the same stratigraphic position in central Australia. The extreme insolubility of barite accounts for its trace abundance in modern sediments, and only low-sulfate water could have supplied Ba rapidly as required to form barite cements in areas of active sediment accumulation. The sudden switch from barite to aragonite cement coincides precisely (allowing for minor reworking) with change in the allodapic component from ferroan dolostone to limestone. Conceptual models will be discussed that attempt to link the observed simultaneous changes in cement and sediment mineralogy, stable isotope fractionation (see figure), and relative sea level, given an ocean with euxinic deep water evolved during the snow-ball event and an unusually stable density stratifica-tion imposed by strong temperature and salinity gra-dients related to greenhouse melt-ing of a thick global ice shell.



Ice Brook glaciation, Mackenzie Mtns, northwest Canada

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