DATING METHODS IN PREHISTORY DURING QUATERNARY PERIOD

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The Quaternary spans the last 2.6 million years (Ma) of geological time including the Pleistocene and Holocene periods. During this period, glacial and interglacial periods alternate and establishing the timing of these climate changes and of their effects on the earth’s environment, is a major topic in Quaternary research. The study of human evolution and its behaviors needs to establish a chronology of events using different dating techniques applicable within the field of Quaternary science. Dating methods based on radioactive decay processes associated with biochronology and magnetostratigraphic data allow the building of a chronologic framework for the Lower Pleistocene (up to 0.8 Ma) when the first hominins, after leaving Africa, settle in Eurasia, mainly in South east Asia (Java) and continental Asia (China and India), and in Europe. Important events such as the standardization of Acheulean tool-kits and the emergence of typical anatomical traits of Neandertals occur in Europe during the Middle and Upper Pleistocene, spanning between 0.7 to 0.04 Ma. Finally, modern Humans appear in Europe after they had reach south east Asia and Australia, and long after they were present in the Levant, northern, eastern and southern Africa.

Two main types of dating methods will be presented.

- Isotopic dating methods such as radiocarbon (^{14}C), U-series and K/Ar ($^{39}Ar/^{40}Ar$), cosmogenic elements (Al/Be) can be applied according their half-life which determines their range and capabilities. Non invasive methods using mass spectrometry allow the dating of valuable samples such as human remains.

- The radiogenic trapped charge methods of Electron Spin Resonance (ESR), luminescence methods (OSL, TL) can be applied on different types of samples that can be found either in layers contemporaneous with human bearing occupations or used on minerals unearthed from geological layers.

[1] C. Falguères et al., Quaternary International 223-224 (2010) 293–298
[2] C. Falguères et al., "Geochronology of early human settlements in Java: What is at stake?", Quaternary International (2015), http://dx.doi.org/10.1016/j.quaint.2015.10.076