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# Success stories on the characterization of Cultural Heritage in Latin America: dating of the Mayan Codex of Mexico and determination of arsenic in Chilean mummies

*Monday, 13 June 2022 14:00 (20 minutes)*

Two success stories on the characterization of cultural heritage in Mexico and Chile using accelerator-based techniques will be presented and discussed.
The first case is the determination of the authenticity of the Mayan Codex of Mexico (MCM). The Mesoamerican codices are documents describing pre-Hispanic history and cosmogony. The MCM was unveiled in 1971 during an exhibition at the Grolier Club of New York. This codex is a folding-screen book, with 11 pages painted on bark paper covered with a fine layer of stucco. It illustrates astronomical events related to Venus cycles. Since the discovery of the Mayan Codex, its authenticity has been subject of controversy and discussion due its scarce iconographic content and its unknown origin. Some studies have been conducted to verify if the materials in the MCM match with those found for other pre-Hispanic documents. Among them, the group led by Dr. Ruvalcaba presented a comprehensive study of the whole document using a set of non-destructive techniques (1). They concluded that no modern inorganic materials are present in the codex. Besides, it was also determined that it contains materials used in pre-Hispanic times. More recently, the group led by Dr. Solís revised the dating of the MCM using AMS 14C (2). Results obtained placed the age of the bark paper between 1159 and 1261 cal AD, indicating that the vegetal support of the MCM belongs to Postclassical Mayan period.
The second case is the study of arsenic poisoning in mummies from Chile. Arsenic (As) is an abundant trace element in Andean groundwater, and arsenicism has been detected in ancient and modern populations. However, discriminating endogenous arsenic by ingestion from external contamination as a result of exposure to geogenic toxic contaminants remains an analytical challenge. To evaluate the origin of As in pre-Hispanic populations, Dr. Kakoulli and collaborators from University of Chile determined the distribution and chemical speciation of As in ancient human hair using synchrotron radiation based techniques (3). In addition, the group led by Dr. Echeverria measured the hair As concentrations of ninety-two pre-Hispanic naturally mummified individuals from northern Chile using INNA (4). These mummies belonged to communities with diverse traditions and had access to different water sources. The work points to the analysis of arsenic in hair as a useful tool in the study of living conditions and patterns of diet and mobility in ancient populations.

References:
(1) The Grolier Codex: A Non Destructive Study of a Possible Maya Document using Imaging and Ion Beam Techniques, Jose Luis Ruvalcaba *et al*, Mater. Res. Soc. Symp. Proc. Vol. 1047, (607) 2007.
(2) AMS 14C dating of the Mayan Codex of Mexico revisited, Corina Solís *et al*, Radiocarbon 62 (6), 2020.
(3) Distribution and Chemical Speciation of Arsenic in Ancient Human Hair Using Synchrotron Radiation, I. Kakoulli *et al*, Anal. Chem. 86, 2014.
(4) Arsenic in the hair of mummies from agro-ceramic times of Northern Chile (500 BCE - 1200 CE), J. Echeverría *et al*, Journal of Archaeological Science: Reports 21, 2018.

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