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The ASTR community reporting format: Making geochemical data computationally interoperable in archaeometry and beyond

THOMAS ROSE[1], CLEMENS SCHMID[2], KATRIN J. WESTNER[3], SABINE KLEIN[3], ANDREA ACEVEDO MEJIA[4], ALEXANDRA RODLER[5], BERBER S. VAN DER MEULEN-VAN DER VEEN[6], MARÍA FLORENCIA BECERRA[7] AND TZILLA ESHEL[8]

[1]Massachusetts Institute of Technology
[2]Max Planck Institute for Evolutionary Anthropology
[3]Leibniz-Forschungsmuseum für Georessourcen/Deutsches Bergbau-Museum Bochum
[4]Austrian Archeological Institute
[5]Austrian Academy of Sciences
[6]University of Amsterdam
[7]CONICET, Universidad Nacional de La Plata
[8]University of Haifa

The efficient (re-)use of data in archaeometry, geochemistry and other domains relies heavily on data interoperability. Based on the FAIR data principles, interoperability is often associated with the interoperability of (meta)data describing datasets. This aspect is currently addressed by many major national and international initiatives such OneGeochemistry. An often less prominent but similarly crucial aspect of interoperability is computational interoperability, i.e. that datasets can be easily passed between different software tools.

The community reporting format defined for and implemented in the R package ASTR – Archaeometric Tools and Standards in R (https://archaeothommy.github.io/ASTR/) is addressing exactly this aspect. Defined by a diverse group of archaeologists and archaeological scientists, it aims to minimize implicit information in datasets while providing a generalized approach to describing geochemical analytical data in a machine-readable way while organizing the data in a flat table format with human-readable column names. Defining the format became necessary because comparable conventions and templates fall short in at least one of these aspects.

The suggested community reporting format makes datasets arbitrarily subsettable and allows for extensive data validation beyond compliance with the format. In addition, ASTR leverages the machine-readability of variable names adhering to the format by providing convenient data handling functionalities such as on-the-fly unit conversion of SI and common geochemical non-SI units (e.g., oxide%, ppm) and set-wise operations on different geochemical data types such as isotopic or elemental data.

The ASTR reporting format presented in this contribution goes beyond archaeometry and contributes to ongoing discussions in the wider geochemistry community thanks to its generalized approach.