Short-lived radionuclei as clocks for the prehistory of the Solar System

M. Lugaro[a], U. Ott[b,c] and K. Zuber[d]

[a]*Konkoly Observatory, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, H-1121 Budapest, Hungary <maria.lugaro@csfk.mta.hu>,* [b]*Atomki Institute for Nuclear Research, Hungarian Academy of Sciences, H-4026, Debrecen, Hungary,* [c]*Max-Planck Institute for Chemistry, D-55128 Mainz, Germany,* [d]*Institut für Kern- und Teilchenphysik, Technische Universit at Dresden, 01069 Dresden, Germany*

While we know that stars are born in groups (clusters) within stellar nurseries, i.e., (possibly giant) molecular clouds, perhaps surprisingly, we do not have any consensus on the type of stellar nursery and stellar cluster where our Sun was born. Radioactive nuclei with half-lives between roughly 10 and 100 Myr were present in the early Solar System, as indicated by high-precision meteoritic analysis. They provide accurate clocks to measure the timing of the events that predated the formation of the Sun's stellar nursery. By comparing predictions from the evolution of their galactic abundances to the meteoritic data we can build up a time line for the nucleosynthetic events that predated the birth of the Sun (Figure 1), and investigate the lifetime of the stellar nursery where the Sun was born. However, many hurdles are still present between us and a clear picture of the Sun prehistory. These difficulties take the form of uncertainties in nuclear physics properties, stellar production, and Galactic evolution. We will present the current knowledge and discuss what is required to make the picture in focus.

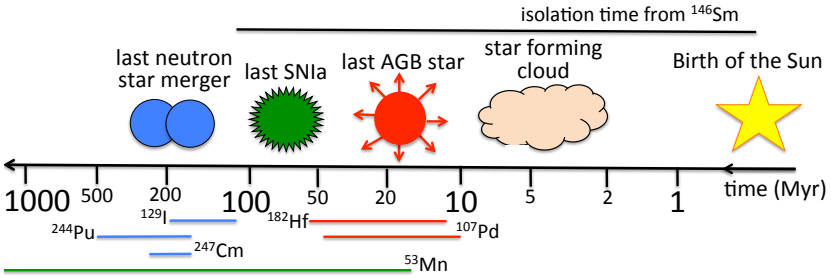

Figure 1: Some of the last stellar events that contributed to the Solar System matter are dated using the indicated radioactive nuclei [1]. Times are in Myr on a logarithmic scale. The time intervals derive from the error bars on the meteoritic ratios and from assumptions related to the Galactic evolution of the radionuclide abundances.

References

[1] M. Lugaro, U. Ott, Á. Kereszturi, 2018 *Progress in Particle and Nuclear Physics*, submitted