

## **Creative Chronology – Recent innovations and future challenges**

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The hugely influential field of isotope chronology has been constantly evolving since the initial attempts at using isotopes to calculate the age of the Earth. And even though pioneering studies by the likes of Rutherford, Boltwood, and Holmes lacked some knowledge about radioactivity that we now understand, these studies set the stage for over a century of breakthroughs, with reverberations throughout science and society: The 1950s welcomed an accurate approximation for the age of the Earth, the return of lunar samples revealed many secrets about the Moon, and martian meteorites continue to provide a wealth of chronological information about the geologic history of the Red Planet. Furthermore, ages derived from differentiated meteorites build upon a planetesimal-scale view of Solar System history, whereas the chronology of chondritic components permits an ever finer-scale understanding of the earliest epoch of disk history.

Although tried-and-true methods and traditional chronometers remain the sturdy backbone of the planetary chronology community, the pace of the field and the available planetary materials have produced some creative chronological solutions in recent times. Advances in both methods and machines have allowed us to date cometary material as well as individual chondrules and exotic refractory inclusions. And even though the Sun and Jupiter lack solid surfaces, these largest objects of the Solar System have now been dated using isotopic measurement by meteoritic proxy. Conversely, precise ages of miniscule presolar grains are on the horizon, soon allowing us to evaluate events that occurred before the Sun existed. Even with these great and diverse successes, our community of chronologists will continue to be tested, particularly with the impending arrival of fresh planetary materials from ongoing and planned sample collection missions. It is impossible to predict the problems the community will encounter when working on the pristine carbonaceous chondrite material currently on its way to Earth, or what curveballs may come from new lunar material or targeted rocks we will eventually receive from Mars—in this talk I will highlight some of our community's creative chronological solutions of the past and address questions we may have the opportunity to answer in the not-too-distant future.