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Claude Allègre's research into the chronology of the early solar system

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After dating with the Rb/Sr method the Moon rocks returned to Earth by the Luna and Apollo missions, Claude Allègre and his laboratory started at the IPGP in the early 80s to try to date meteorites and processes in the early solar system using absolute ages (87Rb-87Sr, 235U-207Pb, 238U-206Pb, 232Th-208Pb) and relative ages (53Mn-53Cr). Here I will discuss some of their results in light of most recent developments in the field.

A major question in the 70s and 80s was to know whether all chondrites formed shortly at the beginning of the solar system. An important result was the finding that bulk chondrites define a Rb-Sr isochron giving an age of 4.498±0.015 Ga [1] (recalculated to 4.571±0.015 using the decay constant of 87Rb accepted today). The ±15 Myr error on this age hides the fact that the different components of chondrites are not synchronous and formed over several Myrs in the accretion disk. The oldest of these components was identified by the U-Pb systematics which gave a best age of 4.566 Ga (+0.002 – 0.001 Ga) for Ca-Al-rich inclusions [2].

The development of the 53Mn-53Cr system [3-5] allowed to evidence that chemical fractionations giving rise to the precursors of the parent bodies of chondrites and of the Earth and Mars took place within the first few Myrs of the protosolar nebula, a view that has been confirmed and improved since then with other short-lived radioactive systems. The identification of a heterogeneous distribution of 54Cr isotopic anomalies in the inner solar system with the identification of two nebula reservoirs [6] was at the origin of the NC-CC dichotomy that is today recognized as one of the major characteristics of the early solar system.

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