Summary: The development of high-precision techniques to measure stable isotope compositions of a number of elements which, in the past, were considered homogeneous, implicated a new fresh look at the origin of Moon. Prior to 2004, only limited stable isotope information was available that mainly focused on oxygen isotopes in Apollo samples and lunar meteorites [1,2]. These studies have shown, to a high degree of confidence, that O isotope similarity (or identity) of Earth and Moon is a unique feature among bodies of the Solar System. More recent investigations [3,4] have re-assessed these earlier conclusions to an unprecedented precision of a few ppm. While the nature of this striking O isotope uniformity remains elusive, it either reflects effective homogenization of pre-collisional isotope disparity or indicates a broad iso- tope homogeneity of early Solar System planetsimals [5,6]. In general, the information and constraints on lunar origin derived from stable isotope systems are manifold as briefly outlined here.

It is notable that some other refractory elements show a similar degree of isotope identity between Earth and Moon. The highly refractory nature of W makes it an ideal candidate for tracing the earliest stage of Earth–Moon evolution. Advanced measurements of selected lunar materials have shown a slight excess of $^{182}$W compared to Earth [7] but these authors were able to derive a pre-impact $^{182}$W which is identical for Earth and Moon [also 8]. Several models were discussed to account for W isotope homogeneity between Earth and Moon prior to the Giant impact. Given the refractory nature of W, a post-collisional ex- change in the refractory nature of W, a post-collisional ex- change between Earth and Moon prior to the Giant impact. Given the refractory nature of W, a post-collisional ex-

Nucleosynthetic Ti anomalies were reported for a number of meteorite classes, including chondrites and acondrites, with the entire range of $^{86}$Ti values spanning nearly six $\varepsilon$ units. Yet, lunar samples and their mineral constituents do not show any resolved depar-
ture from Bulk Silicate Earth value at $^{86}$Ti ~0 [9,10]. Zhang et al. [10] suggested that most lunar Ti should have a terrestrial origin, which appears to be in agree-
ment with recent dynamic models [11]. Indeed, similar conclusions have been made for Cr [12] but given the still limited data set for stable Cr isotope compositions, further analyses are required because it could place constraints on the lunar core formation. In this respect, Si isotope analyses of lunar samples may provide further tests for core formation in the Moon. Silicon iso-
tope homogeneity between Earth and Moon [13] re-

References: