PROGRAM

69TH ANNUAL MEETING OF THE METEORITICAL SOCIETY

AUGUST 6–11, 2006

Using the hand tool of your Acrobat Reader, click on the name of any session. After the full program listing for that session appears, click on the title of a presentation to view the abstract for that presentation.

Monday, August 7, 2006

08:30–12:00	Room F1	Special Session: Astrophysics Meets Cosmochemistry I
08:30–12:00	Room F3	Impacts and Shock
13:30–17:00	Room F1	Special Session: Astrophysics Meets Cosmochemistry II
13:30–17:00	Room F3	Chondrites I (Carbonaceous)

Tuesday, August 8, 2006

08:30–12:00	Room F1	Special Session: In Honor of Johannes Geiss: Genesis and Stardust
08:30–12:00	Room F3	Chondrites II
13:30–15:15	Room F1	Parent Body Processes
15:15–17:00	Room F1	Differentiated Meteorites I
13:30–17:00	Room F3	Cosmogenic Nuclides/ Fall and Recovery/ Astrobiology
19:00–21:30	Poster Hall	Poster Session

Impacts and Shock

Chondrites

Differentiated Meteorites

Parent Bodies

Asteroids, Comets, IDPs and Micrometeorites

Refractory Inclusions and Chondrules

Isotope Studies

Nebular Processes and Early Solar System Chronology

Presolar Materials

Moon, Mars, and Mercury

Poster Session *(continued)*

Martian Meteorites

Cosmogenic Nuclides/Fall and Recovery/Astrobiology

Stardust and Rosetta

Historical Aspects

Wednesday, August 9, 2006

08:30–12:10	Auditorium Maximum	Award Ceremony and Plenary Lectures

Thursday, August 10, 2006

08:30–12:00	Room F1	Isotope Studies
08:30–12:00	Room F3	Differentiated Meteorites II
13:30–17:00	Room F1	Refractory Inclusions and Chondrules
13:30–17:00	Room F3	Asteroids, Comets, IDPs, and Micrometeorites
19:00	Restaurant LakeSide	Annual Banquet

Friday, August 11, 2006

08:30–12:00	Room F1	Presolar Materials
08:30–12:00	Room F3	Moon and Mars
13:30–17:00	Room F1	Nebular Processes and Early Solar System Chronology
13:30–16:45	Room F3	Martian Meteorites

Friday, August 11, 2006
MARTIAN METEORITES
13:30 Room F3

Chairs: C. Herd
D. Rost

13:30 Nyquist L. E. * Shih C.-Y. Reese Y. D.
Initial Isotopic Heterogeneities in Zagami: Evidence of a Complex Magmatic History **[#5143]**

13:45 Jagoutz E. * Dreibus G. Jotter R. Kubny A. Zartman R.
U-Pb Data on Clean Minerals from Nakhlites **[#5212]**

14:00 Albarede F. * Bouvier A. Blichert-Toft J. Vervoort J. D.
Pb-Pb Systematics of Martian Meteorites and the Differentiation History of Mars **[#5125]**

14:15 Misawa K. * Kaiden H. Noguchi T.
Young Radiometric Ages of Shergottites: Implications for Aqueous Alteration on the Martian Surface **[#5315]**

14:30 Park J. * Bogard D. D.
Ar-Ar Age of Shergottite Dhofar 378: Formation or Early Shock Event? **[#5142]**

14:45 Shirai N. * Ebihara M.
The Magmatism on Mars Inferred from Chemical Compositions of Martian Meteorites **[#5251]**

15:00 Schwenzer S. P. * Herrmann S. Ott U.
Nitrogen and Noble Gases in ALHA 77005, A Small Martian Meteorite From Antarctica **[#5013]**

15:15 Bläß U. W. * Langenhorst F. Frosch T. Schmitt M. Popp J.
Shock Metamorphic State of the Chassignite Northwest Africa 2737 **[#5311]**

15:30 Mikouchi T. * McKay G. Koizumi E.
Post-Shock Cooling History of Dhofar 378 Shergottite **[#5289]**

15:45 Rost D. * Vicenzi E. P. Fries M. Steele A.
The Nature of the Lithium-rich Phase Found in MIL 03346 Mesostasis **[#5164]**

16:00 Calvin C. * Rutherford M.
Hydration State of Lherzolitic Shergottite ALH 77005: Evidence from Rehomogenized Melt Inclusions **[#5096]**

16:15 Herd C. D. K. *
An Occurrence of Jarosite in MIL 03346: Implications for Conditions of Martian Aqueous Alteration **[#5027]**

16:30 Kennedy J. D. * Harvey R. P.
The Antarctic Ferrar Dolerite and the Petrogenesis of the Martian Shergottites **[#5329]**

Pb-Pb SYSTEMATICS OF MARTIAN METEORITES AND THE DIFFERENTIATION HISTORY OF MARS

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Our new Pb isotope analyses of basaltic shergottites, in combination with literature data, suggest that their ancient ~4.1 Ga Pb-Pb isochron age reflects the magmatic emplacement of these rocks [1]. This age, however, is in apparent conflict with much younger ages of ~180 Ma of U-Pb, Rb-Sr, Sm-Nd, and Lu-Hf mineral isochrons. We have argued that these younger ages record the last disturbance of disseminated phosphates by acidic brines percolating beneath the Martian surface. The counter suggestion that the old Pb-Pb age reflects contamination by terrestrial Pb [2] has been dismissed in [1] and conflicts with two additional observations: (a) shergottite Pb does not lie between modern terrestrial (SKE) and 180 My old radiogenic Pb in $^{207}Pb/^{206}Pb$-$^{204}Pb/^{206}Pb$ space (b) SKE Pb plots well off the 1.3 Gy nakhlite isochron; given the low Pb contents of nakhlites, they should be far more susceptible to terrestrial contamination than more Pb-rich shergottites. Furthermore, U-Pb Concordia plots are prone to severe artifacts and it is well established that U-Pb systematics in silicate rocks are disrupted by recent subsurface processes and laboratory leaching procedures.

Here we use the principle of intersecting secondary isochrons developed for terrestrial Pb [3] to suggest that Pb isotopes in SNCs portray a rather simple account of Mars differentiation. The present-day Pb isotopic composition of the common source of SNCs (SKM) lies at the intersection between the two isochrons of nakhlites and basaltic shergottites. Within error, SKM plots off the geochron, but on the primary growth curve for a broad range of $^{238}U/^{204}Pb$ (μ) ratios. The low μ value of SKM [2, 4] is inconsistent with extraction of Pb into the core. Rather, together with Hf/Sm ratios, which are subchondritic in nakhlites and superchondritic in shergottites [5], it signals extraction of the Martian lithosphere and ilmenite fractionation during the waning stages of magma ocean solidification. We speculate that basaltic shergottites formed at 4.1 Gy from the ilmenite-rich residual mush, whereas the parent melts of nakhlites formed at 1.3 Gy as melts from the KREEP-like part of the upper mantle rich in heat-producing elements. The lherzolitic shergottites, plotting across both isochrons, may represent different melts forming over most of the planet's history from various sources.

The history emerging from the present re-interpretation of SNC chronology solves the longstanding conundrum of multiple exposure ages for these samples. It also provides a straightforward explanation for the existence of variable extinct radioactive nuclide anomalies (^{182}Hf, ^{146}Sm) with implications for Martian mantle convection. It further removes the need for complex scenarios of meteorite extraction, thereby potentially improving the understanding of Martian cratering chronology.

References: [1] Bouvier A. et al. 2005. *Earth & Planetary Science Letters* 240: 221-233. [2] Borg L. E. et al. 2005. *Geochimica et Cosmochimica Acta* 69: 5819–5830. [3] Stacey J. S. and Kramers J. D. 1975. *Earth & Planetary Science Letters* 26: 207-221. [4] Jagoutz E. 1991. *Space Science Reviews* 56: 13-22. [5] Blichert-Toft J. et al. 1999. *Earth & Planetary Science Letters* 173: 25-39.