XXXI. Comprehensive Bibliography on Martian Meteorites

(compiled by C. Meyer, May 2003)

[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T] [U] [V] [W] [X] [Y] [Z]

A

Agee C.B. (2002) Garnet and majorite fractionation in the early Earth and Mars. (abs) *Lunar Planet. Sci.* **XXXIII** #1862. Lunar Planetary Institute, Houston. (CD-ROM). (*see address in Appendix III*)

Agee C.B, Bogard D.D., Draper D.S., Jones J.H., Meyer C. and Mittlefehldt D.W. (2000) Proposed science rrequirements and acquisition priorities for the first Mars sample return. (abs) *In* Concept and Approaches for Mars Exploration. Part 1 (ed. S. Hubbard) LPI Contribution # 1062.

Agee C.B. and Draper D.S. (2003) Melting of model Martian mantle at high pressure: Implications for the composition of the Martian basalt source region. (abs #1408) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Agerkvist D. P. and Vistisen L. (1993) Mössbauer spectroscopy of the SNC meteorite Zagami. (abs) *Lunar Planet. Sci.* **XXIV**, 1-2. Lunar Planetary Institute, Houston.
Zagami

Agerkvist D. P., Vistisen L., Madsen M. B. and Knudsen J. M. (1994) Magnetic properties of Zagami and Nakhla. (abs) *Lunar Planet. Sci.* **XXV**, 1-2.
Zagami, Nakhla

Akai J. (1997) Characteristics of iron-oxide and iron-sulfide grains in meteorites and terrestrial sediments, with special references to magnetite grains in Allan Hills 84001. (abs) *Meteoritics & Planet. Sci*. **32**, A5.
ALH84001

Albarede F., Blichert-Toft J., Vervoort J. D., Gleason J. and Rosing M. T. (1999) The early evolution of the Earth and Mars from hafnium-neodymium isotopic systematics. *Ninth Annual V. M. Goldschmidt Conference* 3, Cambridge.

Albee A. (2002) Martian rocks, minerals and mantles. (abs) *Meteoritics & Planet. Sci*. **37**, A9.

Allen R.O. and Mason B. (1973) Minor and trace elements in some meteoritic minerals. *Geochim. Cosmochim. Acta* **37**, 1435-1456.
Nakhla

Allen R.O. and Clark P.J. (1977) Fluorine in meteorites. *Geochim. Cosmochim. Acta* **41**, 581-585.
Shergotty

Allen C.C. (1996) What will retrurned samples tell us about Martian volatites. (abs) In *Workshop on evolution of Martian volatiles.* (*eds*. Jakosky and Treiman) *LPI Tech. Rpt.* **96-01**, 1-2. Lunar Planetary Institute, Houston.

Allen C.C. and Treiman A. H. (1995) Who needs a few more Mars samples when we already have the SNCs? (abs) *Lunar Planet. Sci.* **XXVI**, 27-28.

Allen C.C., Morris R.V., Lindstrom D.J., Lindstrom M.M. and Lockwood J.P. (1997a) JSC Mars-1: Martian regolith simulant. (abs) *Lunar Planet. Sci.* **XXVIII**, 27-28.

Amato I. (1989) Meteorite may carry organic Martian cargo. *Science* **136**, 53.
EETA79001

Anders E. (1996) Evaluating the evidence for past life on Mars. *Science* **274**, 2119-2120.
ALH84001

Anders E. and Grevesse N. (1989) Abundances of the elements: Meteoritic and solar. *Geochim. Cosmochim. Acta* **53**, 197-214.

Angel J.R.P. and Wollf N. J. (1996) Searching for life on other planets. *Scientific American* **274**(4), 60-66.

Annexstad J. O. (1983) *Meteorite concentration and glaciological parameters in the Allan Hills Icefield, Victoria Land, Antarctica.* PhD dissertation, Johannes Gutenberg Univ., Mainz.

Anstetter M. and Fuller M. (2001) Paleomagnetic and rock magnetic studies of ALH84001. (abs) *Meteoritcs & Planet. Sci.* **36**, A11-12.
ALH84001

Aramovich C. J., Herd C. D. K. and Papike J. J. (2001) Possible causes for late-stage reaction textures associated with pyroxferroite and metastable pyroxenes in the basaltic Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1003. Lunar Planetary Institute, Houston. (CD-ROM)
QUE94201, Los Angeles, Shergotty, Zagami

Aramovich C.J., Herd C.D.K. and Papike J.J. (2002) Symplectites derived from metastable phases in Martian basaltic meteorites. *American Mineralogist* **87**, 1351-1359.
Los Angeles, QUE94201, Shergotty

Ariskin A.A. (1997) Parent magmas of SNC harzburgites: Phase equilibria modeling. (abs) *Lunar Planet. Sci.* **XXVIII**,
51-52.
LEW88516, ALHA77005

Artemieva N.A. and Stöffler D. (2002) Conditions for the "Launch Window" of martian meteorites: Observations and modeling. (abs) *Meteoritics & Planet. Sci.* **37**, A13.

Ash R.D., Knott S.F. and Turner G. (1995) Evidence for the timing of the early bombardment of Mars. (abs) *Meteoritics* **30**, 483.
ALH84001

Ash R.D., Knott S.F. and Turner G. (1996) A 4-Gyr shock age for a Martian meteorite and implications for the cratering history of Mars. *Nature* **380**, 57-59.
ALH84001

Ashley G.M. and Delaney J.S. (1999) If a meteorite of Martian sandstone hit you on the head would you recognize it? (abs) *Lunar Planet. Sci.* **XXX**, #1273 (CD-ROM). Lunar Planetary Institute, Houston.

Ashwal L.D., Warner J.L. and Wood C.A. (1982a) SNC meteorites: Evidence against an asteroidal origin. (abs) *Lunar Planet. Sci.* **XIII**, 22-23.

Ashwal L.D., Warner J.L. and Wood C.A. (1982b) SNC meteorites: Evidence against an asteroidal origin. *Proc. Lunar Planet Sci. Conf.* **13th**; *J. Geophys. Res.* **87,** A393-A400. *(review paper)*

Ashworth J.R. and Hutchison R. (1975) Water in non-carbonaceous stony meteorites. *Nature* **256**, 714-715.
Nakhla

Attia A. A., El-Shazly E. M., Moharram M. O. and Huzain A. A. (1955) Meteorites and related bodies with a guide to the collection of the Geological Museum, Cairo. *Geological Museum, Les Editions Univer. d'Egypte* Paper No. 1, 51 pp. Cairo.
Nakhla

B TOP

Bada J. L. (1999) A review of "The search for life on other planets" by Bruce Jakosky. *Meteoritics & Planet. Sci.* **34**, 680-681.

Bada J. L. and McDonald G. D. (1995) Amino acid racemization on Mars: Implications for the preservation of biomolecules from an extinct Martian biota. *Icarus* **114**, 139-143.

Bada J. L., Hayes J., Keller L., Kvenvolden K. and Mathies R. A. (1997) Memo on *Organic contamination of Martian meteorites at the Johnson Space Center curatorial facility*. JSC Curator's Office, Houston

Bada J.L., Glavin D.P., McDonald G.D. and Becker L. (1998a) Amino acids in the ALH84001 Martian meteorite. (abs) *Lunar Planet. Sci.* **XXIX** #1894, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Bada J.L., Glavin D.P., McDonald G.D. and Becker L. (1998b) A search for endogenous amino acids in Martian meteorite ALH84001. *Science* **279**, 362-365.
ALH84001

Badjukov D.D., Nazarov M.A. and Taylor L.A. (2001) Shock metamorphism in the Shergottite meteorite Dhofar 019. (abs) *Lunar Planet. Sci.* **XXXII**, #2195. Lunar Planetary Institute, Houston. (CD-ROM).
Dho019

Bailey J.V., McKay D.S., Wentworth S.J. (2003) Mn carbonates in the Martian meteorite Nakhla: Possible evidence of brine evaporation. (abs) *Lunar Planet. Sci.* **XXXIV**, #2060. Lunar Planetary Institute, Houston
Nakhla

Baker L., Franchi I. A., Wright I. P. and Pillinger C. T. (1998) Oxygen isotopes in water from Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **33**, A11-12.
Nakhla, ALH84001

Baker L.L., Agenbroad D. J. and Wood S. A. (2000) Experimental hydrothermal alteration of a Martian analog basalt: Implications for Martian meteorites. *Meteoritics & Planet. Sci.* **33**, 31-38.

Ball J. (1912) The meteorite of El-Nakhla El-Baharia. Egypt Survey Department, paper 25. Cairo
Nakhla

Barber D.J. and Scott E.R.D. (2001) Transmission electron microscopy of carbonates and associated minerals in ALH84001: Impact-induced deformation and carbonate decomposition. (abs) *Meteoritics & Planet. Sci.* **36**, A13-14.
ALH84001

Barber D.J. and Scott E.R.D. (2002) Origin of supposedly biogenic magnetite in the Martian meteorite

Allan Hills 84001. *Proc. Nat. Acad. Sci.* **99**, 6556-6561.

Barker W. W. and Banfield J. F. (1999) HRTEM evidence for low temperature alteration of pyroxene to smectite in ALH84001. *Geol. Soc. Amer. Prog. Abs*. 31:7, A-432.

Barlow N. G. (1990) Constraints on early events in Martian history as derived from the cratering record. *J. Geophys. Res.* **95**, 14191-14201.

Barlow N. G. (1997) The search for possible source craters for Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 65-66.
ALH84001

Barlow N. G. (1998) Status report on the search for craters of ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1705, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Barrat J. A., Gillet Ph., Lecuyer C., Sheppard S. M. F. and Lesourd M. (1998) Formation of carbonates in the Tatahouine meteorite. *Science* **280**, 412-414.

Barrat J. A., Gillet Ph., Jambon A., Sautter V., Jovoy M., Petit E. and Lesourd M. (2001a) New from the Moon and Mars: preliminary examinations of two new Saharan finds. (abs) *Lunar Planet. Sci.* **XXXII**, #1317. Lunar Planetary Institute, Houston. (CD-ROM)
NWA480

Barrat J. A., Gillet Ph., Sautter V., Jambon A., Javoy M., Göpel C., Keller F. and Petit E. (2001b) The basaltic shergottite North West Africa 480: petrology and geochemistry. (abs) *Meteoritics & Planet. Sci.* **36**, A14.
NWA480

Barrat J. A., Blichert-Toft J., Nesbitt R. W. and Keller F. (2001c) Bulk chemistry of Saharan shergottite Dar al Gani 476. *Meteoritics & Planet. Sci.* **36**, 23-29.
DaG476

Barrat J. A., Gillet Ph., Sautter V., Jambon A., Javoy M., Göpel C., Lesourd M., Keller F. and Petit E. (2002a) Petrology and chemistry of the basaltic shergottite North West Africa 480. *Meteoritics & Planet. Sci.* **37**, 487-499.
NWA480, Nakhla

Barrat J. A., Jambon A., Bohn M., Gillet Ph., Sautter V., Göpel C., Lesourd M. and Keller F. (2002b) The picritic shergottite North West Africa 1068 (NWA1068 or "Louise Michel"). (abs) *Lunar Planet. Sci.* **XXXIII**. #1538. Lunar Planetary Institute, Houston. (CD-ROM)
NWA480

Barrat J. A., Jambon A., Bohn M., Gillet Ph., Sautter V., Göpel C., Lesourd M. and Keller F. (2002c) Petrology and chemistry of the picritic shergottite North West Africa 1068 (NWA 1068). *Geochim. Cosmochim. Acta* **66**, 3505-3518.
NWA1068

Barrat J.A. and six authors (2002d) Incompatible trace elements in SNCs and Li isotope systematics in a shergottitte. (abs) Un-mixing SNCs. 7-8. LPI Contribution No. 1134.

Bart G. D., Swindle T. D., Olson E. K. and Treiman A. H. (2001) Xenon and krypton in Nakhla mineral separates. (abs) *Lunar Planet. Sci.* **XXXII**, #1363. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Bartoschewitz R. and Ackermand D. (2001) Dar al Gani 876, a further fragment of the DAG-Shergottite. (abs) *Meteoritics & Planet. Sci.* **36**, A15.
DaG876

Basilevsky A. T., Markiewiez W. J. and Keller H. U. (1998) Morphology of rocks within and nearby rock garden: Mars Pathfinder landing site. (abs) *Lunar Planet. Sci.* **XXIX** #1378, Lunar Planetary Institute, Houston (CD-ROM).
Chimp, Half Dome, Moe, Stimpy, Flat Top, Shark, Ovoid, Half Anvil

Beard B. L., Taylor L. A., Lapen T., Mahlen N. and Johnson C. M. (2002) Hafnium and neodymium isotopic constraints on shergottite formation. (abs) *Lunar Planet. Sci.* **XXXIII** #1933. Lunar Planetary Institute, Houston. (CD-ROM)

Becker L., Glavin D. P. and Bada J. L. (1997a) Polycyclic aromatic hydrocarbons (PAHs) in Antarctic Martian meteorites, carbonaceous chondrites and polar ice. *Geochim. Cosmochim. Acta* **61**, 475-481.
EETA79001, ALH84001

Becker L., McDonald G. D. and Bada J. L. (1997b) Biomarkers for analysis of Martian samples. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life*. (*eds.* Clifford *et al*.) *LPI Contribution* **916,** 6. Lunar Planetary Institute, Houston.
ALH84001, EETA79001

Becker L., McDonald G. D., Glavin D. P., Bada J. L. and Bunch T. E. (1997c) Sublimation: A mechanism for the enrichment of organics in Antarctic ice. (abs) *Meteoritics & Planet. Sci*. **32**, A10-11.
ALH84001, EETA79001

Becker L., Poopp B., Rust T. and Bada J. L. (1999) The origin of organic matter in the Martian meteorite ALH84001. *Earth Planet. Sci. Lett.* **167***, 71-79.*
ALH84001

Becker R. H. and Pepin R. O. (1983a) Heavy nitrogen in glass from the Antarctic meteorite EETA79001. (abs) *EOS, Trans. AGU* **64**, 253.
EETA79001

Becker R. H. and Pepin R. O. (1983b) Nitrogen isotopic compositions in EETA79001. (abs) *Meteoritics* **18**, 264-265.
EETA79001

Becker R. H. and Pepin R. O. (1984) The case for a Martian origin of the shergottites: Nitrogen and noble gases in EETA79001. *Earth Planet. Sci. Lett.* **69,** 225-242.
EETA79001

Becker R. H. and Pepin R. O. (1985) Nitrogen and light noble gases in the Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 1-2. Lunar Planetary Institute, Houston.
Shergotty

Becker R. H. and Pepin R. O. (1986) Nitrogen and light noble gases in Shergotty. *Geochim. Cosmochim. Acta* **50,** 993-1000.
Shergotty

Becker R. H. and Pepin R. O. (1993a) Nitrogen and noble gases in a glass sample from LEW88516. (abs) *Lunar Planet. Sci.* **XXIV**, 77-78.
LEW88516

Becker R. H. and Pepin R. O. (1993b) Nitrogen and noble gases in a glass sample from the LEW88516 shergottite. (abs) *Meteoritics* **28**, 637-640.
LEW88516

Bell J. F. (1996) Evaluating the evidence for past life on Mars. *Science* **274**, 2121-2122.
ALH84001

Bell M. S., Thomas-Keprta K. L., Wentworth S. J. and McKay D. S. (1999a) Microanalysis of pyroxene glass in ALH84001. (abs) *Lunar Planet. Sci.* **XXX**, #1951 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Bell M. S., Thomas-Keprta K. L., Wentworth S. J. and McKay D. S. (1999b) Microanalysis of pyroxene, feldspar and silica glass in Allan Hills 84001. (abs) *Meteoritics & Planet. Sci.* **34**, A10-11.
ALH84001

Bell M. S., McHone J., Kudryavtsev A. and McKay D. S. (1999c) Analysis of carbonates in ALH84001 Martian meteorite by Raman spectroscopy. (abs) P-62, GSA, Denver.
ALH84001

Bell M. S., McHone J., Kudryavtsev A. and McKay D. S. (2000) Raman mapping of carbonates in ALH84001 Martain meteorite. (abs) *Lunar Planet. Sci*. **XXXI**, # 1909 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Bell M. S. and McKay D. S. (2000) Alteration of an ALH84001 analog carbonate to magnetite by shock metamorphism (abs). *Geol. Soc. Amer. Abstr. Prog.* **32:7**, A240.

Bell M.S., Schwandt C., Zolensky M. and Horz F. (2002) Experimental shock decomposition of siderite. (abs) *Meteoritics & Planet. Sci*. **37**, A14.

Benoit P. H. and Tauton A. E. (1997) The challenge of remote exploration for extraterrestrial fossil life (abs). In *Instruments, Methods and Missions for the Investigation of Extraterrestrial Microorganisms*, R. Hoover *ed.* Proc. SPIE **3111**, 98-108.
ALH84001

Berkley J. L. (1987) Petrology and compositional trends in five new Antarctic diogenites. (abs) *Lunar Planet. Sci.* **XVIII**, 62-63.
ALH84001

Berkley J. L., Keil K., Prinz M. and Gomes C. B. (1979) The Governador Valadares nakhlite and its relationship to other nakhlites. (abs) *Lunar Planet. Sci.* **X**, 101-103.
Governador Valadares

Berkley J. L., Keil K. and Prinz M. (1980) Comparative petrology and origin of Governador Valadares and other nakhlites. *Proc. Lunar Planet. Sci. Conf.* **11th**, 1089-1102.
Governador Valadares

Berkley J. L. and Keil K. (1981) Olivine orientation in the ALHA77005 achondrite. *Amer. Mineral.* **66,** 1233-1236.
ALHA77005

Berkley J. L. and Boynton N. J. (1992) Minor/major element variation within and among diogenite and howardite orthopyroxenite groups. *Meteoritics* **27**, 387-394.
ALH84001

Berkley J. L., Treiman A. H., Jones J. H. and Mittlefehldt D. W. (1999) Highly magnesian orthopyroxene xenoliths in EETA79001: Implications for Martian magmas and differentiation. (abs) *Lunar Planet. Sci.* **XXX**, #1588 (CD-ROM). Lunar Planetary Institute, Houston.
EETA79001

Berkley J. L., Treiman A. H. and Jones J. H. (2000) Petrologic history of a complex pyroxene xenolith in EETA79001 Martian meteorite. (abs) *Lunar Planet. Sci*. **XXXI**, # 1729 (CD-ROM). Lunar Planetary Institute, Houston.
EETA79001

Berwerth F. (1912) Min. Petr. Mitt. (Tschermak) vol. xxxi, 107.
Nakhla

Bhandari N., Bhat S. G., Lal D., Rajagopalan G., Tamhane A. S. and Venkatavaradan V. S. (1971) Superheavy elements in extraterrestrial samples. *Nature* **230**, 219-224.
Nakhla

Bhandari N. *et al.* (1980) Calculation of atmospheric ablation based on cosmic ray tracks and Ne isotopes *Nuclear Tracks* **4**, 213.
Nakhla, Chassigny

Bhandari N., Sengupta D., Jha R. and Goswami J. N. (1985) TL and nuclear track studies in Shergotty and other SNC meteorites. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 3-4. Lunar Planetary Institute, Houston.
Shergotty, ALHA77005, EETA79001

Bhandari N., Goswami J. N., Jha R., Sen Gupta D. and Shukla P. N. (1986) Cosmogenic effects in shergottites. *Geochim. Cosmochim. Acta* **50,** 1023-1030.
Shergotty, ALHA77005, EETA79001

Binns R. W. (1967) Stoney meteorites bearing maskelynite. *Nature* **214**, 1111-1112.
Shergotty, Zagami

Birck J. L. and Allègre C. L. (1994) Contrasting Re/Os magmatic fractionation in planetary basalts. *Earth Planet. Sci. Lett.* **124**, 139-148.
Nakhla, Chassigny

Bishoff A. and Stöffler D. (1992) Shock metamorphism as a fundamental process in the evolution of planetary bodies: Information from meteorites. *Eur. J. Minerals.* **4**, 707-755.
ALHA77005

Bishop J. L., Pieters C. M., Mustard J., Pratt S. and Hiroi T. (1994) Spectral analyses of ALH84001, a meteorite from Mars. (abs) *Meteoritics* **29,** 444-445.
ALH84001

Bishop J. L. and Pieters C. M. (1996) Spectral analysis of the Martian meteorite ALH84001. (abs) *Meteoritics & Planet. Sci*. **31**, A15-A16.
ALH84001

Bishop J. L., Pieters C. M. and Hiroi T. (1997a) Spectroscopic properties of Martian meteorite ALH84001 and identification of minerals and organic species. (abs) *Lunar Planet. Sci.* **XXVIII**, 117-118.
ALH84001

Bishop J. L., Pieters C. M. and Hiroi T. (1997b) The source of organic spectral features in Allan Hills

84001: Lab contamination, terrestrial, or extraterrestrial? (abs) *Meteoritics & Planet. Sci*. **32**, A14-15.
ALH84001

Bishop J. L., Mustard J. F., Pieters C. M. and Hiroi T. (1998a) Recognition of minor constituents in reflectance spectra of Allan Hills 84001 chips and the importance for remote sensing on Mars. *Meteoritics & Planet. Sci*. **33**, 693-998.
ALH84001

Bishop J. L., Pieters C. M., Hiroi T. and Mustard J. F. (1998b) Spectroscopic analysis of Martian meteorite Allan Hills 84001 powder and applications for spectral identification of minerals and other soil components on Mars. *Meteoritics & Planet. Sci*. **33**, 699-707.
ALH84001

Bishop J. L., Pieters C. M., Mustard J. F. and Hiroi T. (1999) Spectral identification of major and minor constituents of Martian meteorite ALH84001 and the implications for remote sensing on Mars. (abs) *Lunar Planet. Sci.* **XXX**, #2038 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Bishop J. L. and Hamilton V. E. (2001) Reflectance and emittance spectra of Martian meteorites. (abs) *Meteoriitcs& Planet. Sci.* **36**, A21-22.
Los Angeles, ALH84001, EETA79001

Biswas S., Ngo H. T. and Lipschutz M. E. (1980) Trace element contents of selected Antarctic meteorites, I: Weathering effects and A77005, A77257, A77278 and A77299. *Zeitschrift für Naturforschung,* **35a**, 191-196.
ALHA77005

Blake D. F., Treiman A. H., Cady S., Nelson C. and Krishnan K. (1998) Characterization of magnetite within carbonate in ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1347, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Blake D. F., Treiman A. H., Amundsen H. E. F., Mojzsis S. J. and Bunch T. (1999) Carbonate globules, analogous to those in ALH84001, from Spitzbergen Norway: Formation in a hydrothermal environment. (abs) *Lunar Planet. Sci.* **XXX**, #1683 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Blichert-Toft J., Gleason J. D., Albarede F., Kring D. A., Hill D. H. and Boynton W. V. (1998a) The Hf isotopic compositions of Zagami and QUE94201: A garnet-free depleted Martian mantle. (abs) *Lunar Planet. Sci.* **XXIX** #1074, Lunar Planetary Institute, Houston (CD-ROM).
Zagami, QUE94201

Blichert-Toft J., Albarede F., Gleason J. D., Kring D. A., Hill D. H. and Boynton W. V. (1998b) Martian mantle evolution from the hafnium isotopic perspective. (abs) *Meteoritics & Planet. Sci.* **33**, A16-17.

Blichert-Toft J., Gleason J. D., Telouk P. and Albarede F. (1999) The Lu-Hf isotope geochemistry of shergottites and the evolution of the Martian mantle-crust system. *Earth Planet. Sci. Lett.* **173**, 25-39.
Zagami, Shergotty, ALH77005, EETA79001, QUE94201

Boctor N. W., Meyer H. O. and Kullerud G. (1976) Lafayette meteorite: Petrology and opaque mineralogy. *Earth Planet. Sci. Lett.* **32,** 69-76.
Lafayette

Boctor N. Z., Fei Y., Bertka C. M., D'Alexander C. M. O. and Hauri E. (1998) Vitrification and high pressure phase transition in olivine megacrysts from lithology A in Martian meteorite EETA79001.

(abs) *Lunar Planet. Sci.* **XXIX** #1492, Lunar Planetary Institute, Houston (CD-ROM).
EETA79001

Boctor N. Z., Wang J., D'Alexander C. M. O., Hauri E., Bertka C. M., Fei Y. and Humayun M. (1998a) Petrology and hydrogen and sulfur isotope studies of mineral phases in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1787, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Boctor N. Z., Wang J., D'Alexander C. M. O., Hauri E., Bertka C. M. and Fei Y. (1998b) Hydrogen isotopic studies of carbonate and phosphate in Martian meteorite ALH84001. (abs) *Meteoritics & Planet. Sci.* **33**, A18-19.
ALH84001

Boctor N. Z., Fei Y., Bertka C. M., D'Alexander C. M. O. and Hauri E. (1998c) Shock metamorphic features in lithologies A, B, and C of Martian meteorite EETA79001. (abs) *Meteoritics & Planet. Sci.* **33**, A18.
EETA79001

Boctor N. Z., Fei Y., Bertka C. M., D'Alexander C. M. O. and Hauri E. (1999a) Shock metamorphic effects in Martian meteorite ALHA77005. (abs) *Lunar Planet. Sci.* **XXX**, #1628 (CD-ROM). Lunar Planetary Institute, Houston.
ALHA77005

Boctor N. Z., Wang J., D'Alexander C. M. O., Hauri E., Bertka C. M. and Fei Y. (1999b) Hydrogen-isotopic studies of feldspathic and mafic glasses in Martian meteorites ALH84001 and EETA 79001. (abs) *Lunar Planet. Sci.* **XXX**, #1397 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001, EETA79001

Boctor N. Z., Wang J., D'Alexander C. M. O. and Hauri E. (1999c) Hydrogen-isotopic studies of carbonate and feldspathic and mafic glass in Martian meteorites Allan Hills 84001 and Elephant Moraine 79001. (abs) *Meteoritics & Planet. Sci.* **34**, A14.
ALH84001, EETA79001

Boctor N. Z., D'Alexander C. M. O., Wang J. and Hauri E. (2000a) Hydrogen isotopic studies of mafic, feldspathic, and melt inclusion glasses in Martain meteorite Alan Hills 77005. (abs) *Lunar Planet. Sci*. **XXXI**, # 1759 (CD-ROM). Lunar Planetary Institute, Houston.
ALH77005

Boctor N. Z., D'Alexander C. M. O., Wang J. and Hauri E. (2000b) Hydrogen-isotopic investigations of minerals and glasses in the Martian meteorite Chassigny. (abs) *Meteoritics & Planet. Sci.* **35**, A29.
Chassigny

Boctor N. Z., D'Alexander C. M. O., Wang J. and Hauri E. (2001a) Hydrogen isotope studies ofwater-bearing post-stishovite silica phase and feldspathic glass in the Martian meteorites Shergotty and Zagami. (abs) *Lunar Planet. Sci.* **XXXII**, #1309. Lunar Planetary Institute, Houston. (CD-ROM)
Shergotty, Zagami

Boctor N. Z., D'Alexander C. M. O., Wang J. and Hauri E. (2001b) Shock metamorphic effects and hydrogen isotope study of the Martian meteorite Sayh al Uhaymir 005. (abs) *Meteoritics & Planet. Sci.* **36**, A23.
SaU005

Boctor N. Z., D'Alexander C. M. O., Wang J. and Hauri E. (2001c) The source of extraterestrial water in Marian meteorites: clues from hydrogen isotopic composition of impact-melted glasses and magmatic melt-inclusion glasses. (abs) Eleventh Goldschmidt Conf. 3343. Hot Springs.

Boctor N.Z., D'Alexander C.M.O., Wang J. and Hauri E. (2002a) H isotopic signatures of minerals, melt inclusions, and impact glasses in SNC meteorites. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A85. Davos

Boctor N. Z., Wang J., D'Alexander C. M. O. and Hauri E. (2002b) D/H of minerals and melt inclusions in the SNCs Nakhla and Governador Valadares. (abs) *Meteoritics & Planet. Sci.* **37**, A19.
Nakhla, Governador Valadares

Bodnar R. J. (1999) Fluid inclusions in ALH84001 and other Martian meteorites: Evidence for volatiles on Mars. (abs) *Lunar Planet. Sci.* **XXX**, #1222 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001, Nakhla

Bogard D. D. (1982) Trapped noble gases in the EETA79001 shergottite. (abs) *Meteoritics* **17**, 185.
EETA79001

Bogard D. D. (1983a) Martian atmospheric gases trapped in the EETA79001 shergottite? *Proc. NIPR Sym. Antarctic Meteorites* **8th,** 79-80. Nat. Inst. Polar Res., Tokyo. (*see address in Appendix III*)
EETA79001

Bogard D. D. (1993b) A meteorite from the Moon. *Geophys. Res. Lett.* **10**, 773. (editorial)

Bogard D. D. (1984) On the origin of excess ^{40}Ar in the four shergottite-achondrites. (abs) *Meteoritics* **19**, 195.
Shergotty, Zagami, ALHA77005, EETA79001

Bogard D. D. (1995) Exposure-age-initiating events for Martian meteorites: Three or four? (abs) *Lunar Planet. Sci.* **XXVI**, 143-144.
Nakhla, Chassigny, ALH84001

Bogard D. D. (1997a) A reappraisal of the Martian ^{36}Ar/^{38}Ar ratio. *J. Geophys. Res.* **102**, 1653-1661.
EETA79001

Bogard D. D. (1997b) Martian volatiles and isotopic signatures. In *Mars 2005 sample return workshop*. (*ed*. Gulick) *LPI Tech. Rpt.* **97-1,** 57-63. Lunar Planetary Institute, Houston.

Bogard D. D. and Husain L. (1977) A new 1.3 aeon-young achondrite. *Geophys. Res. Lett.* **4,** 69-71.
Governador Valadares

Bogard D. D. and Husain L. (1978) ^{40}Ar-^{39}Ar dating of shock events in the Shergotty achondrite and the Plainview chondrite. In *Short Papers of the 4th ICOG* (*ed.* Zartman). *USGS Open file report* **78-701,** 43-45.
Shergotty

Bogard D. D., Husain L. and Nyquist L. E. (1979a) ^{40}Ar/^{39}Ar age of the Shergotty achondrite and implications for its post-shock thermal history. *Geochim. Cosmochim. Acta* **43,** 1047-1055.
Shergotty

Bogard D. D. and Nyquist L. E. (1979b) ^{39}Ar/^{40}Ar chronology of related achondrites. (abs) *Meteoritics* **14**, 356.
ALHA77005, Chassigny, Shergotty, Zagami

Bogard D. D., Duke M. B., Gibson E. K., Jr., Minear J. W., Nyquist L. E. and Phinney W. C. (1979c) *Consideration of sample return and the exploration strategy for Mars. NASA Tech. Memo*. **58213**,

Johnson Space Center, Houston.

Bogard D. D. and Johnson P. (1983a) Martian gases in an Antarctic meteorite? *Science* **221,** 651-654.
EETA79001

Bogard D. D. and Johnson P. (1983b) Martian atmospheric gases trapped in the EETA79001 shergottite? (abs) *Lunar Planet. Sci.* **XIV**, 53-54.
EETA79001

Bogard D. D., Johnson P. and Nyquist L. E. (1984a) Cosmic ray exposure of SNC achrondrites and constraints on their derivation from Mars. (abs) *Lunar Planet. Sci.* **XV**, 68-69.
Nakhla, Governador Valadares, Lafayette, Chassigny, Shergotty, Zagami, ALHA77005, EETA79001

Bogard D. D., Nyquist L. E. and Johnson P. (1984b) Noble gas contents of shergottites and implications for the Martian origin of SNC meteorites. *Geochim. Cosmochim. Acta* **48,** 1723-1739.
EETA79001, Zagami, ALHA77005, Shergotty, Chassigny, Nakhla, Lafayette

Bogard D. D. and Hörz F. (1986) Shock-implanted noble gases: An experimental study with implications for the origin of Martian gases in shergottite meteorites. (abs) *Meteoritics* **21**, 337-338.

Bogard D. D., Hörz F., Johnson P. and Schmidt R. (1986a) Noble gases implanted by artificial shock: Implications for trapped Martian gases in the EETA79001 meteorite. (abs) *Lunar Planet. Sci.* **XVII**, 64-65.
EETA79001

Bogard D. D., Hörz F. and Johnson P. (1986b) Shock-implanted noble gases: An experimental study with implications for the origin of Martian gases in shergottite meteorites. *Proc. Lunar Planet. Science Conf.* **17th** ; *J. Geophys. Res.* **91** (suppl.), E99-E114.

Bogard D.D., Hörz F. and Johnson P. (1989) Shock-implanted noble gases II: Additional experimental studies and recognition in naturally shocked terrestrial materials. *Meteoritics* **24**, 113-123.

Bogard D. D. and Garrison D. H. (1993) Noble gases in LEW88516 shergottite: Evidence for exposure age pairing with ALHA77005. (abs) *Lunar Planet. Sci.* **XXIV**, 139-140.
LEW88516, ALHA77005

Bogard D. D. and Garrison D. H. (1997) ^{39}Ar-^{40}Ar age of ALH 84001. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds.* Clifford *et al.*) *LPI Contribution* **916,** 10. Lunar Planetary Institute, Houston.
ALH84001

Bogard D. D. and Garrison D. H. (1998a) Composition of Martian noble gases trapped in Martian meteorite impact glasses. (abs) *Lunar Planet. Sci.* **XXIX** #1076, Lunar Planetary Institute, Houston (CD-ROM).
Shergotty, Y793605, EETA79001

Bogard D. D. and Garrison D. H. (1998b) Relative abundances of Ar, Kr and Xe in the Martian atmosphere as measured in Martian meteorites. *Geochim. et. Cosmochim. Acta* **62**, 1829-1835.
Shergotty, Y793605, EETA79001

Bogard D. D. and Garrison D. H. (1998c) Trapped and radiogenic argon in Martian shergottites. (abs) *Meteoritics Planet. Sci.* **33**, A19.

Bogard D. D. and Garrison D. H. (1999) Argon-39-argon-40 "ages" and trapped argon in Martian shergottites, Chassigny and Allan Hills 84001. *Meteoritics & Planet. Sci*. **34**, 451-473.
Chassigny, AlLH84001, EET79001, Y793605, Shergotty, Zagami, QUE94201, ALH77005

Bogard D. D., Clayton R. N., Marti K., Owen T. and Turner G. (2001) Martian volatiles: Isotopic composition, origin and evolution. *In* Chron. & Evol. of Mars (ISSI) **96**, 425-458. Kluwer Academic Publishers. The Netherlands. *(a review)*

Borg L. E., Nyquist L. E., Weismann H. and Shih C.-Y. (1996) Rb-Sr age and initial $^{87}Sr/^{86}Sr$ of basaltic shergottite QUE94201. (abs) *Meteoritics & Planet. Sci.* **31**, A18-A19.
QUE94201

Borg L. E., Nyquist L. E., Taylor L. A., Wiesmann H. and Shih C.-Y. (1997a) Rb-Sr and Sm-Nd isotopic analyses of QUE94201: Constraints on Martian differentiation processes. (abs) *Lunar Planet. Sci.* **XXVIII**, 133-134.
QUE94201

Borg L. E., Nyquist L. E., Taylor L. A., Wiesmann H. and Shih C.-Y. (1997b) Constraints on Martian differentiation processes from Rb-Sr and Sm-Nd isotopic analyses of the basaltic shergottite QUE94201. *Geochim. Cosmochim. Acta* **61**, 4915-4931.
QUE94201

Borg L. E., Nyquist L. E. and Wiesmann H. (1998a) Rb-Sr isotopic systematics of the lherzolitic shergottite LEW88516. (abs) *Lunar Planet. Sci.* **XXIX** #1233, Lunar Planetary Institute, Houston (CD-ROM).
LEW88516

Borg L. E., Nyquist L. E., Wiesmann H. and Reese Y. (1998b) Samarium-neodymium isotopic systematics of the lherzolitic shergottite Lewis Cliff 88516. (abs) *Meteoritics & Planet. Sci.* **33**, A20.
LEW88516

Borg L. E., Nyquist L. E., Shih C-Y., Wiesmann H., Reese Y. and Connelly J. N. (1998c) Rb-Sr formation age of ALH 84001 carboantes. (abs) Workshop on the Issue Martian Meteorites: Where - - - - #7030. Lunar Planetary Institute, Houston.
ALH84001

Borg L.E., Connelly J. N., Nyquist L.E. and Shih C.-Y. (1999a) Pb-Pb age of the carbonates in the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXX**, #1430 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Borg L.E., Connelly J. N., Nyquist L.E., Shih C.-Y., Wiesmann H. and Reese Y. (1999b) The age of the carbonates in the Martian meteorite ALH84001. Science **286**, 90-94.
ALH84001

Borg L. E., Nyquist L. E., Weismann H., Reese Y. and Papike J. J. (2000) Sr-Nd isotopic systematics of Martian meteorite DaG476. (abs) *Lunar Planet. Sci*. **XXXI**, # 1036 (CD-ROM). Lunar Planetary Institute, Houston.
DaG476

Borg and seven authors (2001a) The age of Dhofar 019 and its relationship to the other Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1144. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Borg L. E., Nyquist L. E., Wiesmann H. and Reese Y. (2001b) Rubidium-strontium and Samarium-

neodymium isotopic systematics of the Lherzolithic shergottites ALH77005 and LEW88516: Constraints on the petrogenesis of Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A25.
ALH77005, LEW88516

Borg L. E., Nyquist L. E., Wiesmann H. and Reese Y. (2002a) Constraints on the petrogenesis of Martian meteorites from the Rb-Sr and Sm-Nd isotopic systematics of the lherzolitic shergottites ALH77005 and LEW88516. *Geochim. Cosmochim. Acta* **66**, 2037-2053.
ALH77005, LEW88516

Borg L.E. (2002b) Exploring trace element and isotopic mixing relationships in the Martian meteorite suite. (abs) Un-mixing SNCs. 9-10. LPI Contribution No. 1134.

Borg L.E., Asmerom Y. and Edmunson J.E. (2003) Uranium-Lead isotopic systematics of the Martian meteorite Zagami. (abs) *Lunar Planet. Sci.* **XXXIV**, #1107. Lunar Planetary Institute, Houston
Zagami

Borg L.E. and Draper D.S. (2003) A petrological model for the origin of Martian shergottite magmas based on their major element, trace element, and isotopic compositions. (abs) *Lunar Planet. Sci.* **XXXIV**, #1169. Lunar Planetary Institute, Houston

Boynton W. V., Starzyk P. M. and Schmitt R. A. (1976) Chemical evidence for the genesis of the ureilites, the achondrite Chassigny and the nakhlites. *Geochim. Cosmochim. Acta* **40,** 1439-1447.
Chassigny

Boynton W. V., Hill D. H. and Kring D. A. (1992) The trace-element composition of LEW88516 and its relationship to SNC meteorites. (abs) *Lunar Planet. Sci.* **XXIII**, 147-148.
LEW88516

Bradley J. P., Harvey R. P. and McSween H. Y., Jr. (1996) Magnetite whiskers and platelets in the ALH84001 Martian meteorite: Evidence of vapor phase growth. *Geochim. Cosmochim. Acta* **60**, 5149-5155.
ALH84001

Bradley J. P., Harvey R. P. and McSween H. Y., Jr. (1997a) Magnetite whiskers and platelets in the ALH84001 Martian meteorite: Evidence of vapor phase growth. (abs) *Lunar Planet. Sci.* **XXVIII**, 147-148.
ALH84001

Bradley J. P., McSween H. Y., Jr. and Harvey R. P. (1997b) Epitaxial growth of single-domain magnetite in Martian meteorite Allan Hills 84001. (abs) *Meteoritics & Planet. Sci*. **32**, A20.
ALH84001

Bradley J. P., Harvey R. P. and McSween H. Y., Jr. (1997c) No 'nanofossils' in Martian meteorite. *Nature* **390**, 454.
ALH84001

Bradley J. P., McSween H. Y., Jr. and Harvey R. P. (1998a) Mechanisms of formation of magnetite in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1757, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Bradley J.P., McSween H.Y., Jr. and Harvey R. P. (1998b) Epitaxial growth of nanophase magnetite in Martian meteorite Allan Hills 84001: Implications for biogenic mineralization. *Meteoritics & Plant. Sci.* **33**, 765-773.
ALH84001

Bradley J.P. (1999) Investigation of biomineralization at the nanometer scale by using electron microscopy. In Knoll *et al. (1999)*
ALH84001

Brandenburg J. E. (1994) Constraints on the Martian cratering record based on the SNC meteorites and implications for the Mars climatic history. *Earth, Moon and Planets* **67**, 35-45.

Brandenburg J. E. (1998) The CI as the missing old meteorites of Mars: New data. (abs) *Lunar Planet. Sci.* **XXIX** #1728, Lunar Planetary Institute, Houston (CD-ROM).

Brandon A. D., Walker R. J., Morgan J. W. and Goles G. G. (1997) Rhenium-187/Osmium-187 isotopic constraints on the chemical evolution of the Martian mantle. (abs) *7th Goldschmidt Conf.*, *LPI Contribution* **921**, 35. Tucson.

Brandon A. D., Walker R. J., Morgan J. W. and Goles G. G. (1998) Re-Os isotopic constraints on the chemical evolution and differentiation of the Martian mantle. (abs) *Lunar Planet. Sci.* **XXIX** #1279, Lunar Planetary Institute, Houston (CD-ROM).

Brandon A. D., Walker R. J., Morgan J. W. and Goles G. G. (2000a) Re-Os isotopic evidence for early differentiation of the Martian mantle. (abs) *Lunar Planet. Sci*. **XXXI**, # 1676 (CD-ROM). Lunar Planetary Institute, Houston.
Nakhla, Chassigny, DaG476, ALH77005, LEW88516, Y793605, Zagami, EETA79001

Brandon A. D., Walker R. J., Morgan J. W. and Goles G. G. (2000b) Re-Os isotopic evidence for early differentiation of the Martian mantle. *Geochim. Cosmochim. Acta* **64**, 4083-4095.
Nakhla, Chassigny, DaG476, ALH77005, LEW88516, Y793605, Zagami, EETA79001

Brearley A. J. (1991) Subsolidus microstructures and cooling history of pyroxenes in the Zagami shergottite. (abs) *Lunar Planet. Sci.* **XXII**, 135-136.
Zagami

Brearley A. J. (1998a) Magnetite in ALH84001: Product of the decomposition of ferroan carbonate. (abs) *Lunar Planet. Sci.* **XXIX** #1451, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Brearley A. J. (1998b) Microstructures of feldspathic glass in ALH84001 and evidence for post carbonate formation shock melting. (abs) *Lunar Planet. Sci.* **XXIX** #1452, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Brearley A. J. (1998c) Rare K-bearing mica in ALH84001: Additional constraints on carbonate formation. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7019. Lunar Planetary Institute, Houston.

Brearley A. J. (2000) Hydrous phases in ALH84001: Further evidence for preterrestrial alteration and a shock-induced thermal overprint. (abs) *Lunar Planet. Sci*. **XXXI**, # 1203 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Brett R. (1974) *On the petrological, geochemical and geophysical characterization of a returned Mars surface sample and the impact of biological sterilization on the analyses*. NASA Johnson Space Center, Houston.

Bridges J. C., Franchi I. A., Grady M. M., Sexton A. S. and Pillinger C. T. (1997) The $\delta^{18}O$ composition

of feldspar and other minerals in Lafayette. (abs) *Meteoritics & Planet. Sci*. **32**, A21.
Lafayette

Bridges J. C. and Grady M. M. (1998a) Melted sediment from Mars in Nakhla. (abs) *Lunar Planet. Sci.* **XXIX** #1399, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Bridges J. C. and Grady M. M. (1998b) Traces of Martian sediment in Nakhla and other SNC meteorites. (abs) *Meteoritics & Planet. Sci.* **33**, A23.
Nakhla

Bridges J. C. and Grady M. M. (1999a) Siderite and gypsum intergrowths with magnetite-ilmenite in Governador Valadares. (abs) *Lunar Planet. Sci.* **XXX**, #1545 (CD-ROM). Lunar Planetary Institute, Houston.
Governador Valadares

Bridges J. C. and Grady M. M. (1999b) Evaporite mineral assemblages in Lafayette and the Nakhlites. (abs) *Meteoritics & Planet. Sci.* **34**, A18-19.
Lafayette, Nakhla, Governador Valadares

Bridges J. C. and Grady M. M. (1999c) A halite-siderite-anhydrite-chloroapatite assemblage in Nakhla: Mineralogical evidence for evaporites on Mars. *Meteoritics & Planet. Sci.* **34**, 407-415.
Nakhla

Bridges J. C., Smith M. P. and Grady M. M. (2000) Progressive evaporation and relict fluid inclusions in the Nakhlites. (abs) *Lunar Planet. Sci*. **XXXI**, # 1590 (CD-ROM). Lunar Planetary Institute, Houston.
Nakhla

Bridges J. C. and Grady M. M. (2000) Evaporite mineral assemblages in the Nakhla (martian) meteorite. *Earth Planet. Sci. Lett.* **176**, 267-279.
Nakhla, Governador Valadaras, Lafayette

Bridges J. C. and Grady M. M. (2001) Chromite chemistry in SNC meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A30.
ALH84001, DaG476, Chassigny, Shergotty, SaU005, EETA79001

Bridges J. C., Catling D. C., Saxton J. M., Swindle T. D., Lyon I. C. and Grady M. M. (2001) Alteration assemblages in Martian meteorites: Implications for near-surface processes. *Space Science Rev*. **96**, 365-392.

Bridges J. C., Schofield P. F., Smith A. D., Scholl A. and Grady M. M. (2002) Chemistry and valency spectra of chromite in SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXIII** #1695 Lunar Planetary Institute, Houston. (CD-ROM)

Browning L. B. and Bourcier W. L. (1997) Did the porous carbonate regions in ALH84001 form by low temperature inorganic processes? (abs) *Lunar Planet. Sci.* **XXVIII**, 161.
ALH84001

Bull R. K. and Durrani S. A. (1981) ALHA77005**:** Uranium content of phosphates and thermoluminscence studies. (abs) *Lunar Planet. Sci.* **XII**, 118-119.
ALHA77005

Bullock M. A., Moore J. M. and Mellon M. T. (2001) Aqueous alteration of Mars-analog rocks under an acidic atmosphere. (abs) *Lunar Planet. Sci.* **XXXII**, #2026. Lunar Planetary Institute, Houston. (CD-ROM)

Bunch T. E. and Cohen A. J. (1968) Shock-induced structural disorder in plagioclase and quartz. In *Shock Metamorphism of Natural Materials* (*eds.* French and Short) 509-518. Mono Books Corp., Baltimore.
Shergotty

Bunch T. E. and Reid A. M. (1975) The nakhlites, I. Petrography and mineral chemistry. *Meteoritics* **10,** 303-315.
Lafayette, Nakhla

Burghele A., Dreibus G., Palme H., Rammensee W., Spettel B., Weckwerth G. and Wänke H. (1983) Chemistry of shergottites and the shergottite parent body (SPB): Further evidence for the two component model for planet formation. (abs) *Lunar Planet. Sci.* **XIV,** 80-81.
Shergotty, Zagami, EETA79001, ALHA77005, Chassigny

Burger M., Eugster O. and Krähenbühl U. (1989) Refractory trace elements in different classes of achondrites by RNAA and INAA and some noble gas data. (abs) *Meteoritics* **24**, 256-257.
Zagami

Burgess R., Wright I. P. and Pillinger C. T. (1987) The distribution of sulphur in Nakhla and shergottite meteorites. (abs) *Meteoritics* **22**, 344-345.
Nakhla

Burgess R., Wright I. P. and Pillinger C. T. (1989) Distribution of sulphides and oxidized sulphur components in SNC meteorites. *Earth Planet. Sci. Lett*. **93**, 314-320.
Shergotty, Nakhla, Chassigny, ALHA77005

Burns R. G. (1989) Olivine alteration phases in shergottite ALHA77005: Information from 4.2^{o}K Mössbauer spectra. (abs) *Lunar Planet. Sci.* **XX**, 129-130.
ALHA77005

Burns R.G. (1991) Does Lafayette = Nakhla? Not necessarily so, based on 4.2^{o}K Mössbauer spectra of all of the SNC meteorites. (abs) *Lunar Planet. Sci.* **XXII**, 157-158.
Lafayette, **Nakhla**

Burns R.G. and Solberg T.C. (1988) Mössbauer spectra of weathered stony meteorites relevant to oxidation on Mars: II. Achondrites and SNC meteorites. (abs) *Lunar Planet. Sci.* **XIX**, 146-147.
Nakhla, ALHA77005, EETA79001

Burns R.G. and Martinez S.L. (1990) Mössbauer spectra of olivine-rich achondrites: II Brachina, Chassigny, ALHA77005, and Nakhla**.** *Lunar Planet. Sci.* **XXI**, 147-148.
Chassigny, **ALHA77005, Nakhla**

Burns R.G. and Martinez S.L. (1991) Mössbauer spectra of olivine-rich achondrites: Evidence for preterrestrial redox reactions. *Proc. Lunar Planet. Sci. Conf.* **21st**, 331-340. Lunar Planetary Institute, Houston.
Nakhla, Lafayette, Chassigny, ALHA77005, EETA79001, Shergotty

Burragato F., Cavarretta G. and Funiciello R. (1975) The new Brazillian achondrite of Governador Valadaras (Minas Gerais). *Meteoritics* **10**, 374-375.
Governador Valadaras

Buseck and seven authors (2001a) Is magnetite from Martian meteorite ALH84001 truly identical to that from bacteria? A TEM reexamination of the evidence. (abs) *Meteoritics & Planet. Sci.* **36**, A33.
ALH84001

Buseck and seven authors (2001b) Magnetite morphology and life on Mars. *Proc. Nat. Acad. Science, USA* **98**, 13490-13495.
ALH84001

Buseck P.R., Weyland M., Midgley P.A., Dunin-Borkowski R.E. and Frankel R.B. (2003) Are current TEM techniques adequate to resolve the ALH84001 life-on-Mars controversy? (abs) *Lunar Planet. Sci.* **XXXIV**, #2044. Lunar Planetary Institute, Houston
ALH84001

Busemann H. and Eugster O. (2002) The trapped heavy noble gases in recently found Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXIII** #1823. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles, SaU005, Nakhla

C TOP

Cady S. L., Walter M. R., Des Marais J. and Blank C. E. (1997) Exopaleontological search strategy for Mars Exploration: A case for siliceous epithermal deposits. (abs) *Lunar Planet. Sci.* **XXVIII**, 197-198.
ALH84001

Cahill J. T., Taylor L. A., Patchen A., Nazarov M. A., Stockstill K. R. and Anand M. (2002) Basaltic shergottite Dhofar 019: A "Normal" olivine cumulate product. (abs) *Lunar Planet. Sci.* **XXXIII** #1722. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Carr M. H. (1990) D/H on Mars: Effects of floods, volcanism, impacts, and polar processes. *Icarus* **87**, 210-227.

Carr M. H. (1996) *Water on Mars*. Oxford Univ. Press, NY. 229 pages

Carr R. H. and Pillinger C. T. (1984) Carbon isotopic data for some SNC meteorites. (abs) *Lunar Planet. Sci.* **XV**, 135-136.
Chassigny, Shergotty, EETA79001

Carr R. H., Wright I. P. and Pillinger C. T. (1984) Martian atmospheric CO_2 in an Antarctic meteorite? *Meteoritics* **19**, 204-205.

Carr R. H., Wright I. P. and Pillinger C. T. (1985a) Carbon isotopic analysis of the Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 5-6. Lunar Planetary Institute, Houston.
Shergotty

Carr R. H., Wright I. P. and Pillinger C. T. (1985b) Carbon isotopes in three SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* **15th**; *J. Geophys. Res.* **90** (suppl.), C664-C668.
Chassigny, Shergotty, EETA79001

Carr R. H., Grady M. M., Wright I. P. and Pillinger C. T. (1985c) Martian atmospheric carbon dioxide and weathering products in SNC meteorites. *Nature* **314,** 248-250.
Nakhla, EETA79001

Carr R. H. and Gibson E. K., Jr. (1987) A laser microprobe - mass spectrometric study of an alteration product in the shergottite EETA79001. (abs) *Lunar Planet. Sci.* **XVIII**, 157-158.
EETA79001

Carver E. A. and Anders E. (1976) Fission track ages of four meteorites. *Geochim Cosmochim Acta* **40**,

467-477.
Nakhla

Cassidy W. A., Olsen E. and Yanai K. (1977) Antarctica: A deep-freeze storehouse for meteorites. *Science* **198**, 727-731.

Cassidy W. A. and Rancitelli L. (1982) Antarctic meteorites. *Amer. Scientist* **70**, 156-164. *(review paper)*

Cassidy W. A., Harvey R. P., Schutt J., Delisle G. and Yanai K. (1992) The meteorite collection sites of Antarctica. *Meteoritics* **27**, 490-525.

Chamberlin T.C. (1897) The method of multiple working hypotheses. *J. Geol.* **5**, 837-848.

Chang S-B. R. and Kirschvink J. L. (1989) Magnetofossils, the magnetization of sediments, and the evolution of magnetite biomineralization. *Annual Rev. Earth Planet.* Sci. **17**, 169-195.

Chapman C. R. (1996) Bombarding Mars lately. *Nature* **380**, 23. *(editorial)*

Chatzitheodoridis E. (1990) A search for Martian alteration products and atmospheric argon in Nakhla meteorite. MS Thesis, Manchester University, Manchester.
Nakhla

Chatzitheodoridis E. and Turner G. (1990) Secondary minerals in the Nakhla meteorite. (abs) *Meteoritics* **25**, 354.
Nakhla

Chaussidon M. and Robert F. (1999) $^{7}Li/^{6}Li$ and $^{11}B/^{10}B$ ratios of SNC meteorites. (abs) *Lunar Planet. Sci.* **XXX**, #1592 (CD-ROM). Lunar Planetary Institute, Houston.
Shergotty, Zagami, EETA79001, Chassigny, ALH84001

Chen J. H. and Wasserburg G. J. (1985a) Peculiar U-Th-Pb systematics in Shergotty: A Martian lead? (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 7-8. Lunar Planetary Institute, Houston.
Shergotty

Chen J. H. and Wasserburg G. J. (1985b) U-Th-Pb systematics in shergottites: Young ages and low mu. (abs) *Meteoritics* **20**, 623-624.
Shergotty, Zagami, EETA79001

Chen J. H. and Wasserburg G. J. (1986a) Formation ages and evolution of Shergotty and its parent planet from U-Th-Pb systematics. *Geochim. Cosmochim. Acta* **50,** 955-968.
Shergotty, Zagami, EETA79001

Chen J. H. and Wasserburg G. J. (1986b) S ≠N =? C. (abs) *Lunar Planet. Sci.* **XVII**, 113-114.
Nakhla, ALHA77005

Chen J. H. and Wasserburg G. J. (1993) LEW88516 and SNC meteorites. (abs) *Lunar Planet. Sci.* **XXIV**, 275-276.
LEW88516

Chen M. and El Gorsey A. (1999) The nature of "maskelynite" in shocked meteorites: Not diaplectic glass but a glass-quenched from shock-induced dense melt at high pressure. (abs) *Meteoritics & Planet. Sci.* **34**, A24.

Chen M. and El Gorsey A. (2000) The nature of maskelynite in shocked meteorites: not a diaplectic glass but a glass quenched from shock-induced dense melt at high pressures. *Earth Planet. Sci. Lett.* **179**,

489-502.

Chen M., El Gorsey A., Reynard B. and Gillet P. (2001) A comparative Raman spectroscopic study of maskelynite in SNC meteoeites and diaplectic glass from the Ries crater: Implications to their origin. (abs) *NIPR Sym. Antarctic Meteorites* **24th**, 10-12. Nat. Inst. Polar Res., Tokyo.
Zagami, DaG476

Chennaoui H., Jambon A., Reynard B. and Blanc P. (2002) High pressure silica phases in shergottites: A cathodoluminescence spectroscopic study. (abs) *Meteoritics & Planet. Sci.* **37**, A32.
Zagami, Los Angeles, Shergotty, NWA856, NWA480

Chikami J., Takeda H., Yugami K., Mikouchi T. and Miyamoto M. (1997) Zn behavior in chromite and daubreelite in some achondrites. (abs) *NIPR Sym. Antarctic Meteorites* **22nd**, 15-17. Nat. Inst. Polar Res., Tokyo.
Zagami

Choleva N., Madsen M. B., Morup S., Lundgreen B., Jacobsen C. T. and Knudsen J. M. (1988) Mössbauer spectroscopy and SNC-meteorites. Rocks from the planet Mars*? Proc. Third Seeheim workshop on Mössbauer spectroscopy*, 509-510.

Cisowski S. M. (1981) Magnetic properties of Shergotty and Zagami meteorites. (abs) *Lunar Planet. Sci.* **XII,** 147.
Shergotty, Zagami

Cisowski S. M. (1982) Magnetic properties and remanence of Antarctic shergottite EETA79001. (abs) *Lunar Planet. Sci.* **XIII**, 106.
EETA79001

Cisowski S. M. (1985) Magnetism of the shergottite meteorites. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 9-10.
Shergotty, Zagami, ALHA77005, EETA79001

Cisowski S. M. (1986) Magnetic studies on Shergotty and other SNC meteorites. *Geochim. Cosmochim. Acta* **50,** 1043-1048.
Shergotty, Zagami, ALHA77005, EETA79001, Nakhla, Governador Valadares

Cisowski S. M. (1987) Magnetism of meteorites. In *Geomagnetism* **2** (*ed.* Jacobs) pp 525-560. Academic Press, London.

Clark R.S., Rowe M.W., Ganapathy R. and Kuroda P.K. (1967) Iodine, uranium and tellurium contents of meteorites. *Geochim. Cosmochim. Acta* **31**, 1605-1613.
Nakhla, Lafayette

Clark B.C. (1983) Correspondance of shergottites and Martian fines. (abs) *Lunar Planet. Sci.* **XIV**, 117-118.

Clark B.C. (1993) Geochemical components in Martian soil. *Geochim. Cosmochim. Acta* **57**, 4575-4581.

Clark B.C. (2003) Sterilized sample return: Breaking through the Mars science barriers. (abs) *Lunar Planet. Sci. Conf.* **34th**, #1797. Lunar Planetary Institute, Houston (CD-ROM).

Clayton R.N. (1993a) Oxygen isotopes in meteorites. *Ann. Rev. Earth Planet. Sci.* **21**, 115-149. *(review paper)*

Clayton R.N. (1993b) Oxygen isotope analysis of ALH84001. In *Antarctic Meteorite Newsletter* **16 (3),** 4.

JSC Curator's Office, Houston. (*see address in Appendix III*)
ALH84001

Clayton R.N., Onuma N. and Mayeda T.K. (1976) A classification of meteorites based on oxygen isotopes. *Earth Planet. Sci. Lett*. **30,** 10-18.
Lafayette, Shergotty

Clayton R.N. and Mayeda T.K. (1982) Oxygen isotopes in carbonaceous chondrites and in achondrites. (abs) *Lunar Planet. Sci.* **XIII**, 117-118.
Shergotty, Zagami, Nakhla, Lafayette, Chassigny, EETA79001

Clayton R.N. and Mayeda T.K. (1983) Oxygen isotopes in eucrites, shergottites, nakhlites, and chassignites. *Earth Planet. Sci. Lett.* **62**, 1-6.
Shergotty, Zagami, EETA79001, Nakhla, Lafayette, Chassigny

Clayton R.N. and Mayeda T.K. (1985) Oxygen isotopes in Shergotty. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 11-12. Lunar Planetary Institute, Houston.
Shergotty

Clayton R.N. and Mayeda T.K. (1986) Oxygen isotopes in Shergotty. *Geochim. Cosmochim. Acta* **50,** 979-982.
Shergotty

Clayton R.N. and Mayeda T.K. (1988) Isotopic composition of carbonate in EETA79001 and its relation to parent body volatiles. *Geochim. Cosmochim. Acta* **52,** 925-927.
EETA79001

Clayton R.N. and Mayeda T.K. (1992) Oxygen isotopic compositions of achondrites. (abs) *NIPR Sym. Antarctic Meteorites* **17th**, 160-163. Nat. Inst. Polar Res., Tokyo. *(review paper)*

Clayton R. N. and Mayeda T. K. (1996) Oxygen isotopic studies of achondrites. *Geochim. Cosmochim. Acta* **60**, 1999-2017.
ALHA77005, ALH84001, Chassigny, EETA79001, Lafayette, LEW88516, QUE94201, Shergotty, Y793605, Zagami

Clemett S. J. and Zare R. N. (1996) Evaluating the evidence for past life on Mars: Responce. *Science* **274**, 2122-2123.
ALH84001

Clemett S. J., Dulay M. T., Gillette J. S., Chiller X. D. F., Mahajan T. B. and Zare R. N. (1998a) Evidence for the extraterrestrial origin of polycyclic aromatic hydrocarbons (PAHs) in the Martian meteorite ALH84001. *Faraday Discuss. R. Soc. Chem.* **109**, 417-436, London.
ALH84001

Clemett S. J., Dulay M. T., Gillette J. S., Chiller X. D. F., Mahajan T. B. and Zare R. N. (1998b) Are the polycyclic aromatic hydrocarbons in ALH84001 of extraterrestial origin?: A reevaluation. (abs) *Lunar Planet. Sci.* **XXIX** #1812, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Collinson D. W. (1985) Magnetic properties of Antarctic shergottites EETA79001 and ALHA77005. (abs) *Meteoritics* **20**, 628.
EETA79001, ALHA77005

Collinson D. W. (1986) Magnetic properties of Antarctic shergottite meteorites EETA79001 and ALHA77005: Possible relevance to a Martian magnetic field. *Earth Planet. Sci. Lett.* **77,** 159-164.

EETA79001, ALHA77005

Collinson D. W. (1992) The magnetism of SNC meteorites-Was there an ancient magnetic field on Mars? (abs) *Meteoritics* **27**, 211.

Collinson D. W. (1997) Magnetic properties of Martian meteorites: Implications for an ancient Martian magnetic field. *Meteoritics Planet. Sci*. **32**, 803-811.
ALH84001, Zagami, EETA79001, Nakhla, Lafayette, Governador Valadares, Chassigny

Colson R. O., Nyquist L., McKay G. amd Hörz F. (1987) Possible isotopic resetting mechanisms in shergottite meteorites. (abs) *Lunar Planet. Sci.* **XVIII**, 191-192.

Cooney T. F., Scott E. R. D., Krot A. N., Sharma S. K. and Yamaguchi A. (1998) Confocal raman microprobe and IR reflectance study of minerals in the Martian Meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1332, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Cooney T. F., Scott E. R. D., Krot A. N., Sharma S. K. and Yamaguchi A. (1999) Vibrational spectroscopic study of minerals in the Martian meteorite ALH84001. *Amer. Mineral.* **84**, 1569-1576.
ALH84001

Corrigan C.M., Harvey R.P. and Bradley J. (1999) Sodium-bearing pyroxene phase in ALH84001. (abs) P-62, GSA, Denver.
ALH84001

Corrigan C.M., Harvey R.P. and Bradley J. (2000) Sodium-bearing pyroxene in ALH 84001. (abs) *Lunar Planet. Sci*. **XXXI**, # 1762 (CD-ROM). Lunar Planetary Institute, Houston.
ALH84001

Corrigan C.M. and Harvey R.P. (2002) Unique carbonates in Martian meteorite Allan Hills 84001. (abs) *Lunar Planet. Sci.* **XXXIII** #1051. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Corrigan C.M. and Harvey R.P. (2003) Evidence for a second generation of magnesite in Martian meteorite Allan Hills 84001. (abs) *Lunar Planet. Sci.* **XXXIV**, #1255. Lunar Planetary Institute, Houston
ALH84001

Costley W.C. (1865) Circumstances of Shergotty meteorite fall. *Proc. Asiatic Soc. Bengal,* p194
Shergotty

Coulson A.L. (1940) *A catalogue of meteorites: with special reference to Indian falls and finds and to specimens in the Indian Museum, Calcutta.* Geol. Survey India, Mem. vol. 75. Calcutta.
Shergotty

Crozaz G. (1979) Uranium and thorium microdistributions in stony meteorites. *Geochim. Cosmochim. Acta* **43**, 127-136.
Nakhla, Lafayette

Crozaz G. and Wadhwa M. (1999) Chemical alteration of hot desert meteorites: The case of shergottite Dar al Gani 476. *In* Workshop on Extraterrestrial Materials from Cold and Hot Deserts. LPI Cont. 997. (*eds*. Schultz *et al*.) Lunar Planetary Institute, Houston.
DaG476

Crozaz G., Wadhwa M. and Barrat J. A. (2001) Trace elements in NWA480: Still more diversity in the

basaltic Shergottite group. (abs) *Meteoritics & Planet. Sci.* **36**, A45.
NWA480

Crozaz G. and Wadhwa M. (2001) The terrestrial alteration of Saharan Shergottites Dar al Gani 476 and 489: A case study of weathering in a hot desert environment. *Geochim. Cosmochim. Acta* **65**, 971-978.
DaG476, DaG489

Curtis D., Gladney E. and Jurney E. (1980) A revision of the meteorite-based, cosmic abundance of boron. *Geochim. Cosmochim. Acta* **44**, 1945-1953.
Nakhla, Chassigny

D TOP

Dalton J.B. and Bishop J.L. (2003) Micro-spectroscopy as a tool for detecting micron-scale mineral variations across a rock surface: An example using a thin section of Martian meteorite ALH84001. (abs. #2066) *Lunar Planet. Sci. Conf.* **34rd** , Lunar Planetary Institute, Houston (CD-ROM).

Damour A. (1862) Note sur la pierre meteoritique de Chassigny. *Compt. Rend. Acad. Sci. Paris* **55**, 591-594.
Chassigny

Dann J. C., Holzheid A. H., Grove T. L. and McSween H. Y., Jr. (2000) Phase equilibria of the Shergotty meteorite: New petrologic constraints on the H_2O contents of Martain magmas. (abs) *Lunar Planet. Sci*. **XXXI**, # 1081 (CD-ROM). Lunar Planetary Institute, Houston.
Shergotty

Dann J. C., Holzheid A. H., Grove T. L. and McSween H. Y., Jr. (2001) Phase equilibria of the Shergotty meteorite: constraints on pre-eruptive water contents of Martian magmas and fractional crystallization under hydrous conditions. *Meteoritics & Planet. Sci.* **36**, 793-806.
Shergotty

Dasch P. and Kross J. (1996) My favorite Martians: NASA uncovers evidence of ancient life on Mars. *Ad Astra* 8-5, 27-29.

Dasch P. and Treiman A. (1997) *Ancient life on Mars??? A Slide Set.* Lunar Planetary Institute, Houston.

de Duve C. R. (1995) *Vital Dust*. Basic Books, NY.

Delano J. W. and Arculus R. J. (1980) Nakhla: oxidation state and other constraints. (abs) *Lunar Planet. Sci.* **XI**, 219-221.
Nakhla

Delaney J. S. (1992) Petrological comparison of LEW88516 and ALHA77005 shergottites. (abs) *Meteoritics* **27**, 213-214.
LEW88516, ALHA77005

Delaney J. S. (1994) A model composition for Mars derived from the oxygen isotopic ratios of Martian/SNC meteorites. (abs) *Meteoritics* **29**, 459.

Delaney J. S., Sutton S. R. and Dyar D. M. (1998) Variable oxidation states of iron in Martian meteorites. (abs) *Lunar Planet. Sci.* **XXIX** #1241, Lunar Planetary Institute, Houston (CD-ROM).
Shergotty, Zagami, Nakhla, ALHA77005, EETA79001, LEW88516

Delaney J. S., Dyar D. M ., Sutton S. R., Polyak D. and Stefanis M. (1999) Mineralogical Fe^{+3}/Fe measurements as proxies of volatile budgets: III Oxidation state zoning in Martian basalt. (abs) *Lunar*

Planet. Sci. **XXX** #1861, Lunar Planetary Institute, Houston (CD-ROM).

Delaney J. S. and Dyar M. D. (2000) Correction of the callibration of ferric/ferrous determinations in pyroxene from Martain samples and achonditic meteorites by synchrotron microXANES spectroscopy. (abs) *Lunar Planet. Sci*. **XXXI**, # 1981 (CD-ROM). Lunar Planetary Institute, Houston.
Shergotty, Zagami, Nakhla, Chassigny, ALH77005, EETA79001, LEW88516, ALH84001

Delaney J. S. and Dyar M. D. (2001) Magmatic magnetite in Martian meteorite melt inclusions from Chassigny. (abs) *Meteoritics & Planet. Sci.* **36**, A48.
Chassigny

Delaney J. S. and Dyar M. D. (2002a) Compositional and oxidation state zoning in Martian pyroxene: Paradox or process indicator. (abs) *Lunar Planet. Sci.* **XXXIII** #1659. Lunar Planetary Institute, Houston. (CD-ROM)
QUE94201

Delaney J.S. and Dyar M.D. (2002b) What should we (be) looking for in Martian meteorites? Is evidence of crustal process or mantle process more important…and to whom? (abs) Un-mixing SNCs. 11-12. LPI Contribution No. 1134.

Delaney J.S. and Dyar M.D. (2003) Comparison of synchrotron microXANES determination of Fe3+/Zfe with Mossbauer values for clean mineral separates of pyroxenes from Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXIV**, #1979. Lunar Planetary Institute, Houston

Deloule E. (2002) D/H ratio ion probe measurements on magmatic minerals from Martian meteorites: Implications for degassing of the Martian mantle. (abs) *Lunar Planet. Sci.* **XXXIII** #1607. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla, Chassigny, Zagami, NWA480, NWA856

Dera P., Prewitt C.T., Boctor N.Z. and Hemley R.J. (2002) Characterization of a high-pressure phase of silica from the Martian meteorite Shergotty. *Amer. Mineral.* **87**, 1018-1023.
Shergotty

Devouard B., Posfal M., Hua X., Bazylinski D. A., Frankel R. B. and Buseck P. R. (1998) Magnetite from magnetotactic bacteria: Size distributions and twinning. *Amer. Mineral*. **83**, 1387-1398.
ALH84001

Dodd R. T. (1981) *Meteorites: A petrologic-chemical synthesis.* Cambridge Univ. Press. pp368 *(good introduction to meteorites)*
Nakhla, Lafayette, Governador Valadares, Chassigny, Shergotty, Zagami, ALHA77005

Douglas C., Wright I.P., Yates P. D. and Pillinger C.T. (1992) The carbon isotopic composition of LEW88516, the fifth shergottite. (abs) *Meteoritics* **27**, 215-216.
LEW88516

Douglas C., Wright I.P. and Pillinger C. T. (1994) A search for further concentrations of organic materials in EETA79001. (abs) *Lunar Planet. Sci.* **XXV**, 339-340.
EETA79001

Dowty E. (1977) Phosphates in Agra Dos Reis: Structure and composition of $Ca_3(P0_4)_2$ minerals. *Earth Planet. Sci. Lett.* **35**, 347-351.

Drake M.J. (1982) Igneous rocks from asteroids (and Mars?). *Geotimes* **27**, 27.

Drake M.J., Greeley R., McKay G.A., Blanchard D.P., Carr M.H., Gooding J., McKay C.P., Spudis P.D.

and Squyres S.W. (1987) Workshop on Mars sample return science. *LPI Tech. Rpt*. **88-07**, Lunar Planetary Institute, Houston.

Drake M.J., Newsom H.E. and Capobianco C.J. (1989) V, Cr, and Mn in the Earth, EPB and SPB and the origin of the Moon: Experimental studies. *Geochim. Cosmochim. Acta* **53**, 2101-2111.

Drake M.J., Owen T., Swindle T.D. and Musselwhite D.S. (1993) Noble gas evidence of an aqueous reservoir near the surface of Mars more recently than 1.3 Ga. (abs) *Lunar Planet. Sci.* **XXIV**, 431-432.

Drake M.J., Swindle T.D., Owen T. and Musselwhite D S. (1994) Fractionated Martian atmosphere in the nakhlites? *Meteoritics* **29,** 854-859.

Draper S.S., Bogard D.D., Agee C.B., McKay G.A. and Jones J.H. (2002) Merits of a locality sample for accomplishing Mars exploration goals: The first sample return mission. (abs) AGU

Dreibus G. (1999) On the early differentiation of Mars. *Ninth Annual V. M. Goldschmidt Conference,* 78, Cambridge

Dreibus G., Palme H., Rammensee W., Spettel B., Weckwerth G. and Wänke H. (1981) Chemistry of the Shergotty parent body. (abs) *Meteoritics* **16**, 310.
Shergotty

Dreibus G. and Wänke H. (1982) Parent body of the SNC-meteorites: chemistry, size and formation. (abs) *Meteoritics* **17**, 207-208.

Dreibus G., Palme H., Rammensee W., Spettel B., Weckwerth G. and Wänke H. (1982) Composition of the Shergotty parent body: Further evidence of a two component model for planet formation. (abs) *Lunar Planet. Sci.* **XIII**, 186-187.
Shergotty

Dreibus G. and Wänke H. (1985) Mars, a volatile-rich planet. *Meteoritics* **20**, 367-381.

Dreibus G., Wänke H. and Schultz L. (1985) Mysterious iodine-overabundance in Antarctic meteorites. In *International Workshop on Antarctic Meteorites.* (*ed.* Annexstad) *LPI Tech. Rpt.* **86-1,** 34-36. Lunar Planetary Institute, Houston.
Shergotty, ALHA77005, EETA79001

Dreibus G. and Wänke H. (1987) Volatiles on Earth and Mars: A comparison. *Icarus* **71**, 225-240.
Shergotty, Zagami, Nakhla, EETA79001, ALHA77005, Chassigny

Dreibus G. and Wänke H. (1990) Mars: Data from SNC-meteorites, Viking- and Phobos-missions. (abs) *Meteoritics* **25**, 359.

Dreibus G., Jochum K. H., Palme H., Spettel B., Wlotzka F. and Wänke H. (1992) LEW88516**:** A meteorite compositionally close to the "Martian mantle". (abs) *Meteoritics* **27**, 216-217.
LEW88516, ALHA77005

Dreibus G. and Wänke H. (1992) On the weathering of Martian igneous rocks. (abs) In *MSATT workshop on chemical weathering on Mars.* (*eds.* Burns and Banin) *LPI Tech. Rpt*. **92-04**, 11-12. Lunar Planetary Institute, Houston.

Dreibus G., Burghele A., Jochum K. P., Spettel B., Wlotzka F. and Wänke H. (1994) Chemical and mineral composition of ALH84001: A Martian orthopyroxenite. (abs) *Meteoritics* **29,** 461.
ALH84001

Dreibus G., Jagoutz E., Spettel B. and Wänke H. (1996a) Phosphate-mobilization on Mars? Implication from leach experiments on SNC's. (abs) *Lunar Planet. Sci.* **XXVII**, 323-324.
Shergotty, Zagami, ALHA77005

Dreibus G., Spettel B., Wlotzka F., Schultz L., Weber H. W., Jochum K. P. and H. Wänke (1996b) QUE94201: An unusual Martian basalt. (abs) *Meteoritics & Planet. Sci.* **31**, A39-40.
QUE94201

Dreibus G., Wänke H. and Lugmair G. W. (1997) Volatile inventories of Mars and Earth and their implications for the evolution of the planetary atmospheres. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds.* Clifford *et al*.) *LPI Contribution* **916,** 26. Lunar Planetary Institute, Houston.
Shergotty, Zagami, EETA79001, QUE94201, ALHA77005, LEW88516, Lafayette, Nakhla, Chassigny, ALH84001

Dreibus G., Rieder R., Bruckner J. and Wänke H. (1998) Chemical composition of rocks and soil at the Pathfinder site and their relation to the Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **33**, A42.
Shark

Dreibus G., Spettel B., Huth J. and Zipfel J. (1999) Halogens in Nakhla: Terrestrial or Martian origin. (abs) *Meteoritics & Planet. Sci.* **34**, A33-34.
Nakhla

Dreibus G., Spettel B., Haubold R., Jochum K. P., Palme H., Wolf D. and Zipfel J. (2000) Chemistry of a new shergottite: Sayh al Uhaymir 005. (abs) *Meteoritics & Planet. Sci.* **35**, A49.
SaU005

Dreibus G., Huisl W., Haubold R. and Jagoutz E. (2001) Influence of terrestrial desert weathering in Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A50-51.

Dreibus G., Wlotzka F., Huisl W., Jagoutz E., Kubny A. and Spettel B. (2002) Chemistry and petrology of the most feldspathic shergottite: Dhofar 378. (abs) *Meteoritics & Planet. Sci.* **37**, A43.
Dho378

Dreibus G. and Jagoutz E. (2002a) Constraints on Martian evolution from SNC meteorites. (abs) *Antarctic Meteorites* **XXVII**, 12-14, NIPR, Tokyo

Dreibus G. and Jagoutz E. (2002b) Crust-mantle reservoirs of radiogenic isotopes of Mars and earth: Where can we see a mixing? (abs) Un-mixing SNCs. 13-14. LPI Contribution No. 1134.

Dreibus G. and Jagoutz E. (2003) Chemical and isotopic constraints for the Martian crust. (abs) *Lunar Planet. Sci.* **XXXIV**, #1350. Lunar Planetary Institute, Houston

Dreibus G., Huisl W., Spettel B. and Haubold R. (2003) Comparison of the chemistry of Y-000593 and Y-000749 with other nakhlites. (abs) *Lunar Planet. Sci.* **XXXIV**, #1586. Lunar Planetary Institute, Houston
Y000593, Y000749

Duke M.B. (1963) *Petrology of basaltic achondrites*. Ph. D. Dissertation, Calif. Inst. of Tech., Pasadena.
Shergotty

Duke M.B. (1968) The Shergotty meteorite: Magmatic and shock metamorphic features. In *Shock Metamorphism of Natural Materials.* (*ed*. French and Short), 612-621. Mono Book Corp., Baltimore.
Shergotty

Duke M.B. and Silver L.T. (1967) Petrology of eucrites, howardites and mesosideroites. *Geochim. Cosmochim. Acta* **31,** 1637-1665.
Shergotty

D'yakonova M.I. and Kharitonova V.Y. (1960) Chemical analyses of some stoney and iron meteorites from the collection of the Academy of Sciences of the USSR. *Meteoritika* **18**, 48-67.
Chassigny

Dyar M.D. (2002) Moessbauer spectroscopy of SNC meteorites. (abs) Un-mixing SNCs. 15-16. LPI Contribution No. 1134.

Dyar M.D. (2003) Moessbauer spectroscopy of mineral separates from SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXIV**, #1701. Lunar Planetary Institute, Houston
ALHA77005, Chassigny, EETA79001, Governadore Valadares, Lafayette, Nakhla, Shergotty, Zagami

Dyar M.D. and Schaefer M.W. (2003) Moessbauer spectroscopy on the Martian surface: Constraints of the interpretation of MER data. (abs) *Lunar Planet. Sci.* **XXXIV**, #1329. Lunar Planetary Institute, Houston

E TOP

Easton A. J. and Elliott C. J. (1977) Analysis of some meteorites from the British Museum (Natural History) collection. *Meteoritics* **12**, 409-416.
Zagami

Eberhardt P. and Hess D. C. (1960) Helium in stone meteorites. *Astrophys. J.* **131**, 38-46.
Shergotty

Ebihara M., Kong P. and Shinotsuka K. (1997a) Chemical composition of Y-793605, a Martian lherzolite. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 22-26. Nat. Inst. Polar Res., Tokyo.
Y793605

Ebihara M., Kong P. and Shinotsuka K. (1997b) Chemical composition of Y-793605, a Martian lherzolite. *Antarctic Meteorite Research* **10***,* 83-94. Nat. Inst. Polar Res., Tokyo.
Y793605

Ebihara M., Shinotsuka K. and Kong P. (1998) Chemical composition of Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **33**, A44.

Economou T., Turkevich A., Rieder R. and Wänke H. (1997) Report on the status of the APX on Mars Pathfinder mission. (abs) *Lunar Planet. Sci*. **XXVIII**, 319-320.
Zagami

Economou T. E., Rieder R., Wänke H., Bruckner J., Dreibus G., Crisp J. and McSween H. Y., Jr. (1998) The chemical composition of Martian rocks and soils: Preliminary analysis. (abs) *Lunar Planet. Sci.* **XXIX** #1711, Lunar Planetary Institute, Houston (CD-ROM).

Edmunson J., Borg, L. E., Shearer C., Papike J. J. and Davidson K. (2001) High-Si glasses in basaltic Shergottite DaG 476 and their implications for geochronology. (abs) *Lunar Planet. Sci.* **XXXII**, #1439. Lunar Planetary Institute, Houston. (CD-ROM)
DAG476

Edmunson J., Borg L. E., Schearer C. K. and Papike J. J. (2002) Olivines in lherzolitic shergottite

ALH77005: Inclusions and geochronology. (abs) *Lunar Planet. Sci.* **XXXIII** #1844. Lunar Planetary Institute, Houston. (CD-ROM)
ALH77005

Ehmann W. D. and Lovering J. F. (1967) The abundance of mercury in meteorites and rocks by neutron activation analysis. *Geochim. Cosmochim. Acta* **31**, 357-376.
Nakhla

Eichhorn G., Accomazzi A., Grant C. S., Kurtz M. J. and Murray S. S. (1998) Planetary literature in the ABS abstract service. (abs) *Lunar Planet. Sci.* **XXIX** #1514, Lunar Planetary Institute, Houston (CD-ROM).

Eiler J. M., Valley J. W. and Graham C. M. (1997a) Standardization of SIMS analysis of O and C isotope ratios in carbonate from ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 327-328.
ALH84001

Eiler J. M., Valley J. W. and Stolper E. M. (1997b) Stable isotopes in Allan Hills 84001: An ion microprobe study. (abs) *Meteoritics & Planet. Sci*. **32**, A38.
ALH84001

Eiler J. M., Valley J. W., Graham C. M. and Fournelle J. (1998) Geochemistry of carbonates and glass in ALH84001. (abs) *Meteoritics & Planet. Sci.* **33**, A44-45.
ALH84001

Eiler J., Kitchen N. and Leshin L. (2001) The hosts of hydrogen in ALH84001: evidence for hydrous Martian salts in the oldest SNC meteorite. (abs*) Eleventh Goldschmidt Conf.* 3376. Hot Springs.
ALH84001

Eiler J., Valley J. W., Graham C. M. and Fournelle J. (2002a) Two populations of carbonate in ALH84001: Geochemical evidence for discrimination and genesis. *Geochim. Cosmochim. Acta* **66**, 1285-1303.
ALH84001

Eiler J., Kitchen N., Leshin L. and Strausberg M. (2002b) Hosts of hydrogen in Allan Hills 84001: Evidence for hydrous martian salts in the oldest martain meteorite. *Meteoritics & Planet. Sci*. **37**, 395-405.
ALH84001

El Goresy A., Wopenka B., Chen M. and Kurat G. (1997a) The saga of maskelynite in Shergotty. (abs) *Meteoritics & Planet. Sci*. **32**, A38-39.
Shergotty

El Goresy A., Chen M., Sharp T. G., Wopenka B. and Weinbruch S. (1997b) Shock-induced high-pressure phase transformations in chondritic and differentiated meteorites: Solid-state transformations, high-pressure liquidus phases and alkali vapour fractionation. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 27-30. Nat. Inst. Polar Res., Tokyo.
Shergotty

El Goresy A., Sharp T. G., Wopenka B. and Chen M. (1998a) A new very-high-pressure silica mineral in the Shergotty SNC meteorite: Implications for shock metamorphism and the Earth's lower mantle. (abs) *Lunar Planet. Sci.* **XXIX** #1707, Lunar Planetary Institute, Houston (CD-ROM).
Shergotty

El Goresy A., Dubrovinsky L., Saxena S. and Sharp T.G. (1998b) A new post-stishovite silicon dioxide-polymorph with the baddelyite structure (Zirconium Oxide) in the SNC meteorite Shergotty: Evidence

for extreme shock pressure. (abs) *Meteoritics & Planet. Sci.* **33**, A45.
Shergotty

El Goresy A., Kong P. and Palme H. (1999) Discovery of Cu-, Ni-, Zn-, Fe-metal alloy impregnations in the SNC meteorite Chassigny: Fingerprints of a pristine metallogenic activity on the SNC parent body? (abs) *Lunar Planet. Sci.* **XXX** #1078, Lunar Planetary Institute, Houston (CD-ROM).
Chassigny

El Goresy A., Chen M., Gillet Ph. and Dubrovinsky L.S. (2000a) Shock-induced high-pressure phase transition of Labradorite to Hollandite in Zagami and the assemblage Hollandite + Jadeite in L Chondrites: Constaints to peak shock pressures. (abs) *Meteoritics & Planet. Sci.* **35**, A51.
Zagami

El Goresy A., Dubrovinsky L., Sharp T. G., Saxena S.K. and Chen M. (2000b) A monoclinic post-stishovite polymorph of silica in the Shergotty meteorite. *Science* **288**, 632-634.
Shergotty

Elkins-Tanton L.T., Parmentier E.M. and Hess P.C. (2003) A model for Martian magma ocean crystallization and overturn. (abs #1479) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Eugster O. (1994) Orthopyroxenite ALH84001: Ejection from Mars (?) 15 Ma. (abs) *Meteoritics* **29,** 464.
ALH84001

Eugster O. and Weigel A. (1992) Exposure histories of lodranites, shergottite LEW88516 and CK-chondrites. (abs) *Meteoritics* **27**, 219.
LEW88516

Eugster O., Weigel A. and Polnau E. (1996) Two different ejection events for basaltic shergottites QUE94201, Zagami and Shergotty (2.6 Ma ago) and lherzolitic shergottites LEW88516 and ALHA77005 (3.5 Ma ago). (abs) *Lunar Planet. Sci.* **XXVII**, 345-346.
QUE94201, **Zagami, Shergotty, LEW88516, ALHA77005**

Eugster O. and Polnau E. (1997a) Mars-Earth transfer time of lherzolite Yamato-793605. (abs) *Proc. NIPR Sym. Antarctic Meteorites* **22nd***, 31-33*. Nat. Inst. Polar Res., Tokyo.
Y793605, ALH77005, LEW88516

Eugster O. and Polnau E. (1997b) Mars-Earth transfer time of lherzolite Yamato-793605. *Antarctic Meteorite Research* **10***,* 141-149. Nat. Inst. Polar Res., Tokyo.
Y793605, ALH77005, LEW88516

Eugster O., Weigel A. and Polnau E. (1997a) Ejection times of Martian meteorites. *Geochim. Cosmochim. Acta* **61**, 2749-2757.
EETA79001, QUE94201, Shergotty, Zagami, ALH77005, LEW88516, Chassigny, Nakhla, Govenador Valadares, Lafayette, ALH84001

Eugster O., Polnau E. and Terribilini D. (1997b) Ejection age of Martian lherzolite Yamato 793605, Chassigny, and Shergotty and crystallization age of shergotty maskelynite. (abs) *Meteoritics & Planet. Sci*. **32**, A40.
Y793605, Chassigny, Shergotty

Eugster O., Busemann H. and Lorenzetti S. (2002a) The pre-atmospheric size of Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXIII** #1096. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles, QUE94201, Shergotty, Zagami, Nakhla, Chassigny, SaU005

Eugster O., Busemann H., Lorenzetti S. and Terribilini D. (2002b) Ejection ages from 81Kr-83Kr dating

and pre-atmospheric sizes of Martian meteorites. *Meteoritics & Planet. Sci.* **37** , 1345-1360.
Los Angeles, QUE94201, Shergotty, Zagami, Nakhla, Chassigny, ALH84001

Evans J. C. and Reeves J. H. (1984) Al-26 measurements on Antarctic meteorites. *Lunar Planet. Sci*. **XV**, 260-261.
EETA79001, ALHA77005

Evans J. C., Wacker J. and Reeves J. H. (1992) Terrestrial ages of Victoria Land meteorites derived from cosmic-ray-produced radionuclides. In *Field and laboratory investigations of Antarctic meteorites collected by the United States expeditions 1985-1987.* (*eds.* Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* **30**, 45-56. Washington, DC. *(see Appendix III for address)*
ALHA77005

F TOP

Fallick A. E., Hinton R. W., Mattey D. P., Norris S. J., Pillinger C. T., Swart P. K. and Wright I. P. (1983) No unusual compositions of the stable isotopes of nitrogen, carbon and hydrogen in SNC meteorites. (abs) *Lunar Planet. Sci.* **XIV**, 183-184.
Nakhla

Faquhar J., Thiemens M. H. and Jackson T. (1998a) Delta^{17}O measurements of carbonates from ALH84001: Implications for oxygen cycling between the atmosphere-hydrosphere and pedosphere of Mars. (abs) *Lunar Planet. Sci.* **XXIX** #1872, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Farquhar J., Thiemens M. H., and Jackson T. (1998b) Atmosphere-surface interactions on Mars: Delta^{17}O measurements of carbonate from ALH 84001. *Science* **280**, 1580-1582.
ALH84001

Farquhar J., Thiemens M. H., and Jackson T. L. (1999) Delta^{17}O anomolies in carbonate from Nakhla and Lafayette and delta ^{33}S anomolies in sulfur from Nakhla: Implications for atmospheric chemical interactions with the Martain regolith. (abs) *Lunar Planet. Sci.* **XXX** #1675, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla, Lafayette

Farquhar J., Savarino J., Jackson T. L. and Thiemens M. H. (2000a) Evidence of atmospheric sulfur in SNC meteorites: Implications for the Martain sulfur cycle. (abs) *Lunar Planet. Sci.* **XXXI** #1275, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla, Lafayette, Shergotty, Zagami, EETA79001

Farquhar J., Savarino J., Jackson T. L. and Thiemens M. H. (2000b) Evidence of atmospheric sulphur in the Martian regolith from sulphur isotopes in meteorites. *Nature* **404**, 50-52.
EETA79001, Zagami, Shergotty, Lafayette, Nakhla

Farquhar J. and Thiemens M. H. (2000) Oxygen cycle of the Martian atmosphere-regolith system: delta 17O of secondary phases in Nakhla and Lafayette. *J. Geophys. Res.* **105**, 11991-11997.
Nakhla, Lafayette

Farquhar J., Savarino J., Airieau S. and Thiemens M. H. (2001a) Observations of wavelength-sensitive mass-independent sulfur isotopic effects during SO2 photolysis: Implications for sulfur isotope compositions of SNC meteorites and ancient terrestrial samples. (abs) *Lunar Planet. Sci.* **XXXII**, #1750. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla, ALH84001

Faquhar J., Bao H. and Thiemens M. H. (2001b) Implications of recent observations of mass-independent

sulfur and oxygen isotope fractionations in terrestrial samples for interpretations SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1756. Lunar Planetary Institute, Houston. (CD-ROM)

Fedden F. (1880) *Catalog Meteorites Indian Museum*. Calcutta.
Shergotty

Feierberg M. A. and Drake M.J. (1980) The meteorite-asteroid connection: The infrared spectra of eucrites, shergottites and Vesta. *Science* **209**, 805-807.
Shergotty, ALHA77005

Fei Y. and Bertka C.M. (2003) Experimental constraints on the thermal structure of the Martian interior and Martian magmatism. (abs #1829) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Fisler D.K., Cygan R.T. and Westrich H.R. (1997) Cation diffusion in carbonate minerals: Determining closure temperatures and the thermal history for the ALH 84001 meteorite. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life*. (*eds*. Clifford *et al*.) *LPI Contribution* **916,** 32. Lunar Planetary Institute, Houston.
ALH84001

Fishler D.K. and Cygan R.T. (1998) Cation diffusion in calcite: Determining closure temperatures and the thermal history for the Allan Hills 84001 meteorite. *Meteoritics Planet. Sci*. **33**, 785-789.
ALH84001

Floran R. J., Prinz M., Hlava P. F., Keil K., Nehru C. E. and Hinthorne J. R. (1977) Chassigny revisited: A cumulate dunite with hydrous amphibole-bearing melt inclusions. (abs) *Meteoritics* **12,** 225-226.
Chassigny

Floran R. J., Prinz M., Hlava P. F., Keil K., Nehru C. E. and Hinthorne J. R. (1978) The Chassigny meteorite: A cumulate dunite with hydrous amphibole-bearing melt inclusions. *Geochim. Cosmochim. Acta* **42,** 1213-1229.
Chassigny

Flynn G. J., Keller L. P., Kirz J., Wirick S., Bajt S. and Chapman H. N. (1997a) Carbon mapping and carbon-Xanes measurements of carbonate globules from ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 365-366.
ALH84001

Flynn G. J., Sutton S. R. and Keller L. P. (1997b) Element abundance patterns in carbonate globules and rims from ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 367-368.
ALH84001

Flynn G. J., Keller L. P., Jacobsen C., Wirick S., Bajt S. and Chapman H. N. (1997c) The spatial distribution and bonding states of carbon associated with Allan Hills 84001 carbonates. (abs) *Meteoritics Planet. Sci*. **32**, A42.
ALH84001

Flynn G. J., Keller L. P., Miller M. A., Jacobsen C. and Wirick S. (1998a) Organic compounds associated with carbonate globules and rims in the ALH84001 meteorite. (abs) *Lunar Planet. Sci.* **XXIX** #1156, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Flynn G. J., Keller L. P., Jacobsen C. and Wirick S. (1998b) Carbon in Allan Hills 84001 carbonate and rim. (abs) *Meteoritics Planet. Sci.* **33**, A50-51.

ALH84001

Flynn G. J., Keller L. P., Jacobsen C. and Wirick S. (1999) Organic carbon in Mars meteorites: A comparison of ALH84001 and Nakhla. (abs) *Lunar Planet. Sci.* **XXX** #1087, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001, Nakhla

Flynn G. J., Keller L. P., Jacobsen C. and Wirick S. (2000) Organic carbon in carbonate and rim from ALH84001. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7013. Lunar Planetary Institute, Houston.

Flynn G. J., Sutton S. R. and Keller L. P. (2002) X-ray microprobe measurements of the chemical compositions of ALH84001 carbonate globules. (abs) *Lunar Planet. Sci.* **XXXIII** #1648. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Folco L., Franchi I. A., Scherer P., Schultz L. and Pillinger C. T. (1999) Dar al Gani 489 basaltic Shergottite: A new find from the Sahara likely paired with Dar al Gani 476. (abs) *Meteoritics Planet. Sci.* **34**, A36-37.
DaG489

Folco L. and Franchi I. A. (2000) Dar al Gani 670 Shergottite: A new fragment of the Dar al Gani 476/489 Martian meteorite. (abs) *Meteoritics Planet. Sci.* **35**, A54-55.
DaG670

Folco L. and Rastelli N. (2000) The meteorite collection of the Museo Nazionale dell'Antartide in Siena. (abs) *Meteoritics Planet. Sci.* **35**, A189-198.
DaG489

Folco L. and Mellini M. (2000) 1990-2000: Ten years of Antarctic meteorite search by Italian PNRA. (abs) Antarctic Meteorites **XXV**. NIPR, Tokyo.

Folco L., Franchi I. A., D'Orazio M., Rocchi S. and Schultz L. (2000) A new Martian meteorite from the Sahara: The shergottite Dar al Gani 489. *Meteoritics & Planet. Sci.* **35**, 827-839.
DaG489

Folco L., Capra A., Chiappini M., Frezzotti M., Mellini M. and Tabacco I. E. (2002) The Frontier Mountain meteorite trap (Antarctica). *Meteoritics Planet. Sci*. **37**, 209-228.

Foley C.N., Humayun M., Davis A. M. and Kagan O. (1998) Chemical and SEM studies of mineral assemblages within ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1928, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Foley C.N., Wadhwa M. and Janney P.E. (2003) Tungsten isotopic composition of the SNC meteorite Los Angles: Further implications for early differentiation. (abs #2117) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Folk R.L., Taylor L.A. and Nazarov M.A. (2001) Similarity of nanometer-size spheroids in Martian meteorite Dhofar 019 & enclosing calichi soil: South-Pole vs. Desert forms. (abs) *Lunar Planet. Sci.* **XXXII**, #1777. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Folk R.L. and Taylor L.A. (2002) Nanobacterial alteration of pyroxene in Martian meteorite ALH84001. *Meteoritics Planet. Sci*. **37**, 1057-1069.

ALH84001

Ford D. J. and Rutherford M. J. (1993) Primitive SNC parent magmas and crystallization: low P_{H_2O} experiments. (abs) *Lunar Planet. Sci.* **XXIV**, 503-504.

Forsythe R. D. and Zimbelman J. R. (1995) A case for ancient evaporite basins on Mars. *J. Geophy. Res*. **100**, 5553-5563.

Franchi I. A., Sexton A. S., Wright I. P. and Pillinger C. T. (1997) A refinement of oxygen isotopic composition of Mars. (abs) *Lunar Planet. Sci.* **XXVIII**, 379-380.
ALHA77005, EETA79001, QUE94201, Shergotty, Zagami, Lafayette, Nakhla, Governador Valadares, Chassigny, ALH84001

Franchi I. A., Wright I. P., Sexton A. S. and Pillinger C. T. (1999) The oxygen-isotopic composition of Earth and Mars. *Meteoritics & Planet. Sci*. **34**, 657-661.

Franck S. (1997) SNC meteorties and the magnetic field strength history of Mars. (abs) *Meteoritics Planet. Sci*. **32**, A44-45.
ALH84001

French B., MacPherson G. and Clarke R. (1990) *Antarctic meteorite teaching collection: Educational meteorite thin sections. Draft available from* JSC Curator's Office, Houston.
EETA79001

Freundel M., Schultz L. and Reedy R. C. (1986) Terrestrial ^{81}Kr-^{83}Kr ages of Antarctic meteorites. *Geochim. Cosmochim. Acta* **50**, 2663-2673.

Friedman R. C., McCoy T. J. and Taylor G. J. (1994) Constraints on the physical details of nakhlite formation. (abs) *Lunar Planet. Sci.* **XXV**, 391-392.
Nakhla

Friedman R. C., Taylor G. J. and Treiman A. H. (1995) Processes in thick lava flows: Nakhlites (Mars) and Theo's flow (Ontario, Earth). (abs) *Lunar Planet. Sci*. **XXVI**, 429-430.
Nakhla

Friedman R. C., Taylor G. J. and Treiman A. H. (1998) Nakhlites and Theo's flow: Formation of extrusive pyroxenites. (abs) *Lunar Planet. Sci.* **XXIX** #1190, Lunar Planetary Institute, Houston (CD-ROM).

Friedman E. I., Wierzchos J. and Ascaso C. (1998) Chains of magnetite crystals in ALH84001: Evidence of biological origin. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7018. Lunar Planetary Institute, Houston.
ALH84001

Friedmann E. I., Wierzchos J., Ascaso C. and Winklhofer M. (2001a) Chains of magnetite crystals in the meteorite ALH84001: Evidence of biological origin. (abs) *Lunar Planet. Sci.* **XXXII**, #1996. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Friedmann E. I., Wierzchos J., Ascaso C. and Winklhofer M. (2001b) Chains of magnetite crystals in the meteorite ALH84001. *Proc. Nat. Acad. Science USA* **98**, 2176-2181.
ALH84001

Fritz J., Greshake A., Hecht L. and Stöffler D. (2002) Shock metamorphism of Martian meteorites: New data from quantitative shock barometry. (abs) *Lunar Planet. Sci.* **XXXIII** #1504. Lunar Planetary

Institute, Houston. (CD-ROM)
Shergotty, Zagami, EETA79001, SaU005, DaG476, ALH77005

Fritz J., Greshake A. and Stoffler D. (2003) Launch conditions for Martian meteorites: Plagioclase as a shock pressure barometer. (abs) *Lunar Planet. Sci.* **XXXIV**, #1335. Lunar Planetary Institute, Houston

Fuchs L. H. (1962) Occurrence of whitlockite in chondritic meteorites. *Science* **137**, 425-426.
Shergotty

Fuchs L. H. (1969) The phosphate mineralogy of meteorites. In *Meteorite Research*. (*ed.* Millman) page 683-695. Springer-Verlag, N.Y.
Shergotty

Fudali R. F. and Schutt J. W. (1989) The field season in Victoria land, 1983-1984. In *Field and laboratory investigations of meteorites from Victoria Land and the Thiel Mountains Region, Antarctica 1982-1983 and 1983-1984.* (*eds.* Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* **28**, 23-28. Washington, DC.

Fuse K. and Anders E. (1969) Aluminium-26 in meteorites VI Achondrites. *Geochim. Cosmochim. Acta* **33**, 653-670.
Nakhla, Lafayette, Shergotty

G TOP

Gale N. H., Arden J. W. and Hutchison R. (1975) The chronology of the Nakhla achondritic meteorite. *Earth Planet. Sci. Lett.* **26**, 195-206.
Nakhla

Ganapathy R. and Anders E. (1969) Ages of calcium-rich achondrites- II Howardites, nakhlites and the Angra dos Reis angrite. *Geochim. Cosmochim. Acta* **33**, 775-787.
Nakhla, Lafayette

Gao X. and Thiemens M. (1990) Sulfur isotopic studies in meteorites. (abs) *Lunar Planet. Sci.* **XXI**, 401-402.
ALHA77005

Garrison D. H., Rao M. N. and Bogard D. D. (1994) Solar proton produced neon in shergottite meteorites. (abs) *Lunar Planet. Sci.* **XXV**, 403-404.
ALHA77005

Garrison D. H., Rao M. N. and Bogard D. D. (1995) Solar-proton-produced neon in shergottite meteorites and implications for their origin. *Meteoritics* **30**, 738-747.
ALHA77005

Garrison D. H. and Bogard D. D. (1997) Argon-39/Argon-40 dating of Martian meteorites. (abs) *Meteoritics Planet. Sci*. **32**, A45.
ALH84001, Zagami, QUE94201

Garrison D. H. and Bogard D. D. (1998) Isotopic composition of trapped and cosmogenic noble gases in several Martian meteorites. *Meteoritics Planet. Sci.* **33**, 721-736.
Shergotty, Y793605, ALH84001, QUE94201, EETA79001

Garrison D. H. and Bogard D. D. (2000) Cosmogenic and trapped Noble gases in the Los Angeles Martian meteorite. (abs) *Meteoritics Planet. Sci.* **35**, A58.

Los Angeles

Garrison D. H. and Bogard D. D. (2001) Argon-39-argon-40 "ages" and trapped argon for three Martian Shergottites. (abs) *Meteoritics Planet. Sci.* **36**, A62-63.
Los Angeles, DaG476, Dho019

Geiss J. and Hess D. C. (1958) Argon-potassium ages and the isotopic composition of argon from meteorites. *Ap. J.* **127**, 224-236.
Shergotty

Ghosal S., Sack R. O., Ghiorso M. S. and Lipschutz M. E. (1997) Shergottite evidence for a reduced, iron-depleted Martian mantle. (abs) *Meteoritics Planet. Sci*. **32**, A46.

Ghosal S., Sack R.O., Ghiorso M.S. and Lipschutz M.E. (1998) Evidence for a reduced, Fe-depleted Martian mantle source region of shergottites. *Contrib. Mineral Petrol.* **130**, 346-357.

Ghosh A., Nimmo F. and McSween H.Y. (2003) The effect of early accretion and redistribution of 26Al on the thermal evolution of Mars. (abs #2011) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Gibbs W.W. (1998) Endangered. *Scientific. American* April 1998, pp19-20. *(news article)*
ALH84001

Gibson E.K. (2001) Martian meteorites unveil secrets of the red planet. (abs) *Meteoritics Planet. Sci.* **36**, A64-65.

Gibson E.K. and Moore C.B. (1983) Sulfur in achondritic meteorites. (abs) *Lunar Planet. Sci.* **XIV**, 247-248.

Gibson E.K., Moore C.B., Primus T. M. and Lewis C. F. (1985) Sulfur in achondritic meteorites. *Meteoritics* **20**, 503-511.
Shergotty, Zagami, EETA79001, Chassigny, Nakhla, Lafayette

Gibson E.K., McKay D.S., Thomas-Keprta K.L. and Romanek C.S. (1996) Evaluating the evidence for past life on Mars: Responce. *Science* **274**, 2125.
ALH84001

Gibson E.K., McKay D.S., Thomas-Keprta K.L., Romanek C.S., Clemett S.J., Zare R.N. and Vali H. (1997a) Possible relic biogenic activity in Martian meteorite ALH84001: A current assessment. (abs) *Lunar Planet. Sci.* **XXVIII**, 413-414.
ALH84001

Gibson E. K., Jr., McKay D. S., Thomas-Keprta K. L., Romanek C. S., Clemett S. J. and Zare R. N. (1997b) Biogenic activity in Martian meteorite ALH84001 - status of the studies. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life*. (*eds*. Clifford *et al.) LPI Contribution* **916,** 35. Lunar Planetary Institute, Houston.
ALH84001

Gibson E. K., Jr., Romanek C. S., McKay D. S., Thomas-Keprta K. L., Allen C. C. and Wentworth S. (1997c) Nature of carbon phases in Allan Hills 84001. (abs) *Meteoritics Planet. Sci*. **32**, A47.
ALH84001

Gibson E. K., Jr., McKay D. S., Thomas-Keprta K. L. and Romanek C. S. (1997d) The case for relic life on Mars. *Scientific American* **277**, 58-65.

ALH84001

Gibson E. K., Jr., McKay D. S. and Thomas-Keprta K. L. (1998a) Exobiological features within ALH84001: Current observations. (abs) *Lunar Planet. Sci.* **XXIX** #1433, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Gibson E. K., Jr., McKay D. S., Thomas-Keprta K., Westall F. and Romanek C. A. (1998b) How do the properties of ALH84001 compare with accepted-criteria for evidence of ancient life? (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7010. Lunar Planetary Institute, Houston.

Gibson E. K., McKay D. S. and Thomas-Keprta K. L. (1998c) The case for life on Mars, Part 2: data support the hypothesis. *BioAstronomy News* **10**, 1-8.

Gibson E. K., Jr., McKay D. S. and Thomas-Keprta K. L. (1999a) Life on Mars: Evidence within Martin meteorites. (*ed*. Zubrin) *Proc. Founding Convention of Mars Soc.* part II, 437-447. Univelt, San Diego.

Gibson E. K., Jr., McKay D. S., Thomas-Keprta K. L., Westfall F. and Romanek C. S. (1999b) Criteria for evidence of ancient life: How does the data from ALH84001 compare with accepted requirements? (abs) *Lunar Planet. Sci.* **XXX** #1174, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Gibson E. K., Jr., McKay D. S., Thomas-Keprta K., Westall F. and Clemett S. J. (2000) What is the status of the hypothesis of evidence of biogenic activity within Martian meteorites: Alive or dead? (abs) *Meteoritics Planet. Sci.* **35**, A60.
ALH84001, Nakhla, Shergotty

Gibson and eight authors (2000) Life on Mars. *Precambrian Research* **106**, 15-34.
ALH84001, Nakhla, Shergotty

Gillet Ph., Barrat J.A., Heulin Th., Achouak W., Lesourd M., Guyot F. and Benzerara K. (2000) Bacteria in the Tatahouine meteorite: nanometric-scale life in rocks. *Earth Planet. Sci. Lett.* **175**, 161-167.

Gillet Ph., Barrat J.A., Crozaz G., Deloule E., Jambon A., Neuville D., Sautter V. and Wadhwa M. (2001) Aqueous alterations in the NWA817 Martian meteorite. (abs) *Meteoritics & Planet. Sci.* **36**, A66.
NWA817

Gillet Ph., Barret J.A., Deloule E., Wadhwa M., Jambon A., Sautter V., Devouard B., Neuville D., Benzerara K. and Lesourd M. (2002) Aqueous alteration in the Northwest Africa 817 (NWA 817) Martian meteorite. *Earth Planet. Sci. Lett.* **203**, 431-444.
NWA817

Gilmour J. D., Whitby J. A., Ash R. D. and Turner G. (1995) Xenon isotopes in irradiated and unirradiated samples of Allan Hills 84001. (abs) *Meteoritics* **30**, 510-511.
ALH84001

Gilmour J. D., Whitby J. A. and Turner G. (1996) Carrier phases of Xenon in ALH84001. (abs) *Meteoritics & Planet. Sci.* **31**, A51.
ALH84001

Gilmour J. D., Lyon I. C., Saxton J. M., Turner G. and Whitby J. A. (1997a) Oxygen and noble gas isotope constraints on the origin of ALH84001 carbonate. (abs) *Lunar Planet. Sci*. **XXVIII**, 421-422.
ALH84001

Gilmour J. D., Wogelius R. A., Grime G. W. and Turner G. (1997b) Major- and trace-element distributions in ALH84001 carbonate: Implications of a high temperature. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds*. Clifford *et al*.) *LPI Contribution* **916,** 37. Lunar Planetary Institute, Houston.
ALH84001

Gilmour J. D., Wogelius R. A., Grime G. W. and Turner G. (1997c) Trace- and major-element zoning in Allan Hills 84001 carbonate. (abs) *Meteoritics & Planet. Sci*. **32**, A48-49.
ALH84001

Gilmour J. D., Burgess R., Whitby J. A. and Turner G. (1998a) Soluble phaes in Nakhla, their Ar-Ar ages and noble gas contents. (abs) *Lunar Planet. Sci.* **XXIX** #1788, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Gilmour J. D., Whitby J. A. and Turner G. (1998b) The siting of Martian xenon in Nakhla. (abs) *Meteoritics & Planet. Sci.* **33**, A59.
Nakhla

Gilmour J. D., Whitby J. A. and Turner G. (1998c) Xenon isotopes in irradiated ALH84001: Evidence for shock-induced trapping of ancient Martian atmosphere. *Geochim. Cosmochim. Acta* **62**, 2555-2571.
ALH84001

Gilmour J. D., Whitby J. A., Burgess R. and Turner G. (1998d) Xenon and argon isotopes in irradiated, etched Nakhla: Characterising the host of Martian atmospheric Xenon. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7019. Lunar Planetary Institute, Houston.

Gilmour J. D., Whitby J. A. and Tuner G. (1999a) Comparative iodine geochemistry of Earth and Mars: A Possible biomarker? (abs) *Lunar Planet. Sci.* **XXX** #1661, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Gilmour J. D., Whitby J. A. and Turner G. (1999b) Martian atmospheric xenon contents of Nakhla mineral separates: implications for the origin of elemental mass fractionation. *Earth Planet. Sci. Lett.* **166**, 139-148.
Nakhla

Gilmour J. D., Whitby J. A. and Turner G. (2000) Extraterrestrial Xenon components in Nakhla. (abs) *Lunar Planet. Sci.* **XXXI,** #1513. Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Gilmour J. D., Whitby J. A. and Turner G. (2001) Disentangling xenon components in Nakhla: Martian atmosphere, spallation and Martian interior. *Geochim. Cosmochim. Acta* **65**, 343-354.
Nakhla

Gladman B. and Burns J. A. (1996) Towards a self-consistent model of lunar and Martian meteorite delivery. (abs) *Lunar Planet. Sci*. **XXVII**, 421-422.

Gladman B., Burns J. A., Duncan M., Lee P. and Levinson H. F. (1996) The exchange of impact ejecta between terrestrial planets. *Science* **271**, 1387-1390.

Gladman B. (1997) Destination: Earth. Martian meteorite delivery. *Icarus* **130**, 228-246.

Gleason J. D., Kring D. A. and Boynton W. V. (1995) Shergottite mixing relations, partial melting models,

and the neodymium evolution of the Martian mantle. (abs) *Meteoritics* **30**, 511.

Gleason J. D., Kring D. A. and Boynton W. V. (1996) The role of garnet in Martian mantle evolution: Further evidence from shergottite rare earth patterns. (abs) *Lunar Planet. Sci.* **XXVII**, 425-426.

Gleason J. D., Kring D. A. and Boynton W. V. (1997a) Divergent mantle evolution on Earth and Mars and the origin of depleted planetary mantles. (abs) *7th Goldschmidt Conf*., *LPI Contribution* **921**, 81. Tucson.

Gleason J. D., Kring D. A., Hill D. H. and Boynton W. V. (1997b) Petrography and bulk chemistry of Martian orthopyroxenite ALH 84001: Implications for the origin of secondary carbonates. *Geochem. Cosmochim. Acta* **61**, 3503-3512.
ALH84001

Gleason J. D., Kring D. A., Hill D. H. and Boynton W. V. (1997c) Petrography and bulk chemistry of Martian lherzolite LEW88516. *Geochim. Cosmochim. Acta* **61**, 4007-4014.
LEW88516

Gnos E., Hofmann B., Franchi I.A., Al-Kathiri A., Hauser M. and Moser L. (2002) Sayh al Uhaymir 094 – a new Martian meteorite from the Oman desert. *Meteoritics & Planet Sci*. **37**, 835-854.
SaU094

Gnos E., Hofmann B., Villa I.M. and AlKathiri A. (2002) Sayh al Uhaymir 094 – a new Martian meteorite from the Oman desert. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A280. Davos
SaU094

Golden D.C., Thomas-Keprta K.L., McKay D.S., Wentworth S.J., Vali H. and Ming D.W. (1997) Size distribution of magnetite in carbonate globules of ALH84001 Martian meteorite. (abs) *Lunar Planet. Sci.* **XXVIII**, 427-428.
ALH84001

Golden D. C., Ming D. W., Schwandt C. S., Morris R. V., Yang S. V. and Lofgren G. E. (1999a) An experimental study of kinetically-driven precipitation of Ca-Mg-Fe carbonates from solution: Implications for the low-temperature formation of carbonates in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXX**, #1973, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Golden D. C., Ming D. W., Schwandt C. S., Morris R. V., Yang S. V. and Lofgren G. E. (2000a) An experimental study of kinetically-driven precipitation of calcium-magnesian-iron carbonates from solution: Implications for the low-temperature formation of carbonates in Martian meteorite ALH84001. *Meteoritics & Planet. Sci.* **35**, 7457-465.
ALH84001

Golden D.C., Ming D. W., Schwandt C. S., Lauer H. V., Socki R. A., Morris R. V., Lofgren G. E. and McKay G. A. (2000b) Inorganic formation of zoned Mg-Fe-Ca carbonate globules with magnetite and sulfide rims similar to those in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXXI** #1799, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Golden D.C.and six authors (2001a) Comparison of carbonate globules synthetically by hydrothermal precipitation with Martian meteorite ALH84001 carbonate globules. (abs) *Lunar Planet. Sci.* **XXXII**, #2054. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Golden D.C., Ming D. W., Schwandt C. S., Lauer H. V., Jr., Socki R. A., Morris R. V., Lofgren G. E. and McKay G. A. (2001b) A simple inorganic process for the formation of carbonates, magnetite, and sulfides in Martian meteorite ALH84001. *Amer. Mineral.* **86**, 370-375.
ALH84001

Golden D.C. and seven authors (2001c) Erratum to "A simple inorganic process for the formation of carbonates, magnetites and sulfides in Martian meteorite ALH84001*"*. *Amer. Mineral.* **86**, 956.

Golden D.C., Ming D.W., Lauer H.V., Schwandt C.S., Morris R.V., Lofgren G.E. and McKay G.A. (2002a) Inorganic formation of "Truncated hexa-octahedral" magnetite: Implications for inorganic processes in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXXIII** #1933. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Golden D.C., Ming D.W., Zolensky M.E., Lauer H.V. Jr., Schwandt C.S., Morris R.V., Lofgren G.E. and McKay G.A. (2002b) Morphology of magnetite formed via thermal decomposition of sidertite: Implications for inorganic formation of magnetite in Martian meteorite ALH84001. (abs) *Meteoritics & Planet. Sci*. **37**, A53.
ALH84001

Golden and nine authors (2003) Morphological evidence for an exclusively inorganic origin for magnetite in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXXIV**, #1970. Lunar Planetary Institute, Houston
ALH84001

Gomez C.B. and Keil K. (1980) *Brazilian stone meteorites*. Univ. New Mexico Press, ABQ, 161 pages.
Governador Valadares

Gooding J.L. (1978) Chemical weathering on Mars: Thermodynamic stabilities of primary minerals (and their alteration products) from mafic rocks. *Icarus* **33,** 483-513.

Gooding J.L. (1984a) Low-temperature aqueous alteration in the early solar system: Possible clues from meteorites weathered in Antarctica. (abs) *Lunar Planet. Sci.* **XV**, 308-309.

Gooding J.L. (1984b) Search for "Martian(?) weathering" effects in achondrites EETA79001 and ALHA77005: Complications from Antarctic weathering. (abs) *Lunar Planet. Sci.* **XV**, 310-311.
EETA79001, ALHA77005

Gooding J.L. (1984c) Do igneous rocks fall from Mars and beyond? *Geotimes* **29**, 29.

Gooding J.L. (1987) Are SNCs smoked or salted? *Geotimes* **32**, 10-11.

Gooding J.L. (1988) Significance of terrestrial weathering effects in Antarctic meteorites. In *Field and laboratory investigations of meteorites from Victoria Land and the Thiel Mountains Region, Antarctica 1982-1983 and 1983-1984.* (*eds.* Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* **28**, 93-98. Washington, DC.

Gooding J.L. (1990) Scientific guidelines for preservation of samples collected from Mars. *NASA Tech. Memo*. **418**. Johnson Space Center, Houston.

Gooding J.L. (1992a) Aqueous geochemistry on Mars: Possible clues from salts and clays in SNC meteorites. (abs) In *MSATT workshop on chemical weathering on Mars. (eds*. Burns and Banin) *LPI Tech. Rpt*. **92-04**, 16-17. Lunar Planetary Institute, Houston.

Gooding J.L. (1992b) Soil mineralogy and chemistry on Mars: Possible clues from salts and clays in SNC

meteorites. *Icarus* **99,** 28-41.
EETA79001, ALHA77005, Shergotty, Nakhla, Chassigny

Gooding J.L. and Muenow D.W. (1986) Martian volatiles in shergottite EETA79001: New evidence from oxidized sulfur and sulfur-rich alumino-silicates. *Geochim. Cosmochim. Acta* **50,** 1049-1059.
EETA79001

Gooding J.L., Aggrey K. and Muenow D.W. (1987a) Pre-terrestrial volatile compounds in shergottites and nakhlites. (abs) *Meteoritics* **22**, 391.
ALHA77005, EETA79001, Nakhla, Shergotty

Gooding J.L., Wentworth S.J. and Zolensky M.E. (1987b) Martian (?) calcite and gypsum in shergottite EETA79001. (abs) *Lunar Planet. Sci.* **XVIII**, 345-346.
EETA79001

Gooding J.L., Wentworth S.J. and Zolensky M.E. (1988) Calcium carbonate and sulfate of possible extraterrestrial origin in the EETA79001 meteorite. *Geochim. Cosmochim. Acta* **52,** 909-915.
EETA79001

Gooding J.L., Carr M.H. and McKay C.P. (1989) The case for planetary sample return missions. 2. History of Mars. *EOS* **70**, 745.

Gooding J.L., Aggrey K.E. and Muenow D.W. (1990a) Volatile compounds in shergottite and nakhlite meteorites. *Meteoritics* **25**, 281-289.
EETA79001, Nakhla, ALHA77005, Shergotty

Gooding J.L., Aggrey K.E. and Muenow D.W. (1990b) Volatile compounds in shergottite and nakhlite meteorites. (abs) *Lunar Planet. Sci.* **XXI**, 423-424.

Gooding J. L., Wentworth S. J. and Zolensky M. E. (1991) Aqueous alteration of the Nakhla meteorite. *Meteoritics* **26**, 135-143.
Nakhla

Gooding J. L. and Wentworth S. J. (1991) Origin of "white druse" salts in the EETA79001 meteorite. (abs) *Lunar Planet. Sci.* **XXII**, 461-462.
EETA79001

Gooding J. L., Arvidson R. E. and Zolotov M. Yu. (1992) Physical and chemical weathering. In *Mars* (*eds*. Kieffer *et al.*), pp. 626-651, Univ. Arizona Press, Tucson.

Gooding J. L. and Wentworth S. J. (1996) Origin of "white druse" in the EETA79001 meteorite. Curator's note. JSC Curator's Office, Houston.
EETA79001

Goodrich C. A. (2001) Chromites in basaltic shergottite Sayh al Uhaymir 005: Implications for petrogenesis and relationship to Lherzolithic shergottites. (abs) *Lunar Planet. Sci.* **XXXII**, #1166. Lunar Planetary Institute, Houston. (CD-ROM)
SaU005

Goodrich C. A. and Zipfel J. (2001a) Magmatic inclusions in olivine and chromite in basaltic shergottite Sayh al Uhaymir 005: Implications for petrogensis. (abs) *Lunar Planet. Sci.* **XXXII**, #1174. Lunar Planetary Institute, Houston. (CD-ROM)
SaU005

Goodrich C.A. and Zipfel J. (2001b) The parent magma of the megacryst assemblage in Shergottite

EETA79001 (Lithology A) inferred from melt inclusions in olivine and chromite. (abs) *Meteoritics & Planet. Sci.* **36**, A69.
EETA79001

Goodrich C.A. and Harvey R.P. (2002) The parent magmas of lherzolitic shergottites ALH77005 and LEW88516: A reevaluation from magmatic inclusions in olivine and chromite. (abs) *Meteoritics & Planet. Sci*. **37**, A54.
ALH77005, LEW88516

Goodrich C.A. (2002) Petrogenesis of olivine-phyric shergottites Sayh al Uhaymir 005 and Elephant Moraine A79001 lithology A. (abs) Un-mixing SNCs. 17-18. LPI Contribution No. 1134.
EETA79001, SaU005

Goodrich C.A., Herd C.D.K. and Taylor L.A. (2003) Spinels and oxygen fugacity in olivine-phyric and lherzolithic shergottites. (abs) *Lunar Planet. Sci.* **XXXIV**, #1426. Lunar Planetary Institute, Houston

Goodrich C.A., vanNiekerk D. and Morgan M.L. (2003) Northwest Africa 1110: A new olivine-phyric shergottite possibly paired with Northwest Africa 1068. (abs) *Lunar Planet. Sci.* **XXXIV**, #1266. Lunar Planetary Institute, Houston
NWA1110

Goreva J.S., Guan Y. and Leshin L.A. (2002) Isotopic composition of carbon in Martian magmatic minerals: Insights into Martian carbon reservoirs. (abs) *Lunar Planet. Sci.* **XXXIII** #1933. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles

Goreva J.S., Leshin L.A. and Guan Y. (2003) Ion microprobe measurements of carbon isotopes in Martian phosphates: Insights into the Martian mantle. (abs #1987) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Goswami J.N., Sinha N., Murty S.V.S., Mohapatra R.K. and Clement C.J. (1997) Nuclear tracks and light noble gases in Allan Hills 84001: Preatmospheric size, fall characteristics, cosmic-ray exposure duration and formation age. *Meteoritics & Planet. Sci.* **32**, 91-96.
ALH84001, ALHA77005, EETA79001, Shergotty

Grady M.M. (2000) ***Catalogue of Meteorites.*** *Fifth edition.* Cambridge Univ. Press. *(see also catalogs by Graham et al. and Hey)*

Grady M.M., Gibson E.K., Wright I.P. and Pillinger C.T. (1989) The formation of weathering products on the LEW85320 ordinary chondrite: Evidence from carbon and oxygen stable isotope compositions and implications for carbonates in SNC meteorites. *Meteoritics* **24**, 1-7.

Grady M. M., Wright I. P., Franchi I. A. and Pillinger C. T. (1993) Nitrates in SNCs: Implications for the nitrogen cycle on Mars. (abs) *Lunar Planet. Sci.* **XXIV**, 553-554.
EETA79001

Grady M. M., Wright I. P., Douglas C. and Pillinger C. T. (1994a) Carbon and nitrogen in ALH84001. (abs) *Meteoritics* **29**, 469.
ALH84001

Grady M. M., Wright I. P. and Pillinger C. T. (1994b) A search for nitrates in Nakhla. (abs) *Lunar Planet. Sci.* **XXV**, 451-452.
Nakhla

Grady M. M., Wright I. P. and Pillinger C. T. (1995a) A search for nitrates in Martian meteorites. *J. Geophys. Res.* **100**, 5449-5455.
EETA79001, Nakhla

Grady M. M., Wright I. P., Douglas C. and Pillinger C. T. (1995b) Carbonates in Martian meteorites: A reappraisal. (abs) *Meteoritics* **30**, 511-512.
Nakhla

Grady M. M. and Hutchison R. (1996) The meteorite teaching package of the Natural History Museum. (abs) *Lunar Planet. Sci.* **XXVII**, 435-436.
Nakhla

Grady M. M., Wright I. P. and Pillinger C. T. (1996a) Nitrogen and Argon in ALH84001 revisted: Unraveling a Martian atmospheric componet. (abs) *Lunar Planet. Sci.* **XXVII**, 437-438.
ALH84001

Grady M. M., Verchovsky A., Wright I. P. and Pillinger C. T. (1996b) Fully automated stepped combustion analysis of carbon, nitrogen and argon in QUE94201: Comparison with other shergottites. (abs) *Meteoritics & Planet. Sci.* **31**, A52-A53.
QUE94201

Grady M. M., Wright I. P. and Pillinger C. T. (1996c) Opening a Martian can of worms? *Nature* **382**, 575-576.
ALH84001

Grady M. M., Verchovsky A. B., Wright I. P. and Pillinger C. T. (1997a) The light element geochemistry of Yamato 793605. (abs) *Meteoritics Planet. Sci*. **32**, A51.
Y793605

Grady M. M., Verchovsky A. B., Wright I. P. and Pillinger C. T. (1997b) Carbon, nitrogen and neon in Yamato 793605 lherzolite shergottite. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 46-48. Nat. Inst. Polar Res., Tokyo.
Y793605

Grady M. M., Wright I. P. and Pillinger C. T. (1997c) A carbon and nitrogen isotope study of Zagami. *J. Geophys. Res.* **102**, 9165-9173.
Zagami

Grady M. M., Verchovsky A. B., Wright I. P. and Pillinger C. T. (1997d) Light element geochemistry of Yamato-793605. *Antarctic Meteorite Research* **10***,* 151-162. Nat. Inst. Polar Res., Tokyo.
Y793605

Grady M. M., Wright I. P. and Pillinger C. T. (1998) A nitrogen and argon stable isotope study of Allan Hills 84001: Implications for the evolution of the Martian atmosphere. *Meteoritics Planet. Sci*. **33**, 795-802.
ALH84001

Grady M.M and Wright I.P (2003) Carbon reservoirs on Mars: Constraints from Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXIV**, #1312. Lunar Planetary Institute, Houston

Graham A. L., Bevan A. W. R. and Hutchison R. (1985) *Catalogue of Meteorites. Fourth Edition*. British Museum (Natural History). Univ. Arizona Press, Tucson.
Nakhla, Lafayette, Governador Valadares, Chassigny, Shergotty, Zagami

Graham G. A., Kearsley A. T., Wright I. P., Grady M. M. and Pillinger C. T. (2000) Carbonates in Los

Angeles 001 meteorite. (abs) *Meteoritics & Planet. Sci.* **35**, A63.
Los Angeles

Greenwood J. P., Riciputi L. R. and McSween H. Y., Jr. (1997a) Sulfur isotopic variations in sulfides from shergottites and ALH84001 determined by ion microprobe: No evidence for life on Mars. (abs) *Lunar Planet. Sci.* **XXVIII**, 459-460.
ALH84001

Greenwood J. P., Riciputi L. R. and McSween H. Y., Jr. (1997b) Sulfide isotopic compositions in shergottites and ALH84001 and possible implications for life on Mars. *Geochim. Cosmochim. Acta* **61**, 4449-4453.
Shergotty, Zagami, QUE94201, EETA79001, LEW88516, ALH84001

Greenwood J. P. and McSween H. Y., Jr. (1998) Origin of stoichiometric feldspathic glasses in ALH84001 by mixing of plagioclase and orthoclase during multiple shock events. (abs) *Lunar Planet. Sci.* **XXIX** #1830, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Greenwood J. P., Riciputi L. R. and McSween H. Y., Jr. (1998a) Sulfur isotopic ratios in Nakhla and Chassigny sulfides determined by ion microprobe: Implications for the Martian sulfur cycle. (abs) *Lunar Planet. Sci.* **XXIX** #1643, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla, Chassigny

Greenwood J. P., Riciputi L. R., Taylor L. A. and McSween H. Y., Jr. (1998b) Hydrothermal modification of sulfides in Nakhla, Lafayette and Chassigny. (abs) *Meteoritics & Planet. Sci.* **33**, A62-63.
Nakhla, Lafayette and Chassigny.

Greenwood J. P., Mojzsis S. J., Coath C. D. and Wasson J. T. (1999) Measurements of Sulfur-32,33,34 in Allan Hills 84001 and Nakhla sulfides by multicollecter secondary ion mass spectrometry: Implications for Crustal-Atmospheric exchange and biogenic activity on Mars. *Ninth Annual V. M. Goldschmidt Conference,* 103, Cambridge
ALH84001, Nakhla

Greenwood J. P., Warren P. H. and Rubin A. E. (2000a) Late-stage crystallization of Los Angeles, A new basaltic shergottite. (abs) *Lunar Planet. Sci.* **XXXI** #2074, Lunar Planetary Institute, Houston (CD-ROM).
Los Angeles

Greenwood J. P., Riciputi L. R., McSween H. Y., Jr. and Taylor L. A. (2000b) Modified sulfur isotopic compositons of sulfides in the nakhlites and Chassigny. *Geochim. Cosmochim. Acta* **64**, 1121-1131.
Nakhla, Governador Valadares, Lafayette, Chassigny

Greenwood J. P., Mojzsis S. J. and Coath C. D. (2000c) Sulfur isotopic compositions of individual sulfides in Martian meteorites ALH84001 and Nakhla: implications for crust-regolith exchange on Mars. *Earth Planet. Sci. Lett.* **184**, 23-35.
ALH84001, Nakhla

Greenwood J. P. and McSween H. Y., Jr. (2001) Petrogenesis of Allan Hills 84001: Constraints from impact-melted feldspathic and silica glasses. *Meteoritics & Planet. Sci.* **36**, 43-61
ALH84001.

Greenwood J. P., Mojzsis S. J. and Coath C. D. (2001) Development of the sulfur isotope biomarker for Mars sample return: Results from Los Angeles, Nakhla and ALH84001. (abs) *Lunar Planet. Sci.* **XXXII**, #1734. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles, Nakhla, ALH84001

Greenwood J.P. and Blake R.E. (2001) Oxygen isotope ratios of phosphate in ALH84001 and Los Angeles by ion microporbe : Development of a new biomarker in the search for life on Mars. (abs) *Meteoritics Planet. Sci.* **36**, A72.
ALH84001, Los Angeles

Greenwood J.P. and McKeegan K.D. (2002) Oxygen isotope composition of silica in ALH84001. (abs) *Meteoritics & Planet. Sci.* **37**, A54.
ALH84001

Green P. F., Bull R. K. and Durrani S. A. (1978) The fission track records of the Esterville, Nakhla and Odessa meteorites. *Geochim. Cosmochim. Acta* **42**, 1359-1366.
Nakhla

Greshake A. (1998) Transmission electron microscopy characterization of shock defects in minerals from the Nakhla SNC meteorite. (abs) *Meteoritics & Planet. Sci.* **33**, A63.
Nakhla

Greshake A. and Langenhorst F. (1997) Transmission electron microscope characterization of shock defects in minerals of the Martian meteorite Chassigny. (abs) *Meteoritics & Planet. Sci*. **32**, A52.
Chassigny

Greshake A., Stephen T. and Rost D. (1998) Symplectic exsolutions in olivine from the Martian meteorite Chassigny: Evidence for slow cooling under highly oxidizing conditions. (abs) *Lunar Planet. Sci.* **XXIX** #1069, Lunar Planetary Institute, Houston (CD-ROM).
Chassigny

Greshake A. and Stöffler D. (1999) Shock metamorphic features in the SNC meteorite Dar al Gani 476. (abs) *Lunar Planet. Sci.* **XXX** #1377, Lunar Planetary Institute, Houston (CD-ROM).
DaG476

Greshake A. and Stöffler D. (2000) Shock related melting phenomena in the SNC meteorite Dar al Gani 476. (abs) *Lunar Planet. Sci.* **XXXI** #1043, Lunar Planetary Institute, Houston (CD-ROM).
DaG476

Greshake A., Stephan T. and Rost D. (2000) Combined TEM and TOF-SIMS study of symplectite exsolutions in olivine from the Martian meteorites Nakhla and Governador Valadarez. (abs) *Lunar Planet. Sci.* **XXXI** #1150, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla, Governador Valadarez

Griffith L. L. and Shock E. L. (1995) A geochemical model for the formation of hydrothermal carbonates on Mars. *Nature* **377**, 406-408.
Shergotty, ALH84001

Griffith L. L., Shock E. L. and Arvidson R. E. (1995) Calculating the effects of hydrothermal alteration on Mars. (abs) *Luanr Planet. Sci.* **XXVI**, 517-518.

Griffith L. L. and Shock E. L. (1997a) Orthopyroxenite hydrothermal alteration pathways: Low vs. high temperature. (abs) *Lunar Planet. Sci*. **XXVIII**, 469-470.
ALH84001

Griffith L. L. and Shock E. L. (1997b) Hydrothermal hydration of Martian crust: Illustration via geochemical model calculations. *J. Geophys. Res*. **102**, 9135-9143.
Shergotty, Chassigny

Griffith L. L. and Shock E. L. (1998) New models of planetary processes that link magma evolution and hydrothermal alteration. (abs) *Lunar Planet. Sci.* **XXIX** #1971, Lunar Planetary Institute, Houston (CD-ROM).

Grimm R. E. and McSween H. Y., Jr. (1982) Numerical simulation of crystal fractionation in shergottite meteorites. *Proc. Lunar Planet. Sci. Conf.* **13th**; *J. Geophys. Res.* **87** (suppl.), A385-A392.
Shergotty, Zagami

Grimm R. E., McSween H. Y., Jr. and Callcott T. A. (1982) Numerical simulation of crystal fractionation in shergottites. (abs) *Lunar Planet. Sci.* **XIII**, 287-288.

Grossman J. N. (1994) The Meteoritical Bulletin, No. 76: The U. S. Antarctic meteorite collection. *Meteoritics* **29**, 100-143.
ALHA77005, EETA79001, ALH84001, LEW88516

Grossman J. N. and Score R. (1996) Recently classified specimens in the US Antarctic meteorite collection (1994-1996). *Meteoritics & Planet. Sci.* **31**, A161-A180.
QUE94201

Grossman J. N. (1998) The Meteoritical Bulletin, No. 83, 1999 July. *Meteoritics & Planet. Sci.* **34**, A169-186.
DaG476, DaG489

Grossman J. N. (2000) The Meteoritical Bulletin, No. 84, 2000 August. *Meteoritics & Planet. Sci.* **35**, A199-225.
DaG670, Dho019, Los Angeles, SaU005, **SaU008**

Grossman J. N. and Zipfel J. (2001) The Meteoritical Bulletin, No. 85, 2001 September. *Meteoritics & Planet. Sci.* **36**, A293-322.
DaG876, NWA480, NWA817, SaU051, SaU094

Guan Y., Hsu W., Leshin L.A., Wang H., Wang R., Zhang F., Lin C. and Zhang W. (2003) Hydrogen isotopes of phosphates in the new Martian meteorite GRV99027. (abs) *Lunar Planet. Sci.* **XXXIV**, #1830. Lunar Planetary Institute, Houston
GRV99027

Gulick V. C., *ed*. (1997) Mars 2005 sample return workshop. *LPI Tech. Rpt.* **97-01**. Lunar and Planetary Institute, Houston.

H TOP

Haag R. (1991) *Field guide of meteorites. 10th Aniversary Edition*. R. Haag, 60 pp, Tucson.
Zagami, Nakhla

Hale V.P.S., McSween H. Y., Jr. and McKay G. A. (1997) Estimates of cumulus pyroxene and intercumulus liquid compositions in Shergotty. (abs) *Meteoritics & Planet. Sci*. **32**, A54.
Shergotty, Zagami

Hale V.P.S., McSween H. Y., Jr. and McKay G. A. (1998) Cumulus pyroxene in Shergotty: Why do estimates vary between experimental and observational studies? (abs) *Lunar Planet. Sci.* **XXIX** #1109, Lunar Planetary Institute, Houston (CD-ROM).
Shergotty

Hale V.P.S., McSween H.Y., Jr. and McKay G.A. (1999) Re-evaluation of intercumulus liquid composition and oxidation state for the Shergotty meteorite. *Geochim. Cosmochim. Acta* **63,** 1459-

1470.
Shergotty, Zagami

Hall T. M. and Burns R. G. (1992) Fusion crusts of achondrites: Changes of mineralogy of iron in the outermost surfaces of meteorites. (abs) *Lunar Planet. Sci.* **XXIII**, 475-476.
Nakhla, EETA79001, ALHA77005

Halliday A. N., Wänke H., Birk J-L. and Clayton R. N. (2001) The accretion, composition and early differentiation of Mars. *Space Science Rev*. **96**, 197-230. *The Netherlan*ds

Hamilton V. E. and Christensen P. R. (1996) Determining the composition of Mars: Vibrational spectroscopy of the Zagami meteorite. (abs) *Lunar Planet. Sci.* **XXVII**, 481-482.
Zagami

Hamilton V. E. and Christensen P. R. (1997) Interpreting the origins and evolutions of Martian basalts from pyroxene composition, II, Vibrational spectroscopy of clinopyroxenes and terrestrial basaltic rocks. (abs) *Lunar Planet. Sci*. **XXVIII**, 499-500.

Hamilton V. E., Christensen P. R. and McSween H. Y. Jr. (1997a) Determining the compositions of Martain meteorites using thermal infrared emission spectroscopy: A precursor to Martian surface spectroscopy. (abs) *Meteoritics & Planet. Sci*. **32**, A55.
ALH77005, Nakhla, Lafayette, Zagami, EET79001

Hamilton V. E., Christensen P. R. and McSween H. Y. Jr. (1997b) Determination of Martian meteorite lithologies and mineralogies using vibrational spectroscopy. *J. Geophys. Res*. **102**, 25593-25603.
ALHA77005, Nakhla, Zagami, EETA79001

Hamilton V. E., Christensen P. R., McSween H. Y. Jr., Clark R. N. and Hoefen T. M. (2001) Spectral variations in MGS TES data of Nili Fossae: A possible source region for SNC meteorites on Mars? (abs) *Lunar Planet. Sci.* **XXXII**, #2184. Lunar Planetary Institute, Houston. (CD-ROM)

Hamilton V.E., Christensen P.R. and McSween H.Y. Jr. (2002) Global constraints on the source regions of Martian meteorites from MGS TES data. (abs) Meteoritics 65th meeting at UCLA. *Meteoritics & Planet. Sci*.

Hamilton V.E. and Christensen P.R. (2003) Detailed mineralogical analysis of Martian meteorite-like terrains using MGS TES and Odyssey THEMIS data. (abs. #1982) *Lunar Planet. Sci. Conf.* **34th** , Lunar Planetary Institute, Houston (CD-ROM).

Haramura H. (1995) Chemical compositions of Antarctic meteorites. In *Catalog of the Antarctic Meteorites.* (*eds.* Yanai and Kojima) page 48. Nat. Inst. Polar Res., Tokyo.
ALHA77005, Zagami

Hartmann W.K. (2002a) Mars cratering chronology system: Improved isochrons and dates. (abs) Meteoritics 65th meeting at UCLA. *Meteoritics & Planet. Sci*.

Hartmann W.K. (2002b) Mars meteorite statistics and the Martian uplands. (abs) Un-mixing SNCs. 19. LPI Contribution No. 1134.

Hartmann W.K., Popova O. and Nemtchinov I. (2003) SNC's that didn't make it: Analysis of impact crater clusters on Mars. (abs. #1815) *Lunar Planet. Sci. Conf.* **34th** , Lunar Planetary Institute, Houston (CD-ROM).

Hartmetz C. P., Wright I. P. and Pillinger C. T. (1991) Attempts to constrain the carbon isotopic composition of dispersed carbonate in EETA79001. (abs) *Meteoritics* **26**, 342.

EETA79001

Harper C. L. and Jacobsen S. B. (1994) Accretion chronology of the inner solar system: Isotopic constraints. (abs) *Meteoritics* **29**, 471.

Harper C. L., Nyquist L. E., Bansal B., Weismann H. and Shih C.-Y. (1995) Rapid accretion and early differentiation of Mars indicated by $^{142}Nd/^{144}Nd$ in SNC meteorites. *Science* **267**, 213-217.
Nakhla, Lafayette, Chassigny, Governador Valadares, Shergotty, Zagami, ALHA77005, EETA79001

Harvey R. P. (1998) Formation of carbonates in Allan Hills 84001 by impact metasomatism: Cooking with gas. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7019. Lunar Planetary Institute, Houston.

Harvey R. P. (2001) The Ferrar Dolerite: An Antarctic analog for Martian basaltic lithologies and weathering processes. (abs) Workshop on Martian Highlands. LPI

Harvey R. P. and McSween H. Y., Jr. (1991a) New observations of Nakhla, Governador Valadares and Lafayette, and their bearing on petrogenesis. (abs) *Lunar Planet. Sci.* **XXII**, 527-528.
Nakhla, Governador Valadares, Lafayette

Harvey R. P. and McSween H. Y., Jr. (1991b) Parental magmas of the nakhlites: Clues from the mineralogy of magmatic inclusions. (abs) *Meteoritics* **26**, 343.
Governador Valadares

Harvey R. P. and McSween H. Y., Jr. (1992a) The mineralogy and petrography of LEW88516. (abs) *Meteoritics* **27**, 231-232.
LEW88516

Harvey R. P. and McSween H. Y., Jr. (1992b) Petrogenesis of the nakhlite meteorites: Evidence from cumulate mineral zoning. *Geochim. Cosmochim. Acta* **56,** 1655-1663.
Nakhla, Lafayette, Governador Valadares

Harvey R. P. and McSween H. Y., Jr. (1992c) Parental magmas of the nakhlites re-examined. (abs) *Lunar Planet. Sci.* **XXIII**, 499-500.
Governador Valadares

Harvey R. P. and McSween H. Y., Jr. (1992d) Parent magma of the nakhlite meteorites: Clues from melt inclusions. *Earth Planet. Sci. Lett.* **111,** 467-482.
Nakhla, Governador Valadares

Harvey R. P., Wadhwa M., McSween H. Y., Jr. and Crozaz G. (1993) Petrography, mineral chemistry and petrogenesis of Antarctic shergottite LEW88516. *Geochim. Cosmochim. Acta* **57,** 4769-4783.
LEW88516

Harvey R. P. and McSween H. Y., Jr. (1994) Ancestor's bones and palimpsests: Olivine in ALH84001 and orthopyroxene in Chassigny. (abs) *Meteoritics* **29,** 472.
ALH84001, Chassigny

Harvey R. P. and McSween H. Y., Jr. (1995) Carbonates in the Martian orthopyroxenite ALH84001: Evidence of formation during impact-driven metasomatism. (abs) *Lunar Planet. Sci.* **XXVI**, 555-556.
ALH84001

Harvey R. P. and McSween H. Y., Jr. (1996) A possible high-temperature origin for the carbonates in

Martian meteorite ALH84001. *Nature* **382**, 49-51.
ALH84001

Harvey R. P., McCoy T. J. and Leshin L. A. (1996) Shergottite QUE94201: Texture, mineral compositions, and comparison with other basaltic shergottites. (abs) *Lunar Planet. Sci.* **XXVII**, 497-498.
QUE94201

Hargraves R. B., Collinson E. W., Arvidson R. E. and Spitzer C. R. (1977) Viking results. *J. Geophys. Res*. **82**, 4547-4558.

Hasan F. A. and Sears D. W. G. (1985) A thermoluminescence study of the shergottites. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 1314. Lunar Planetary Institute, Houston
Shergotty, EETA79001, Zagami, ALHA77005

Hasan F. A., Haq M. and Sears D. W. G. (1986) Thermoluminescence and the reheating history of meteorites- III: The shergottities. *Geochim. Cosmochim. Acta* **50**, 1031-1038.
Shergotty, EETA79001, Zagami, ALHA77005

Hasan F. A., Score R., Myers B. M., Sears H., Cassidy W. A. and Sears D. W. G. (1992) Natural thermoluminescence levels and the recovery location of Antarctic meteorites. In *Field and laboratory investigations of Antarctic Meteorites collected by United States Expedititons, 1985-1987*. (*eds.* Marvin and MacPherson). *Smithsonian Contri. Earth Sci*. **30**, 57-68.

Hashimoto M., McKay G., Le L., Schwandt C. and Mikouchi T. (1999) Experimental crystallization of a revised Shergotty bulk composition. (abs) *Meteoritics & Planet. Sci.* **34**, A51.

Haskin L., Frey F., Schmitt R. A. and Smith R. H. (1966) Meteorites, solar and terrestrial rare earth distributions. *Phys. Chem. Earth* **7**, 167-321.
Nakhla, Lafayette

Head J. N. and Melosh H. J. (2000) Launch velocity distribution of the Martian clan meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1937. Lunar Planetary Institute, Houston (CD-ROM).

Herd C. D. K. and Papike J. J. (1998) Estimates of oxygen fugacity in the basaltic shergottites from electron microprobe oxygen analysis. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7019. Lunar Planetary Institute, Houston.

Herd C. D. K. and Papike J. J. (1999) Implications for the petrogensis of Martian meteorite Dar al Gani 476 from spinel, olivine and pyroxene compositions. (abs) P-62, GSA, Denver.
DaG476

Herd C. D. K., Jones J. H. and Papike J. J. (2000a) Experimental constraints on the Cr content, oxygen fugacity and petrogenesis of EETA79001 lithology A. (abs) *Lunar Planet. Sci.* **XXXI,** #1387. Lunar Planetary Institute, Houston (CD-ROM).
EETA79001

Herd C. D. K., Shearer C. K. and Papike J. J. (2000b) Systematics of Ni and Co in olivine from planetary melt systems: Martian basalts Dar al Gani 476 and EETA79001. (abs) *Lunar Planet. Sci.* **XXXI,** #1390. Lunar Planetary Institute, Houston (CD-ROM).
DaG476, EETA79001

Herd C. D. K. and Papike J. J. (2000c) Oxygen fugacity of the Martian basalts from analysis of iron-titanium oxides: Implications for Mantle-crust interaction on Mars. (abs) *Meteoritics & Planet. Sci.* **35**, A70.

QUE94201, DaG476, EETA79001, Shergotty, Zagami, Los Angles

Herd C. D. K., Jones J. H., Schearer C. K. and Papike J. J. (2001a) Systematics of Ni, Co, Cr and V in olivine from planetary melt systems: Martian basalts. (abs) *Lunar Planet. Sci.* **XXXII**, #1635. Lunar Planetary Institute, Houston. (CD-ROM)
DaG476, EETA79001, ALH77005, LEW88516

Herd C. D. K., Borg L. E. and Papike J. J. (2001b) Controls on oxygen fugacity during Martian basalt petrogenesis: Clues from geochemical correlations. (abs) *Lunar Planet. Sci.* **XXXII**, #1150. Lunar Planetary Institute, Houston. (CD-ROM)

Herd C.D.K., Karner J. M., Shearer C. K. and Papike J. J. (2001c) The effect of oxygen fugacity on Co and Ni partioning in olivine: Insights into Martian magmas. (abs) *Meteoritics & Planet. Sci.* **36**, A78-79.
Dho019, DaG476, EETA79001, LEW88516, ALH77005

Herd C.D.K., Papike J.J. and Brearley A.J. (2001d) Oxygen fugacity of Martian basalts from electron microprobe oxygen and TEM-EELS analysis of Fe-Ti oxides. *Amer. Mineralogist* **86**, 1015-1024.
Shergotty, Zagami, EETA79001, DaG476, QUE94201, Los Angeles

Herd C.D.K., Borg L. E., Jones J.H. and Papike J. J. (2002a) Oxygen fugacity and geochemical variations in the Martian basalts: Implications for Martian basalt petrogenesis and the oxidation state of the upper mantle of Mars. *Geochim. Cosmochim. Acta* **66**, 2025-2036.

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2002b) Experimental lithium and boron partition coefficients: Implications for magmatic water in Martian meteoeites. (abs) *Lunar Planet. Sci.* **XXXIII** #1333. Lunar Planetary Institute, Houston. (CD-ROM)

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2002c) Implications of experimental lithium and boron partition coefficients for the petrogenesis of Martian basalts. (abs) *Meteoritics & Planet. Sci.* **37**, A62.

Herd C.D.K., Schwandt C.S., Jones J.H. and Papike J.J. (2002d) An experimental and petrographic investigation of Elephant Moraine 79001lithology: Implications for its petrogenesis and the partioning of chromium and vanadium in a Martian basalt. *Meteoritics & Planet. Sci.* **37**, 987-1000.
EETA79001

Herd C.D.K. (2002) Martian basalt oxygen fugacity and geochemistry: Implications for a heterogeneous Martina mantle. (abs) Un-mixing SNCs. 21-22. LPI Contribution No. 1134.

Herd C.D.K., Treiman A.H., McKay G.A. and Shearer C.K. (2003) Light lithophile elements in natural and experimental phases in Martian basalts: Implications for the degassing of water from Martian magmas. (abs #1635) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Herpers U., Vogt S., Bremer K., Hofmann H. J., Suter M., Wieler R., Lange H.-J. and Michel R. (1995) Cosmogenic nuclides in differentiated Antarctic meteorites: measurements and model calculation. *Planet. Space Sci*. **43**, 545-556.
ALH84001

Hess P.C. (2002) Origin of the Martian Crust and Mantle. (abs) Un-mixing SNCs. 23-24. LPI Contribution No. 1134.

Hey M. H. (1966) *Catalog of Meteorites.* British Museum (Natural History), London.
Shergotty, Nakhla, Chassigny

Heymann D., Mazor E. and Anders E. (1968) Ages of the calcium-rich achondrites - I. Eucrites. *Geochim.*

Cosmochim. Acta **32,** 1241-1268.
Shergotty, Zagami

Hidaka H., Yoneda S. and Nishiizumi K. (2001) Neutron capture effects on SM and Gd isotopes in Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A680-81.
ALH77005, ALH84001, EETA79001, Lafayette, Nakhla, SaU005, Zagami

Hofmann B. A., Gnos E., Hauser M., Moser L., AlKathiri A. and Franchi I. A. (2001) The 2001 Omani-Swiss meteorite search campaign and recovery of Shergottite Sayh al Uhaymir 094. (abs) *Meteoritics & Planet. Sci.* **36**, A82-83.
SaU094

Hohenberg C. M. (1968) PhD Thesis, Univer. Calif., Berkeley.
Lafayette

Holland G., Lyon I. C., Saxton J. M. and Turner G. (1999) Evidence for an unusual generation of carbonate in Allan Hills 84001. *Meteoritics & Planet. Sci.* **34**, A55-56.
ALH84001

Holland G., Lyon I. C., Cliff B., Lockyer N. P. and Vickerman J. C. (2000a) Halogen concentrations and distribution in Allan Hills 84001 measured by time-of-flight secondary ion mass spectroscopy. (abs) *Meteoritics & Planet. Sci.* **35**, A76.
ALH84001

Holland G., Lyon I. C., Saxton J. M. and Turner G. (2000b) Very low oxygen-isotopic ratios in Allan Hills 84001 carbonates: possible meteoric component? (abs) *Meteoritics & Planet. Sci.* **35**, A76-77.
ALH84001

Holland G., Lyon I. C., Cliff B., Lockyer N. P. and Vickerman J. C. (2001a) Halogen concentrations and possible chlorine zoning in ALH84001 measured by time-of-flight SIMS and electron microprobe. (abs) *Lunar Planet. Sci.* **XXXII**, #1654. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Holland G., Lyon I. C., Saxton J. M. and Turner G. (2001b) Atmospheric precipitation as a possible origin of very light oxygen isotopes in ALH84001 carbonate. (abs) *Meteoritics & Planet. Sci.* **36**, A83-84.
ALH84001

Hoover R. B. (1997) Meteoritic nanofossils and microfossils. (abs) *7th Goldschmidt Conf. LPI Contribution* **921**, 99. Tucson.
ALH84001

Hörz F., Hanss R. and Serna C. (1986) X-ray investigations related to the shock history of the Shergotty achondrite. *Geochim. Cosmochim. Acta* **50**, 905-908.
Shergotty

Humayun M. and Clayton R. N. (1993) Potassium isotope cosmochemistry, volatile depletion and the origin of the Earth. (abs) *Lunar Planet. Sci.* **XXIV**, 685-686.
Shergotty, Zagami

Hume W. F. (1911) The first meteorite record in Egypt. *Cairo Sci. Journ.* **vol V**, no. 59, page 212.
Nakhla

Hunten D. M., Pepin R. O. and Walker J. C. G. (1987) Mass fractionation in hydrodynamic escape. *Icarus* **69**, 532-549.
EETA79001

Hutchins K. S. and Jakosky B. M. (1997) Carbonates in Martian meteorite ALH84001: A planetary perspective on the formation temperature. *Geophys. Res. Let.* **24**, 819-822.
ALH84001

Hutchison R., Gale N. H. and Arden J. W. (1975) Invalid 4.01 Gyr. model U-Pb "age" of the Nakhla meteorite. *Nature* **254**, 678-680.
Nakhla

Hutchison R. (1981) The significance of unique or rare meteorties. *Nature* **293**, 260.
Nakhla

I TOP

Ihinger P.D., Chamberlin S. and Smith S. (2002) Inorganic terrestrial analog for carbonate-magnetite-pyrite assemblage in ALH84001. (abs) *Lunar Planet. Sci.* **XXXIII** #2057. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Ikeda Y. (1994) Petrography and petrology of the ALHA77005 shergottite. *Proc. NIPR Symp. Antarctic Meteorites* **7th,** 9-29. Nat. Inst. Polar Res., Tokyo.
ALHA77005

Ikeda Y. (1997a) Petrology of the Yamato 793605 lherzolitic shergottite. (abs) *Meteoritics & Planet. Sci*. **32**, A64.
Y793605

Ikeda Y. (1997b) Petrology and mineralogy of the Y-793605 Martian meteorite. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 64-65. Nat. Inst. Polar Res., Tokyo.
Y793605

Ikeda Y. (1997c) Petrology and mineralogy of the Y-793605 Martian meteorite. *Antarctic Meteorite Research* **10***,* 13-40. Nat. Inst. Polar Res., Tokyo.
Y793605

Ikeda Y. (1998) Petrology of magmatic silicate inclusions in the Allan Hills 77005 lherzolitic shergottite. *Meteoritics & Planet. Sci*. **33**, 803-812.
ALH77005

Ikeda Y. (2001a) Magmatic inclusions in the DaG 735 shergottite. (abs) *NIPR Sym. Antarctic Meteorites* **24th***,* 43. Nat. Inst. Polar Res., Tokyo.
DaG735

Ikeda Y. (2001b) Magmatic and unusual inclusions in olivine grains in the Dar al Gani 735 shergottite. (abs) *Meteoritics & Planet. Sci.* **36**, A86.
DaG735

Ikeda Y., Takeda H., Kimura M. and Suzuki A. (2002) A new shergottite from Oman, Dhofar 378. (abs) *Lunar Planet. Sci.* **XXXIII** #1434. Lunar Planetary Institute, Houston. (CD-ROM)
Dho378

Ikeda Y., Takeda H., Kimura M and Nakamura N. (2002) A new basaltic shergottite, Dhofar 378. (abs) *Antarctic Meteorites* **XXVII**, 40-42, NIPR, Tokyo
Dho378

Ilg S., Jessberger E.K. and El Goresy A. (1997) Argon-40/Argon-39 laser extraction dating of individual maskelynites in SNC pyroxenite ALH84001. (abs) *Meteoritics & Planet. Sci*. **32**, A65.
ALH84001

Imae N., Okazaki R., Kojima H. and Nagao K. (2002) The frst nakhlite from Antarctica. (abs) *Lunar Planet. Sci.* **XXXIII** #1483. Lunar Planetary Institute, Houston. (CD-ROM)
Y000593, Y000749

Imae N., Iwata N. and Shimoda Y. (2002) Search for Antarctic meteorites in the bare ice field around the Yamato mountains by JARE-41. *Antarct. Meteorite Res*. **15**, 1-24.

Imae N., Ikeda Y., Shinoda K., Kojima H. and Iwata N. (2002) Two nakhlites from Antarctica: Y000593 and Y000749. (abs) *Antarctic Meteorites* **XXVII**, 45-47, NIPR, Tokyo
Y000593, Y000749

Imae N., Ikeda Y. and Kojima H. (2003) Igneous petrogenesis of Yamato nakhlites. (abs) *Lunar Planet. Sci.* **XXXIV**, #1520. Lunar Planetary Institute, Houston
Y000593, Y000749, Y000802

Irving A.J., Kuehner S.M., Rumble D. III, Carlson R.W., Hupe A.C. and Hupe G.M. (2002a) Petrology and isotopic composition of orthopyroxene-bearing nakhlite NWA 998. (abs) *Meteoritics & Planet. Sci.* **37**, A70.
NWA998

Irving A.J., Kuehner S.M., Hupe A.C. and Hupe G.M. (2002b) Olivine-phyric basaltic shergottite NWA1195: a very primitive Martian lava. (abs) *Meteoritics & Planet. Sci.* **37**, A69.
NWA1195.

Irving A.J. and Kuehner S.M. (2003) Petrology of NWA1460: A baddelyite-bearing shergottite paired with NWA 480. (abs) *Lunar Planet. Sci.* **XXXIV**, #1503. Lunar Planetary Institute, Houston
NWA1460

Ishii T., Takeda H. and Yanai K. (1979) Pyroxene geothermometry applied to a three-pyroxene achondrite from Allan Hills, Antarctica and ordinary chondrites. *Miner. Jour.* **9,** 460-481.
ALHA77005

J TOP

Jagoutz E. (1986) Sm-Nd and Rb-Sr systematics of the SNC meteorite ALHA77005. (abs) *Lunar Planet. Sci.* **XVII**, 384-385.
ALHA77005

Jagoutz E. (1987) New light on shergottites: ALHA77005, the shock age. (abs) *Meteoritics* **22**, 417-418.
ALHA77005

Jagoutz E. (1989a) Is the shergottite EETA79001 a breccia? (abs) *Lunar Planet. Sci.* **XX**, 450-451.
EETA79001

Jagoutz E. (1989b) Sr and Nd isotopic systematics in ALHA77005: Age of shock metamorphism in shergottites and magmatic differentiation on Mars. *Geochim. Cosmochim. Acta* **53,** 2429-2441.
ALHA77005

Jagoutz E. (1991) Chronology of SNC meteorites. *Space Sci. Rev.* **56,** 13-22. *(a review*)

Jagoutz E. (1996) Nd isotopic systematics of Chassigny. (abs) *Lunar Planet. Sci.* **XXVII**, 597-598.

Chassigny

Jagoutz E. (1997a) Why the SNC meteorites might not come from Mars. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds*. Clifford *et al*.) *LPI Contribution* **916,** 42. Lunar Planetary Institute, Houston.

Jagoutz E. (1997b) Isotopic constraints on differentiation and evolution of SNC meteorites. (abs) *Lunar Planet. Sci.* **XXVIII**, 651-652.
EETA79001, Chassigny

Jagoutz E. (1998) Models on SNC differentiation processes as constraint by isotopes. (abs) *Lunar Planet. Sci.* **XXIX** #1662, Lunar Planetary Institute, Houston (CD-ROM).

Jagoutz E. and Wänke H. (1985a) Sm-Nd and Rb-Sr isotope studies on Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 15-16. Lunar Planetary Institute, Houston
Shergotty

Jagoutz E. and Wänke H. (1985b) Nd and Sr isotope studies on Shergotty meteorite. (abs) *Meteoritics* **20**, 672-673.
Shergotty

Jagoutz E. and Wänke H. (1986) Sr and Nd isotopic systematics of Shergotty meteorite. *Geochim. Cosmochim. Acta* **50,** 939-953.
Shergotty

Jagoutz E. and Wänke H. (1990) Two stage isotopic evolution of SNC meteorites. (abs) *Meteoritics* **25**, 373.

Jagoutz E., Luck J. M. and Wänke H. (1993a) Os isotopes in SNC meteorites and their implications for the early evolution of Mars and Earth. (abs) *Meteoritics* **28**, 372-373.
Chassigny

Jagoutz E., Luck J. M., Othman B. and Wänke H. (1993b) Os isotopes in SNC meteorites and their implications to the early evolution of Mars and Earth. (abs) *Lunar Planet. Sci.* **XXIV**, 711-712.
Chassigny

Jagoutz E., Sorowka A., Vogel J. D. and Wänke H. (1994) ALH84001: Alien or progenitor of the SNC family? (abs) *Meteoritics* **29,** 478-479.
ALH84001

Jagoutz E. and Dreibus G. (1997) On the significance of the internal ages and the assocoiated chemical changes in SNC meteorites. (abs) *Meteoritics & Planet. Sci*. **32**, A66-67.

Jagoutz E., Bogdanovski O., Krestina N. and Jotter R. (1999) DAG: A new age in the SNC family, or the first gathering of relatives. (abs) *Lunar Planet. Sci.* **XXX**, #1808, Lunar Planetary Institute, Houston. (CD-ROM)
DaG476

Jagoutz E. and Dreibus G. (2000) Isotopic systematics of SNC meteorites. (abs) *Antarctic Meteorites* **XXV**. NIPR, Tokyo.

Jagoutz E. and Jotter R. (2000) New Sm-Nd isotopic data on Nakhla minerals. (abs) *Lunar Planet. Sci.* **XXXI,** #1609. Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Jagoutz E. and Kubny A. (2000) Vibrational spectroscopic study of feldspathic glasses in SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1218. Lunar Planetary Institute, Houston (CD-ROM).

Jagoutz E., Jotter R. and Dreibus G. (2000) Evolution of six SNC meteorites with anomalous Neodinium-142. (abs) *Meteoritics & Planet. Sci.* **35**, A83.

Jagoutz E., Jotter R., Dreibus G. and Zartman R. (2001a) New U-Pb isotopic data on SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1307. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla, SaU005

Jagoutz E., Jotter R. and Zartman R. (2001b) Initial Pb isotopes and Rb-Sr isotopic systematics of some SNC meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A89-90.

Jagoutz E., Dreibus G., Jotter R., Kubny A. and Zartman R. (2002) New U-Pb data on clean Nakhla minerals. (abs) *Meteoritics & Planet. Sci.* **37**, A71.
Nakhla

Jagoutz E. and Dreibus G. (2002) New aspects in the isotopic systematics of shergottites. (abs) Un-mixing SNCs. 25-26. LPI Contribution No. 1134.

Jakosky B. M. (1991) Mars volatile evolution: Evidence from stable isotopes. *Icarus* **94,** 14-31.

Jakosky B. M. (1993) Mars volatile evolution: Implications of the recent measurement of ^{17}O in water from the SNC meteorites. *Geophys. Res. Lett.* **20,** 1591-1594.

Jakosky B. M. (1997a) The case for life on Mars. *The Planetary Report* **XVII**, 12-17.

Jakosky B. M. (1997b) Mars Life ? One year later. *The Planetary Report* **XVIII**, 10-14.
ALH84001

Jakosky B. M. (1997c) Martian exobiology: Introduction. *J. Geophys. Res*. **102**, 23673-23674.

Jakosky B. M. (1998a) *The search for life on other planets*. Cambridge University Press. Cambridge. 336 pp. *(see review by Bada)*
ALH84001

Jakosky B. M. and Jones J. H. (1995) Mars volatile evolution from SNC and planetary data analysis. (abs) *Lunar Planet. Sci.* **XXVI**, 667-668.

Jakosky B. M. and Jones J. H. (1997) The history of Martian volatiles. *Rev. of Geophysics* **35**, 1-16.

Jambon A., Barrat J.A., Gillet Ph., Göpel C., Javoy M., Joron J-L. and Sautter V. (2001) One more shergottite from North Western Africa. (abs) *Meteoritics & Planet. Sci.* **36**, A90.
NWA856

Jambon A., Barrat J.A., Sautter V., Gillet Ph., Göpel C., Javoy M., Joron J-L. and Lesourd M. (2002) The basaltic shergottite North West Africa 856: Petrology and chemistry. *Meteoritics & Planet. Sci.* **37,** *1147-1164.*
NWA856

Jarosewich E. (1980) Chemical analyses of some Allan Hills meteorites. In *Smithson. Contrib. Earth Sci.* **23**, 48.
ALHA77005

Jarosewich E. (1984) Bulk chemical analyses of Antarctic meteorites, with notes on weathering effects on FeO, Fe-metal, FeS, H_2O and C. *Smithson. Contrib. Earth Sci.* **26**, 111-114. Washington, DC.
ALHA77005

Jarosewich E. (1990a) Chemical analyses of meteorites: A compilation of stony and iron meteorite analyses. *Meteoritics* **25**, 323-337.
ALHA77005, **EETA79001**

Jarosewich E. (1990b) Homogenized powders of Antarctic meteorites. *Antarctic Meteorite Newsletter* **13 (1),** 134.
ALHA77005, **EETA79001**

Jérémine E., Orcel J. and Sandréa A. (1962) Etude minéralogique et structurale de la météorite de Chassigny. *Bull. Soc. Fr. Mineral. Cristalogr.* **85**, 262-266.
Chassigny

Jérome D. Y. (1970) *Composition and origin of some achondrite meteorites*. PhD Dissertation. Univ. Oregon.
Shergotty, Chassigny

Jérome D. Y. and Goles G. G. (1971) A re-examination of the relationships among pyroxene-plagioclase achondites. In *Activation Analysis in Geochemistry and Cosmochemistry* (*eds.* Brunfelt and Steinnes) 261-266. Universitesforaget, Oslo.

Jessberger E. K. (1991) Discussion: Returned Martian samples. *Space Science Rev*. **56**, 59-63.

Jessberger E. K., Schaffer O. A., Warasila R., Walker R. and Labotka T. (1981) Unmasking "extra" ^{40}Ar in ALHA77005 by the laser extraction technique. (abs) *Meteoritics* **16**, 331-332.
ALHA77005

Jochum K. P. and Palme H. (1987) Abundances and ratios of refractory elements in SNC-meteorites and eucrites. (abs) *Meteoritics* **22**, 420-421.

Jochum K. P. and Palme H. (1990) Alkali elements in eucrites and SNC-meteorites: No evidence for volatility related losses during magmatic eruption or thermal metamorphism. (abs) *Meteoritics* **25**, 373-374.
Zagami, Shergotty, Lafayette, Nakhla, EETA79001, ALHA77005, Chassigny

Jochum K. P., Stoll B., Amini M. and Palme H. (2001) Limited trace element fractionation in SNC meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A90-91.

Johnson M. C., Rutherford M. J. and Hess P. C. (1989) Experimental study of igneous kaersutite stability with application to SNC petrogenesis. (abs) *Lunar Planet. Sci.* **XX**, 472-473.

Johnson M. C., Rutherford M. J. and Hess P. C. (1991) Chassigny petrogenesis: Melt compositions, intensive parameters, and water contents of Martian (?) magmas. *Geochim. Cosmochim. Acta* **55,** 349-366.
Chassigny

Jones J. H. (1985a) The youngest meteorites: I. A 180 m.y. igneous age for the shergottites - The constraint of petrography. (abs) *Lunar Planet. Sci.* **XVI**, 406-407.
EETA79001

Jones J. H. (1985b) The youngest meteorites: III. Implications of 180 m.y. igneous activity on the SPB.

(abs) *Lunar Planet. Sci.* **XVI**, 408-409.

Jones J. H. (1986) A discussion of isotopic systematics and mineral zoning in the shergottites: Evidence for a 180 m.y. igneous crystallization age. *Geochim. Cosmochim. Acta* **50**, 969-977.

Jones J. H. (1988) Speculations on the igneous history of Mars: Inferences from the SNC meteorties. In *Workshop on Mars Sample Return Science.* (*eds* Drake *et al*.) *LPI Tech. Rpt*. **88-07**, 97-98. Lunar Planetary Institute, Houston.

Jones J. H. (1989) Isotopic relationships among the shergottites, the nakhlites and Chassigny. *Proc. Lunar Planet. Sci. Conf.* **19th**, 465-474. Lunar Planetary Institute, Houston.
Shergotty, Zagami, ALHA77005, EETA79001, Nakhla, Chassigny

Jones J. H. (1992) Distribution of water on Mars: Implications from SNC meteorites. (abs) In *Workshop on the Martian surface and atmosphere through time*. *LPI Tech Rpt*. **92-0,** 78-79. Lunar Planetary Institute, Houston.

Jones J. H. (1993) SNC meteorites and their implications for reservoirs of Martian volatiles. In *Mars: Past present and future - results from the MSATT program.* (*ed*. Haberle) *LPI Tech. Rpt*. **93-06,** Lunar Planetary Institute, Houston.

Jones J. H. (1996) Martian volatiles: Insights from the SNC meteorites. (abs) In *Workshop on evolution of Martian volatiles.* (*eds.* Jakosky and Treiman) *LPI Tech. Rpt* **96-01**, 30-31. Lunar Planetary Institute, Houston.
EETA79001, ALH84001, Shergotty, Zagami, Chassigny

Jones J.H. (2001) Alternative view of Martian Pb and Os. (abs) *Lunar Planet. Sci.* **XXXII**, #1355. Lunar Planetary Institute, Houston. (CD-ROM)

Jones J.H. (2002) Volatile element reservoirs on Mars: C and H isotopic signatures of crust, mantle and aquifer. (abs) *Lunar Planet. Sci.* **XXXIII** #1150. Lunar Planetary Institute, Houston. (CD-ROM)

Jones J. H., Benjamin T. M., Duffy C. J., Rogers P. S. Z., Hollander M. and Maggiore C. J. (1985a) A tale of two phosphates: REE reservoirs in the Shergotty meteorite. (abs) *Meteoritics* **20**, 674-675.
Shergotty

Jones J. H., Benjamin T. M., Hollander M., and Conner J. (1985b) The youngest meteorites: II. Trace element zoning in Zagami maskelynite. (abs) *Lunar Planet. Sci.* **XVI**, 410-411.
Zagami

Jones J. H., Jurewicz A. J. G. and Le. L. (1991) A liquidus phase diagram for a primitive shergottite. (abs) *Meteoritics* **26**, 353.
EETA79001, Shergotty, Zagami

Jones J. H., Borg L. E. and Nyquist L. E. (1997) Contrasting styles of differentiation for the Earth, Moon and Mars. (abs) *7th Goldschmidt. Conf., LPI Contribution* **921**, 108. Tucson.

Jones J. H. and Schwandt C. S. (1998) Experimental investigations of the high-temperature stability of siderite: Implications for the origin of ALH84001 carbonates. (abs) *Lunar Planet. Sci.* **XXIX** #1425, Lunar Planetary Institute, Houston (CD-ROM).

Jones J.H. (2002) SNC meteorites and Martian resovoirs. (abs) Un-mixing SNCs. 27-28. LPI Contribution No. 1134.

Jones J.H. (2003) A liquidus geothermometer for SNC, lunar and Eucritic magmas. (abs. #1130) *Lunar*

Planet. Sci. Conf. **34th** , Lunar Planetary Institute, Houston (CD-ROM).

Jovanovic S. and Reed G. W. (1987) Isotopically anomalous Hg in Antarctic achondrites. *J. Geophys. Research Lett*. **14**, 1127-1130.
Shergotty, ALH84001, EETA79001

Jull A. J. T. and Donahue D. J. (1988) Terrestrial ^{14}C age of the Antarctic shergottite EETA79001. *Geochim. Cosmochim. Acta* **52**, 1309-1311.
EETA79001

Jull A. J. T., Donahue D. J. and Linick T. W. (1989) Trends in carbon-14 terrestrial ages of Antarctic meteorites from different sites. (abs) *Lunar Planet. Sci.* **XX**, 488-489.
ALH84001

Jull A. J. T., Donahue D. J., Swindle T. D., Burkland M. K., Herzog G. F., Albrecht A., Klein J. and Middleton R. (1992) Isotopic studies relevant to the origin of the "white druse" carbonates on EETA79001. (abs) *Lunar Planet. Sci.* **XXIII**, 641-642.
EETA79001

Jull A. J. T., Donahue D. J., Eastoe C. J., Swindle T. D., Burkland M. K. and Herzog G. F. (1994a) Isotopic evidence for extraterrestrial carbonates in the SNC meteorites ALH84001 and Nakhla. (abs) *Meteoritics* **29**, 479.
ALH84001, Nakhla

Jull A. J. T., Cielaszyk E., Brown S. T. and Donahue D. J. (1994b) ^{14}C terrestrial ages of achondrites from Victoria Land, Antarctica. (abs) *Lunar Planet. Sci.* **XXV**, 647-648.
LEW88516, ALH84001

Jull A. J. T., Eastoe C. J., Xue S. and Herzog G. F. (1995) Isotopic composition of carbonate in the SNC meteorites ALH84001 and Nakhla. *Meteoritics* **30**, 311-318.
Nakhla, ALH84001

Jull A. J. T., Cloudt S. and Eastoe C. J. (1996a) Isotopic composition of carbonates in some SNC meteorites. (abs) In *Workshop on evolution of Martian volatiles.* (*eds*. Jakosky and Treiman) *LPI Tech. Rpt*. **96-01**, 22-23. Lunar Planetary Institute, Houston.
ALH84001, Nakhla, Zagami

Jull A. J. T., Cloudt S. and Eastoe C. J. (1996b) The ^{14}C and stable isotopic composition of carbonates in SNC meteorites. (abs) *Meteoritics & Planet. Sci*. **31**, A68.
ALH84001, Nakhla, Zagami

Jull A. J. T., Eastoe C. J. and Cloudt S. (1997a) Isotopic composition of carbonates in the SNC meteorites, Allan Hills 84001 and Zagami. *J. Geophys. Res.* **102**, 1663-1669.
ALH84001, Zagami, Nakhla

Jull A. J. T., Eastoe C. J. and Cloudt S. (1997b) Terrestrial age of the Lafayette meteorite and stable-isotopic composition of weathering products. (abs) *Lunar Planet. Sci.* **XXVIII**, 685-686.
Lafayette

Jull A. J. T., Cloudt S., Courtney C. and Eastoe C. J. (1997c) Carbon-14 and stable-isotopic composition of organic material and carbonates from some SNC meteorites. (abs) *Meteoritics & Planet. Sci*. **32**, A68.
EETA79001

Jull A. J. T., Courtney C., Jeffrey D. A. and Beck J. W. (1998a) Isotopic evidence for a terrestrial source of organic compounds found in Martian meteorites Allan Hills 84001 and Elephant Moraine 79001. *Science* **279**, 366-369.
ALH84001, EETA79001

Jull A. J. T., Beck J. W., Courtney C. and Jeffrey D. A. (1998b) Carbon isotopic evidence for terrestrial organic compounds found in some Martian meteorites. (abs) *Lunar Planet. Sci.* **XXIX** #1184, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Jull A.J.T., Cloudt S. and Cielaszyk E. (1998c) 14C terrestrial ages of meteorites from Victoria Land, Antarctica, and the infall rates of meteorites. *In* Grady, Hutchison, McCall and Rothery (eds) "Meteorites: flux with time and impact effects". Geological Society Spec. Pub. No. 140, London
ALH84001

Jull A. J. T., Beck J. W., Burr G. S., Gilmour I. A., Sephton M. A. and Pillinger C. T. (1999a) Isotopic evidence for abioic organic compounds in the Martain meteorite Nakhla. (abs) *Meteoritics & Planet. Sci.* **34**, A60.
Nakhla

Jull A. J. T., Klandrud S. E., Schnabel C., Herzog G. F., Nishiiszumi K. and Caffee M. W. (1999b) Cosmogenic radionuclide studies of the Nakhlites. (abs) *Lunar Planet. Sci.* **XXX**, #1004, Lunar Planetary Institute, Houston (CD-ROM)
Nakhla, Lafayette, Governador Valadares

Jurewicz A. J. G., Le L. and Jones J. H. (1991) A liquidus phase diagram for a primative shergottite. (abs) *Meteoritics* **26**, 353.
ALH79001, Shergotty, Zagami

K TOP

Kaiden H., Mikouchi T. and Miyamoto M. (1997) Cooling rates of olivine xenocrysts in the EET79001 shergottite. (abs) *NIPR Sym. Antarctic Meteorites* **22nd**, 75-77. Nat. Inst. Polar Res., Tokyo.
EETA79001

Kaiden H., Mikouchi T. and Miyamoto M. (1998) Cooling rates of olivine xenocrysts in the EET79001 shergottite. *Antarctic Meteorite Research* **11**, 92-102. Nat. Inst. Polar Res., Tokyo.
EETA79001

Kaneda K., McKay G. A. and Le L. (1997a) Synthetic and natural Nakhla pyroxenes: Minor elements composition. (abs) *Lunar Planet. Sci*. **XXVIII**, 693-694.
Nakhla

Kaneda K., McKay G. A. and Le L. (1997b) Comparison between synthetic and natural Nakhla pyroxenes: Minor elements composition. (abs) *NIPR Sym. Antarctic Meteorites* **22nd**, 80-82. Nat. Inst. Polar Res., Tokyo.
Nakhla

Kaneda K., McKay G. A. and Le L. (1998) Synthetic and natural Nakhla pyroxenes: A close match at last. (abs) *Lunar Planet. Sci.* **XXIX** #1620, Lunar Planetary Institute, Houston (CD-ROM).

Karlsson H. R., Clayton R. N., Gibson E. K., Jr., Mayeda T. K. and Socki R. A. (1991) Extraterrestrial water of possible Martian origin in SNC meteorites: Constraints from oxygen isotopes. (abs) *Meteoritics* **26**, 354-355.

Karlsson H. R., Clayton R. N., Gibson E. K., Jr. and Mayeda T. K. (1992) Water in SNC meteorites: Evidence for a Martian hydrosphere. *Science* **255,** 1409-1411.
Nakhla, Shergotty, Zagami, Chassigny, Lafayette, EETA79001

Karlsson H. R., Clayton R. N., Mayeda T. K., Jull A. J. T. and Gibson E. K., Jr. (1993) Martian carbon dioxide: Clues from isotopes in SNC meteorites. (abs) *Lunar Planet. Sci.* **XXIV**, 757-758.
Nakhla, Shergotty, Zagami, Chassigny, Lafayette, EETA79001

Kashkarov L. L., Bulgakova L. M., Assonov S. S., Kalinina G. V. and Shukolyukov Yu. A. (1996) Thermal alteration effects of the large olivine grains of the Zagami meteorite. (abs) *Lunar Planet. Sci.* **XXVII**, 651-652.
Zagami

Kashkarov L. L., Ivliev A. I. and Bulgakova L. M. (1997) Thermoluminescence features in different olivine grains for Zagami meteorite. (abs) *Lunar Planet. Sci.* **XXVIII**, 699-700.
Zagami

Keller L. P., Treiman A. H. and Wentworth S. J. (1992) Shock effects in the shergottite LEW88516: Optical and electron microscope observations. (abs) *Meteoritics* **27**, 242.
LEW88516

Kent A. J. R., Hutcheon I. D., Ryerson F. J. and Phinney D. L. (1999) The temperature of formation of carbonates in Martian meteorite ALH84001: Constraints from cation diffusion. (abs) *Lunar Planet. Sci.* **XXX**, #1473, Lunar Planetary institute, Houston (CD-ROM)
ALH84001

Kent A. J. R., Hutcheon I. D., Ryerson F. J. and Phinney D. L. (2001) The temperature of formation of carbonate in Martian meteorite ALH84001: Constraints from cation diffusion. *Geochim. Cosmochim. Acta* **65**, 311-321.
ALH84001

Kerr R. A. (1996) Ancient life on Mars? *Science* **273**, 864-866.

Kerr R. A. (1997a) Martian 'microbes' cover their tracks. *Science* **276**, 30-31.

Kerr R. A. (1997b) Putative Martian microbes called microscopy artifacts. *Science* **278**, 1706-1707.

Kerr R. A. (2002) Reversals reveal pitfall in spotting ancient and ET life. *Science* **296**, 1384-1385.

Kerridge J. F. (1988) Deuterium in Shergotty and Lafayette (and on Mars?) (abs) *Lunar Planet. Sci.* **XIX**, 599-600.
Shergotty, Lafayette

Kerridge J. F. (1997) Martian exobiology in the post-Allan Hills 84001 Era: Some key issues. (abs) *Meteoritics & Planet. Sci*. **32**, A71.
ALH84001

Kerridge J. F. *and many others* (1995) *An Exobiology Strategy for Mars Exploration*. NASA **SP-530**, NASA-HQ, Code S, Washington, D. C.

Kichinka K. (1998a) El Nakhla. ***Meteorite !*** May issue.

Kichinka K. (1998b) Nakhla, Part II. ***Meteorite !*** August issue.

Kichinka K. (2001a) Chassigny: The First Martian Harvest. ***Meteorite !*** Vol. 7, 14-18. August issue.

Kichinka K. (2001b) Chassigny: The first Martian harvest, Part II. ***Meteorite !*** November issue.

Kiefer W.S. (2002) Melting the martian mantles: Shergottite formation and implications for present day mantle convection on Mars. (abs) Un-mixing SNCs. 29-30. LPI Contribution No. 1134.

King T. V. V., Score R., Gabel E. M. and Mason B. (1980) Meteorite descriptions. In *Catalog of Antarctic Meteorites 1977-1978.* (*eds.* Marvin and Mason) *Smithson. Contrib. Earth Sci.* **23**, 39. Washington, DC.
ALHA77005

Kirschvink J. L., Maine A. T. and Vali H. (1997a) Paleomagnetic evidence of a low-temperature origin of carbonate in the Martian meteorite ALH84001. *Science* **275**, 1629-1633.
ALH84001

Kirschvink J. L., Maine A. T. and Vali H. (1997b) Paleomagnetic evidence supports a low-temperature origin of the carbonate in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 731-732.
ALH84001

Kirschvink J. L. and Vali H. (1999) Criteria for the identification of bacterial magnetofossils on Earth and Mars. (abs) *Lunar Planet. Sci*. **XXX**, #1681, Lunar Planetary Institute, Houston (CD-ROM)

Kirschvink J.L. Kim S., Weiss B.P., Shannon D.M. and Kobayashi A.K. (2002) Rock magnetic and ferromagnetic resonance tests of biogenic magnetite in ALH84001. (abs) *Lunar Planet. Sci.* **XXXIII** #1991. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Kirsten T., Ries D. and Fireman E. L. (1978) Exposure and terrestrial ages of four Allan Hills, Antarctic meteorites. *Meteoritics* **13**, 519-522.

Kletetschka G., Wasilewski P. J. and Taylor P. T. (2000) Mineralogy of the sources for magnetic anomalies on Mars. *Meteoritics & Planet. Sci.* **35**, 895-899.

Knoll A., Osborn M.J., Baross J., Berg H.C. and Sogin M. (1999) Size limits of very small microorganisms. Proc. of Workshop. National Research Council, NAS Press Washington pp148

Knott S. F., Ash R. D. and Turner G. (1995) ^{40}Ar-^{39}Ar dating of ALH84001: Evidence for the early bombardment of Mars. (abs) *Lunar Planet. Sci.* **XXVI**, 765-766.
ALH84001

Knott S. F. (1996) *A study of helium and argon isotopes in extraterrestrial dust and a meteorite from Mars*. PhD thesis. Manchester.
ALH84001

Knudsen J. M. (1992) Magnetic phases in SNC-meteorites and on Mars. (abs) *Meteoritics* **27**, 244.

Kobayashi A. and Taguchi T. (2002) Biological control of magnetite crystal formation in the magnetotactic bacteria: hints concerning the possible evidence from ALH84001 for life on Mars. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A408. Davos
ALH84001

Koblitz J. (1996) *Metbase: Meteorite data retrieval program*. Ver 2.0, Fisherude.

Koizumi E., Mikouchi T., McKay G.A., Le L. and Schwandt C. (2001) Dynamic crystallization of the

Queen Alexandra Range 94201 shergottite. (abs) *Meteoritics & Planet. Sci.* **36**, A102.
QUE94201

Koizumi E., McKay G.A., Mikouchi T., Le L., Schwandt C., Monkawa A. and Miyamoto M. (2002a) Crystallization experiments of the Martian meteorite QUE94201: Additional constraints on its formation condition. (abs) *Lunar Planet. Sci.* **XXXIII** #1442. Lunar Planetary Institute, Houston. (CD-ROM)

Koizumi E., Mikouchi T., McKay G.A., Le L., Schwandt C., Monkawa A. and Miyamoto M. (2002b) Comparative cooling experiments of Queen Alexandra Range 94201 basaltic shergottite under reducing and oxidizing conditions. (abs) *Meteoritics & Planet. Sci*. **37**, A80.
QUE94201

Koizumi E., Mikouchi T., McKay G., Le L., Schwandt C., Monkawa A. and Miyamoto M. (2002c) Effects of cooling rate and oxygen fugacity on the crystallization of the Queen Alexander Range 94201 Martian melt composition. (abs) *Antarctic Meteorites* **XXVII**, 63-65, NIPR, Tokyo.
QUE94201

Koizumi E., Mikouchi T., Monkawa A. and Miyamoto M. (2003) Crystallization experiments of Dar al Gani Martian meteorites: A preliminary report. (abs) *Lunar Planet. Sci.* **XXXIV**, #1567. Lunar Planetary Institute, Houston

Kojima H., Miyamoto M. and Warren P. H. (1997a) The Yamato-793605 Martian meteorite consortium. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 91-93. Nat. Inst. Polar Res., Tokyo.
Y793605

Kojima H., Miyamoto M. and Warren P. H. (1997b) The Yamato-793605 Martian meteorite consortium. *Antarctic Meteorite Research* **10**, 3-12. Nat. Inst. Polar Res., Tokyo.
Y793605

Kojima H., Nakamura N., Imae N. and Misawa K. (2002) The Yamato nakhlite consortium. (abs) *Antarctic Meteorites* **XXVII**, 66-68, NIPR, Tokyo.
Y000583, Y000749, Y000802

Kondorosi G., Hirota Y., Hori K., Nakamura N., Morikawa N. and Misawa K. (1999) Trace element studies of leachates and residues from the lherzolitic shergottite Y-793605. (abs) *NIPR Sym. Antarctic Meteorites* **24th***,* 88-89. Nat. Inst. Polar Res., Tokyo.
Y793605

Kong P., Ebihara M. and Palme H. (1999a) Highly siderophile elements in Martian meteorites. (abs) *Lunar Planet. Sci*. **XXX**, #1570, Lunar Planetary Institute, Houston (CD-ROM)
Nakhla, ALH84001

Kong P., Ebihara M. and Palme H. (1999b) Siderophile elements in Martian meteorites and implications for core formation in Mars. *Geochim. Cosmochim. Acta* **63**, 1865-1875.
Nakhla, Zagami, EET79001, Y793605, ALH77005, ALH84001

Kozar M. P., Krahmer M. T., Fox A., Larsson L and Allton J. (2001) Lunar Dust: A negative control for biomarker analysis of extraterrestrial samples? *Geochim. Cosmochim. Acta* **65**, 3307-3317.

Kothari B. K. and Goel P. S. (1974) Total nitrogen in meteorites. *Geochim. Cosmochim. Acta* **38**, 1493-1508.
Shergotty

Koziol A.M. (1999) Experimental determination of siderite (iron carbonate) stability under moderate

pressure-temperature conditions and applications to Martian paragenesis. (abs) *Lunar Planet. Sci*. **XXX**, #1226, Lunar Planetary Institute, Houston (CD-ROM)
ALH84001

Koziol A.M. (2000) Carbonate and magnetite parageneses as monitors of carbon dioxide and oxygen fugacity. (abs) *Lunar Planet. Sci.* **XXXI,** #1424. Lunar Planetary Institute, Houston (CD-ROM).

Koziol A.M. (2001) Magnetite and carbonate textures in ALH84001: Experimental insights. (abs) *Lunar Planet. Sci.* **XXXII**, #1425. Lunar Planetary Institute, Houston. (CD-ROM)

Koziol A. M. and Brearley A.J. (2002) A non-biological origin for the nanophase magnetite grains in ALH84001: Experimental results. (abs) *Lunar Planet. Sci.* **XXXIII** #1672. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Koziol A.M. (2003) Magnetite-magnesioferrite phase relations and application to ALH84001. (abs) *Lunar Planet. Sci.* **XXXIV**, #1128. Lunar Planetary Institute, Houston
ALH84001

Krahenbuhl, U., Noll K., Dobeli M., Grambole D., Herrmann F. and Tobler L. (1999) Exposure of Allan Hills 84001 and other achondrites on the Antarctic ice. *Meteoritics & Planet. Sci.* **33**, 665-670.
ALH84001

Kring D. A., Gleason J. D., Hill D. H., Jull A. J. T. and Boynton W. V. (1996) QUE94201, a new Martian meteorite that may represent a bulk melt rather than a cumulate fraction. (abs) *Lunar Planet. Sci.* **XXVII**, 705-706.
QUE94201

Kring D. A., Swindle T. D., Gleason J. D. and Grier J. A. (1997) Relative ages of maskelynite and carbonate in ALH84001 and implications for early hydrothermal activity on Mars. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds*. Clifford et al.) *LPI Contribution* **916,** 46. Lunar Planetary Institute, Houston.
ALH84001

Kring D. A. and Gleason J. D. (1997) Magmatic temperatures and compositions on early Mars as inferred from the orthopyroxene-silica assemblage in ALH84001. (abs) *Meteoritics & Planet. Sci*. **32**, A74.
ALH84001

Kring D. A., Swindle T. D., Gleason J. D. and Grier J. A. (1998) Formation and relative ages of maskelynite and carbonate in ALH84001. *Geochim. Cosmochim. Acta* **62**, 2155-2166.
ALH84001

Kring D. A. and Gleason J. D. (1999) Sileous igneous rock on Mars. (abs) *Lunar Planet. Sci*. **XXX**, #1611, Lunar Planetary Institute, Houston (CD-ROM)
LEW88516, ALH84001

Kring D.A. (2002) QUE 94201: Reconsidering its origins as a bulk melt from a volcanic region of Mars. (abs) Un-mixing SNCs. 31-32. LPI Contribution No. 1134.
QUE 94201

Kurat G., Nazarov M. A., Brandstaetter F., Ntaflos T. and Koeberl C. (1997a) Precipitation and reaction products of fluids in Martian orthopyroxenite ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 775-776.
ALH84001

Kubovics I., Kamilla G., Sólymos, Bérczi Sz., Lukács B., Szakmány Gy. and Török K. (1995a) Experimental investigations of ALHA77005 shergottite sample from Antarctica. (abs) *NIPR Sym. Antarctic Meteorites* **20th***,* 130-131. Nat. Inst. Polar Res., Tokyo.
ALHA77005

L TOP

Lacroix A. (1927) Mineralogy of Chassigny meteorite. *Bull. Mus. Nat. Hist. (Paris)* **33**, 411.
Chassigny

Lambert P. (1985) Metamorphic record in shergottites. (abs) *Meteoritics* **20**, 690-691.
Shergotty

Lambert P. (1987) SNC meteorites: The metamorphic record. (abs) *Lunar Planet. Sci.* **XVIII**, 529-530.
Shergotty, Nakhla, Chassigny

Lambert P. and Grieve R. A. F. (1984) Shock experiments on maskelynite-bearing anorthosite. *Earth Planet. Sci. Lett.* **68**, 159-171.
Shergotty

Lancet M. S. and Lancet K. (1971) Cosmic-ray and gas-retention ages of Chassigny meteorite. *Meteoritics* **6**, 81-86.
Chassigny

Langenhorst F., Stöffler D. and Klein D. (1991) Shock metamorphism of the Zagami achondrite. (abs) *Lunar Planet. Sci.* **XXII**, 779-780.
Zagami

Langenhorst F. and Greshake A. (1999) A transmission electron microscope study of Chassigny: Evidence for strong shock metamorphism. *Meteoritics Planet. Sci.* **34**, 43-48.
Chassigny

Langenhorst F., Shaw C. S. J. and Metzler K. (2000) Mineral chemistry and microstructures in ALH84001. (abs) *Lunar Planet. Sci.* **XXXI,** #1866. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Langenhorst F. and Poirier J-P. (2000a) Anatomy of black veins in Zagami: clues to the formation of high-pressure phases. *Earth Planet. Sci. Lett.* **184**, 37-55.
Zagami

Langenhorst F. and Poirier J-P. (2000b) 'Eclogitic' minerals in a shocked basaltic meteorite. *Earth Planet. Sci. Lett.* **176**, 259-265.
Zagami

Laul J. C. (1986a) The Shergotty consortium and SNC meteorites: An overview. *Geochim. Cosmochim. Acta* **50**, 875-888.
Shergotty

Laul J. C. (1986b) An overview of the Shergotty consortium studies. (abs) *Lunar Planet. Sci.* **XVII**, 460-461.
Shergotty

Laul J. C. (1987) Rare earth patterns in shergottite phosphates and residues. *Proc. Lunar Planet. Sci. Conf.* ***17th****; J. Geophys. Res.* **92** (suppl.), E633-E640.
ALHA77005

Laul J. C., Keays R. R., Ganapathy R., Anders E. and Morgan J. W. (1972) Chemical fractionations in meteorites - V. Volatile and siderophile elements in achondrites and ocean ridge basalts. *Geochim. Cosmochim. Acta* **36**, 329-345.
Nakhla, Lafayette, Shergotty, Zagami

Laul J. C., Smith M. R., Wänke H., Jagoutz E., Dreibus G., Palme H., Spettel B., Burghele A., Lipschutz M. E. and Verkouteren R. M. (1985) Chemical systematics of Shergotty. (abs) *Lunar Planet. Sci.* **XVI**, (suppl. A), 17-18. Lunar Planetary Institute, Houston.
Shergotty

Laul J. C., Smith M. R., Wänke H., Jagoutz E., Dreibus G., Palme H., Spettel B., Burghele A., Lipschutz M. E. and Verkouteren R. M. (1986) Chemical systematics of the Shergotty meteorite and the composition of its parent body (Mars). *Geochim. Cosmochim. Acta* **50,** 909-926.
Shergotty

Laul J. C. and Smith M. R. (1986) Rare earth patterns in shergottite phosphates. (abs) *Lunar Planet. Sci.* **XVII**, 464-465.
ALHA77005

Lauer H.V., Ming D.W. and Goldin D.C. (2003) Thermal analysis of acicular shaped magnetite. (abs) *Lunar Planet. Sci.* **XXXIV**, #1341. Lunar Planetary Institute, Houston
ALH84001

Lee D.-C. and Halliday A. N. (1997a) Hf-W evidence for early differentiation of Mars and the eucrite parent body. (abs) *Lunar Planet. Sci.* **XXVIII**, 795-796.
Nakhla, Lafayette, Shergotty, ALH84001, EETA79001

Lee D.-C. and Halliday A. N. (1997b) Tungsten isotopic constraints on the differentiation of Mars and the Eucrite parent body. (abs) *7th Goldschmidt Conf., LPI Contribution* **921**, 124. Tucson.

Lee D.-C. and Halliday A. N. (1997c) Core formation on Mars and differentiated asteroids. *Nature* **388**, 854-857.
Chassigny, Nakhla, Lafayette, Zagami, Shergotty, ALH84001, EETA79001, ALHA77005

Lentz R. C. F. and McSween H. Y., Jr. (1999a) Crystal size distributions of the basaltic shergottites. (abs) *Lunar Planet. Sci*. **XXX**, #1126, Lunar Planetary Institute, Houston (CD-ROM)
Shergotty, Zagami, EETA79001

Lentz R. C. F. and McSween H. Y., Jr. (1999b) Basaltic shergottite crystallization: A quantitative textural analysis. (abs) *Meteoritics & Planet. Sci.* **34**, A74.
Shergotty, Zagami, EET79001, QUE94201, DaG476

Lentz R. C. F., Taylor G. J. and Treiman A. H. (1999c) Formation of a Martian pyroxenite: A comparative study of the nakhlite meteorites and Theo's flow. *Meteoritics & Planet. Sci.* **34**, 919-932.

Lentz R. C. F., Ryan J. G., Riciputi L. R. and McSween H. Y., Jr. (2000) Water in the Martian mantle: Clues from light lithophile elements in Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1672. Lunar Planetary Institute, Houston (CD-ROM).

Lentz R. C. F. and McSween H. Y., Jr. (2000) Crystallization of the basaltic shergottites: Insights from crystal size distribution (CSD) analysis of pyroxenes. *Meteoritics & Planet. Sci.* **35**, 919-927.
Shergotty, Zagami, EETA79001, QUE94201, DaG476

Lentz R. C. F., McSween H. Y., Jr., Nazarov M. A. and Taylor L. A. (2001a) A textural consideration of

Dhofar 019 with comparisons to other basaltic shergottites. (abs) *Lunar Planet. Sci.* **XXXII**, #1742. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019, DaG476, Zagami, EETA79001

Lentz R. C. F. and McSween H. Y., Jr. (2001) Small olivines in Dhofar 019: Indications of a complex petrogenesis. (abs) *Meteoritics & Planet. Sci.* **36**, A111-112.
Dho019

Lentz R.C.F., McSween H.Y., Ryan J. and Riciputi L. R. (2001b) Water in Martian magmas: Clues from light lithophile elements in shergottite and nakhlite pyroxenes. *Geochim. Cosmochim. Acta*, **65**, 4551-4565.
Nakhla, Lafayette, Shergotty, Zagami

Lentz R.C.F. and McCoy T.J. (2002) Insights on mixed basaltic shergottites from a Xenolith-bearing Hawaiian basalt. (abs) *Meteoritics & Planet. Sci*. **37**, A86.

Lentz R.C.F. and McSween H.Y. (2003) Crystal size distribution analysis of new nakhlites and Los Angeles: How do they compare with SNCs of old? (abs) *Lunar Planet. Sci*. **XXXIV** #1914. Lunar Planetary Institute, Houston

Leshin, L. A. (1997) Sample return and climate: Igneous rocks and impact breccias. In *Mars 2005 sample return workshop*. (*ed*. Gulick) *LPI Tech. Rpt*. **97-1,** 53-56. Lunar Planetary Institute, Houston.

Leshin L. A. (1998a) The origin and evolution of water on Mars: Possible constraints on the Juvenile reservoir. (abs) *Lunar Planet. Sci.* **XXIX** #1468, Lunar Planetary Institute, Houston (CD-ROM).
QUE94201

Leshin L. A. (1998b) Constaints on Martian volatile history from studies of Martian meteorites: Lessons learned and open questions. (abs) *Workshop on the Issue of Martian Meteorites: Where - - - -* #7046. Lunar Planetary Institute, Houston.

Leshin L. A., Epstein S. and Stolper E. M. (1995) The abundance and D/H of water dissolved in EETA79001 shocked glass and crystalline host. (abs) *Lunar Planet. Sci.* **XXVI**, 839-840.
EETA79001

Leshin L. A., Epstein S. and Stolper E. M. (1996a) Hydrogen isotope geochemistry of SNC (Martian) meteorites and the history of water on Mars. (abs) In *Workshop on evolution of Martian volatiles.* (*eds.* Jakosky and Treiman) *LPI Tech. Rpt.* **96-01**, 30-31. Lunar Planetary Institute, Houston.
ALH84001, Chassigny, Nakhla, Zagami, EETA79001, Shergotty

Leshin L. A., Harvey R. P., McCoy T. J. and McKeegan K. D. (1996b) Water in apatite from shergottite QUE94201: Abundances and D/H. (abs) *Meteoritics & Planet. Sci.* **31**, A79-A80.
QUE94201

Leshin L. A., Epstein S. and Stolper E. M. (1996c) Hydrogen isotope geochemistry of SNC meteorites. *Geochim. Cosmochim. Acta* **60**, 2635-2650**.**
Nakhla, Lafayette, Governador Valadares, Shergotty, Zagami, EETA79001, ALH84001

Leshin L. A., McKeegan K. D. and Harvey R. P. (1997) Oxygen isotopic constraints on the genesis of carbonates from Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 805-806.
ALH84001

Leshin L. A., McKeegan K. D., Carpenter P. K. and Harvey R. P. (1998) Oxygen isotopic constraints on the genesis of carbonates from Martian meteorite ALH84001. *Geochim. Cosmochim. Acta* **62**, 3-13.
ALH84001

Leshin L. A. (2000) Insights into Martian water reservoirs from analysis of Martian meteorite QUE94201. *Geophys. Res. Lett.* **27**, 2017-2020.
QUE94201

Levsky L. K. and Drubotskoy Y. R. (1988) On the origin of SNC meteorites. *Meteoritika* **47**, 134-137.

Lewis C. F., Wrona J. A. and Moore C. B. (1985) *Catalog of meteorites*. Pub. #20 Center for Meteorite Studies. Univ. Arizona, Tempe.
Nakhla, Chassigny, Shergotty, Lafayette

Lin C-Y., Zhang F-S., Wang H-N., Wang R-C. and Zhang W-L. (2002a) Antarctic GRV9927: A new member of the SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXIII** #1562. Lunar Planetary Institute, Houston. (CD-ROM)
GRV99027

Lin Y., Ouyan Z., Wang D., Miao B., Lin X., Kimura M. and Jun Y. (2002b) Grove Mountain (GRV) 99027: A new Martian lherzolite. (abs) *Meteoritics & Planet. Sci.* **37**, A87.
GRV99027

Lindstrom D. J. (1991) Microprobe studies of microtomed particles of "white druse" salts in shergottite EETA79001**.** (abs) *Meteoritics* **26**, 365.
EETA79001

Lindstrom D. J. and Martinez R. R. (1991) Trace element analysis by INAA of possible Martian weathering products in shergottite EETA79001. (abs) *Lunar Planet. Sci.* **XXII**, 813-814.
EETA79001

Lindstrom D. J., Treiman A. H. and Martinez R. R. (1993) Trace-element analysis of magmatic inclusions in ALHA77005 by micro-INAA. (abs) *Meteoritics* **28**, 386-387.
ALHA77005

Lindstrom D. J., Treiman A. H. and Martinez R. R. (1996) Trace-element geochemistry of Martian weathering products in Lafayette. (abs) In *Workshop on evolution of Martian volatiles.* (*eds*. Jakosky and Treiman) *LPI Tech. Rpt*. **96-01**, 31-32. Lunar Planetary Institute, Houston.
Lafayette

Lindstrom M. M., Mittlefehldt D. W., Treiman A. H., Wentworth S. J., Gooding J. L., Keller L. P. and McKay G. A. (1992) LEW88516: A new shergottite from Antarctica. (abs) *Lunar Planet Sci.* **XXIII**, 783-784.
LEW88516

Lindstrom M. M., Treiman A. H. and Mittlefehldt D. W. (1994) Pigeonholing planetary meteorites: The lesson of misclassification of EET87521 and ALH84001**.** (abs) *Lunar Planet. Sci.* **XXV**, 797-798.
ALH84001

Lindstrom M. M. (1999) Lunar and Martian meteorites: Suites, pairing and implications. (abs) *NIPR Sym. Antarctic Meteorites* **24th***,* 90-92. Nat. Inst. Polar Res., Tokyo.

Lipschutz M. E. (1982) Weathering effects in Antarctic Meteorites. In *Catalog of meteorites from Victoria Land, Antarctica 1978-1980.* (*eds.* Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* **24**, 67-69. Washington, DC.

Lipschutz M. E. and Cassidy W. A. (1986) Antarctic meteorites: A progress report. *EOS* **67**, 1339-1341.

Lodders K. (1998) A survey of shergottite, nakhlite and chassigny meteorites whole-rock compositions. *Meteoritics & Planet. Sci.* **33**, A183-190.

Lodders K. and Fegley B., Jr. (1997) An oxygen isotope model for the composition of Mars. *Icarus* **126**, 373-394.

Lodders K. and Fegley B. Jr. (1998) ***The Planetary Scientist's Companion.*** Oxford University Press, NY.

Lofgren G. E. *and many authors* (1981) Petrology and chemistry of terrestrial, lunar and meteoritic basalts. In *Basaltic Volcanism on the Terrestrial Planets,* 1-437. Pergamon Press.
Shergotty

Longhi J. (1982) Modeling high pressure partial melting of the Martian mantle. (abs) *Lunar Planet. Sci.* **XIII**, 445-446.

Longhi J. (1990) Magmatic processes on Mars: Insights from SNC meteorites. (abs) *Lunar Planet. Sci.* **XXI**, 716-717.

Longhi J. (1991) Complex magmatic processes on Mars: Inferences from the SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* **21st,** 695-709. Lunar Planetary Institute, Houston.

Longhi J. (1992) Volatiles in SNC petrogenesis: A Sr signal? (abs) *Lunar Planet. Sci.* **XXIII**, 805-806.

Longhi J. (1997) What the SNC meteorites tell us about Mars. In *Mars 2005 sample return workshop*. (*ed*. Gulick) *LPI Tech. Rpt*. **97-1,** 64-68. Lunar Planetary Institute, Houston.

Longhi J. and Pan V. (1987) What SNC meteorites tell us about Martian magmatism. (abs) In *MEVTV workshop on nature and composition of surface units on Mars. LPI Tech. Rpt.* **87-0**, 76-78. Lunar Planetary Institute, Houston.

Longhi J. and Pan V. (1988) The parent magmas of the SNC meteorites. (abs) *Lunar Planet. Sci.* **XIX**, 690-691.

Longhi J. and Pan V. (1989) The parent magmas of the SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* **19th**, 451-464. Lunar Planetary Institute, Houston.

Longhi J., Knittle E., Holloway J. R. and Wänke H. (1992) The bulk composition, mineralogy and internal structure of Mars. In ***Mars*** (*eds*. Kieffer *et al.*), 185-208. Univ. Arizona Press, Tucson.

Longhi J. (2002) SNC meteorites and their source compositions. (abs) Un-mixing SNCs. 33-34. LPI Contribution No. 1134.

Ludwig E. (1871) Analysis of Shergotty meteorite. *Tschermaks Min. Pet. Mitt.* p55.
Shergotty

Lundberg L. L., Crozaz G., Zinner E. and McKay G. A. (1986) The REE carriers in the Shergotty meteorite. (abs) *Meteoritics* **21**, 437-438.
Shergotty

Lundberg L. L., Crozaz G. and McSween H. Y., Jr. (1987) Allan Hills 77005**:** In-situ rare earth element analysis by secondary ion mass spectroscopy. (abs) *Meteoritics* **22**, 447-449.
ALHA77005

Lundberg L. L., Crozaz G., McKay G. A. and Zinner E. (1988) Rare earth element carriers in the Shergotty meteorite and implications for its chronology. *Geochim. Cosmochim. Acta* **52**, 2147-2163.

Shergotty

Lundberg L. L., Crozaz G. and McSween H. Y. (1990) Rare earth elements in minerals of the ALHA77005 shergottite and implications for its parent magma and crystallization history. *Geochim. Cosmochim. Acta* **54**, 2535-2547.
ALHA77005

Lugmair G. W., Shukolyukov A. and MacIsaac Ch. (1996) Radial heterogeneity of ^{53}Mn in the early solar system and the place of origin of the ordinary chondrites. (abs) *Lunar Planet. Sci.* **XXVII**, 785-786.
Shergotty, ALH84001

Lugmair G. W. and Shukolyukov A. (1998) Early solar system timescales according to ^{53}Mn-^{53}Cr systematics. *Geochim. Cosmochim. Acta* **62**, 2863-2886.
ALH84001, Shergotty, EETA79001

M TOP

Ma M.-S., Schmitt R. A. and Laul J. C. (1980) Genetic relationship between Allan Hills 77005 and shergottites - A geochemical study. (abs) *Meteoritics* **15**, 327.
ALHA77005

Ma M.-S., Laul J. C. and Schmitt R. A. (1981) Complementary rare earth element patterns in unique achondrites, such as ALHA77005 and shergottites, and in the Earth. *Proc. Lunar Planet. Sci. Conf.* **12th**, 1349-1358.
ALHA77005

Ma M.-S., Laul J. C., Smith M. R. and Schmitt R. A. (1982) Chemistry of shergottites Elephant Moraine A79001 and Zagami. (abs) *Lunar Planet. Sci.* **XIII**, 451-452.
EETA79001, Zagami

Madsen M. B., Olsen M., Knudsen J. M., Petersen D. and Vistisen L. (1992) The ferrimagnetic phase in Nakhla and Zagami - implications for the Martian fines. (abs) *Lunar Planet. Sci.* **XXIII**, 825-826.
Nakhla, Zagami

Malavergne V., Guyot F., Benzerara K. and Martinez I. (2002) Descriptions of new shock-induced phases in the Shergotty, Zagami, Nakhla and Chassigny meteorites. *Meteoritics & Planet. Sci.* **36**, 1297-1305.

Marakushev A. A. and Bobrov A. V. (1999) Origin of ALH84001 Antarctic meteorite. (abs) *NIPR Sym. Antarctic Meteorites* **XXIII**, 66-67, NIPR, Japan.

Marti K., Kim J. S., Thakur A. N., McCoy T. J. and Keil K. (1995) Signatures of the Martian atmosphere in glass of the Zagami meteorite. *Science* **267**, 1981-1984.
Zagami

Marti K. and Mathew K. J. (1998) Relations among solar system Xenon resevoirs and the Chassigny connection. (abs) *Lunar Planet. Sci.* **XXIX** #1841, Lunar Planetary Institute, Houston (CD-ROM).
Chassigny

Marti K., Geddes K., Mathew K. J. and Weigel A. (1999) Searches for signatures of the early atmospheres of Mars and Earth. (abs) *Meteoritics & Planet. Sci.* **34**, A77.

Marti K. and Mathew K. J. (2000a) Meteoritic and solar isotopic signatures in volatiles on early Mars. (abs) *Meteoritics & Planet. Sci.* **35**, A103.
Chassigny, ALH84001

Marti K. and Mathew K. J. (2000b) Ancient Martian nitrogen. *Geophys. Res. Lett.* **27**, 1463-1466.

Marti K., Marty B. and Mathew K. J. (2001) Martian interior volatiles: Indigenous signatures and early evolution. (abs) *Meteoritics & Planet. Sci.* **36**, A122.

Marti K., Mathew K.J. and Marty B. (2003) Martian xenology: Indigenous. Radiogenic and fission components. (abs #1816) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Martinez R. and Gooding J. L. (1986) New saw-cut surfaces of EETA79001. *Antarctic Meteorite Newsletter* **9 (1),** 23. JSC Curator's Office, Houston.
EETA79001

Marty B., Zimmermann L. and Pik R. (1998) Nitrogen and argon isotopes in individual mineral grains of SNC meteorites: A CO2-laser step-heating analysis. (abs) *Lunar Planet. Sci.* **XXIX** #1672, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla, Chassigny, Zagami

Marty B., Marti. K. and Th. Monod Consortium (2001) Noble gases in new SNC meteorites NWA817 and NWA 480. *Meteoritics & Planet. Sci.* **36**, A122-123.
NWA480, NWA817

Marty B. and Marti K. (2002) Signatures of early differentiation of Mars. *Earth Planet. Sci. Lett.* **196**, 251-263.
NWA817, Chassigny, ALH84001, Nakhla

Marty B., Mathew K.J. and Marti K. (2002) Martian xenology. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A490. Davos

Marvin U. B. (1997) Procedures adopted for allocating samples of ALH 84001 and other Antarctic meteorites for research into life on Mars. MMWG, JSC Curator's Office, Houston.

Masarik J. and Reedy R. C. (1995) Production of cosmogenic nuclides in SNC meteorites in the Martian surface. (abs) *Lunar Planet. Sci.* **XXVI**, 901-902.

Mason B. (1962) ***Meteorites***. J. Wiley, New York, 274pp.

Mason B. (1978) ALHA77005**.** *Antarctic Meteorite Newsletter* **1(2)**, 9 and **1(3).** JSC Curator's Office, Houston.
ALHA77005

Mason B. (1979) *Meteorites*. In *Data of Geochemistry, Chapter B, Part 1. USGS Prof. Paper* **440**-B-1, B117-120.
Nakhla, Chassigny

Mason B. (1981) ALHA77005 petrographic description. *Antarctic Meteorite Newsletter* **4(1)**, 12. JSC Curator's Office, Houston.
ALHA77005

Mason B., Nelen J. A., Nuir P. and Taylor S. R. (1975) The composition of the Chassigny meteorite. *Meteoritics* **11**, 21-27.
Chassigny

Mason B., Jarosewich E. and Nelen J. A. (1979) The pyroxene-plagioclase achondrites. *Smithson.*

Contrib. Earth Sci. **22**, 27-45. Washington, DC.
Shergotty

Mason B., MacPherson G. J., Score R., Martinez R., Satterwhite C., Schwarz C. and Gooding J. L. (1992) Descriptions of Stony Meteorites. In *Field and laboratory investigations of Antarctic meteorites collected by the United States expeditions 1985-1987.* (*eds.* Marvin and MacPherson) *Smithson. Contrib. Earth Sci.* **30**, 17-35. Washington, DC.
ALH84001

Mathew K. J., Kim J. S. and Marti K. (1997) Xenon components in Martian meteorites: Evidence for atmospheric evolution? (abs) *Lunar Planet. Sci.* **XXVIII**, 885-886.
ALH84001, EETA79001, Zagami

Mathew K. J. and Marti K. (1998a) Nitrogen and noble gas isotopic signatures in bulk ALH84001 with carbonates. (abs) *Lunar Planet. Sci.* **XXIX** #1825, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Mathew K. J. and Marti K. (1998b) Signatures of noble gases and nitrogen in the atmosphere and interior of Mars. (abs) *Meteoritics & Planet. Sci.* **33**, A99-100.

Mathew K. J. and Marti K. (1999a) Nitrogen and xenon isotopic signatures in SNC'S and the interior of Mars. (abs) *Lunar Planet. Sci.* **XXX**, #1418, Lunar Planetary Institute, Houston (CD-ROM)
Chassigny

Mathew K. J., Kim J. S. and Marti K. (1999b) Martian atmospheric and indigenous components of xenon and nitrogen in the Shergotty, Nakhla and Chassigny group meteorites. *Meteoritics & Planet. Sci.* **33**, 655-664.
Shergotty, Nakhla, Chassigny, Zagami, ALH84001, EET79001

Mathew K. J. and Marti K. (2001a) Nitrogen and noble gass signatures in Nakhla: Identification of primitive and evolved components. (abs) *Lunar Planet. Sci.* **XXXII**, #1214. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Mathew K. J. and Marti K. (2001b) Early evolution of Martian volatiles: Nitrogen and noble gas components in ALH84001 and Chassigny. *J. Geophys. Res.* **106**, 1401-1422.
ALH84001, Chassigny

Mathew K.J., Marti K. and Marty B. (2002) Fission xenon on Mars. (abs) *Lunar Planet. Sci.* **XXXIII** #1427. Lunar Planetary Institute, Houston. (CD-ROM)
NWA817, ALH84001, Nakhla, Chassigny

Mathew K.J. and Marti K. (2002a) Martian atmospheric and interior volatiles in the meteorite Nakhla. *Earth Planet. Sci. Lett.* **199**, 7-20.
Nakhla

Mathew K.J. and Marti K. (2002b) Nitrogen, Ar, and Xe in Martian meteorites: clues to the evolution of interior gas components. (abs) *Antarctic Meteorites* **XXVII**, 77-78, NIPR, Tokyo

Mautner M.N. and Sinaj S. (2002) Water-extractable and exchangeable phosphate in Martian and carbonaceous chondrite meteorites and in planetary soil analogs. *Geochim. Cosmochim. Acta* **66**, 3161-3174.
Nakhla, DaG476, EETA79001

Mayeda T. K., Yanai K. and Clayton R. N. (1995) Another Martian meteorite. (abs) *Lunar Planet. Sci.*

XXVI, 917-918.
Y793605

McAdam A.C., Leshin L.A. and Harvey R.P. (2002) Investigation of weathering products of Martian meteorite analog materials on Earth and applications to Martian dust. (abs) *Meteoritics & Planet. Sci.* **37**, A96.

McBride K.M. (2001) More Martian meteorites from Antartica? A comparison of Antarctic meteorite abundances with falls. (abs) *Meteoritics &Planet. Sci.* **36**, A128.

McCanta M.C. and Rutherford M.J. (2001) SNC oxygen fugacity as recorded in pyroxenes: An experimental study. (abs) *Lunar Planet. Sci.* **XXXII**, #1348. Lunar Planetary Institute, Houston. (CD-ROM)
QUE94201, Shergotty

McCanta M.C., Rutherford M.J. and Jones J.H. (2002a) An experimental study of Eu/Gd partioning between a shergottite melt and pigeonite: Implications for the oxygen fugacity of the Martian interior. (abs) *Lunar Planet. Sci.* **XXXIII** #1942. Lunar Planetary Institute, Houston. (CD-ROM)

McCanta M.C., Rutherford M.J. and Musselwhite D.S. (2002b) An experimental study of REE partioning between a dry shergottite melt and pigeonite as a function of fO2: Implications for the Martian interior. (abs) *Meteoritics & Planet. Sci.* **37**, A97.

McCanta M.C. and Rutherford M.J. (2002) Oxygen fugacity recorded in pigeonite: Indications of a heterogeneous Martian magma source region? (abs) Un-mixing SNCs. 35-36. LPI Contribution No. 1134.

McCanta M.C., Rutherford M.J., Dyar M.D. and Delaney J.S. (2003) Fe+3/Fe ratios in pigeonite as a function of fO2: A preliminary investigation. (abs #1361) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

McCarthy T. S., Erlank A. J., Willis J. P. and Ahrens L. H. (1974) New chemical analyses of six achondrites and one chondrite. *Meteoritics* **9**, 215-222.
Shergotty, Chassigny

McCoy T. J., Taylor G. J., Keil K. and Noll P. D., Jr. (1991) Zagami: Product of a two-stage magmatic history. (abs) *Lunar Planet. Sci.* **XXII**, 867-868.
Zagami

McCoy T. J., Taylor G. J. and Keil K. (1992) Zagami: Product of a two-stage magmatic history. *Geochim. Cosmochim. Acta* **56**, 3571-3582.
Zagami

McCoy T.J., Keil K. and Taylor G.J. (1993) The dregs of crystallization in Zagami. (abs) *Lunar Planet. Sci.* **XXIV**, 947-948.
Zagami

McCoy T.J., Wadhwa M. and Keil K. (1995) Zagami: another new lithology and a complex near-surface magmatic history. (abs) *Lunar Planet. Sci.* **XXVI**, 925-926.
Zagami

McCoy T.J. and Lofgren G.E. (1996) The crystallization of the Zagami shergottite: A 1 atm. experimental study. (abs) *Lunar Planet. Sci.* **XXVII**, 839-840.
Zagami

McCoy T.J., Wadhwa M. and Keil K. (1997) New lithologies in the Zagami meteorite: Evidence for fractional crystallization of a single magma unit on Mars. *Geochim. Cosmochim. Acta* **63**, 1249-1262.
Zagami

McCoy T.J. and Lofgren G.E. (1999) Crystallization of the Zagami shergottite: an experimental study. *Earth Planet. Sci. Lett.* **173**, 397-411.
Zagami

McDonald G.D. and Bada J.L. (1995) A search for endogenous amino acids in the Martian meteorite EETA79001**.** *Geochim. Cosmochim. Acta* **59**, 1179-1184.
EETA79001

McElroy M.B., Yung Y.L. and Nier A.O.C. (1976) Isotopic composition of nitrogen: Implications for the past history of Mars' atmosphere. *Science* **194,** 70-72.

McEwen A., Turtle E., Burr D., Milazzo M., Lanagan P., Christensen P. and Boyce J. (2003) Discovery of a large rayed crater on Mars: Implications for recent volcanic and fluvial activity and the origin of Martian meteorites. (abs. #2040) *Lunar Planet. Sci. Conf.* **34th** , Lunar Planetary Institute, Houston (CD-ROM).

McFadden L. A. (1987) Spectral reflectance of SNC meteorites: Relationships to Martian surface composition. *MEVTV workshop on nature and composition of surface of Mars (and whether wine can be made). LPI Tech. Rpt.* **88-05,** 88-90. (*eds*. Zimbelman *et al*.) Lunar Planetary Institute, Napa Valley.
Shergotty, Nakhla, Chassigny, ALHA77005

McFadden L. A. and Pratt S. F. (1989) Remote sensing and the Shergottite-Nakhlite-Chassignite meteorite parent body. (abs.) *Bull. Am. Astron. Soc*. **21**, 967.
Shergotty, Nakhla, Chassigny, ALHA77005

McHone J. F., Kudryavtsev A. B., Agresti D. G., Wdowiak T. J. and Killgore M. (1999) Raman imagery of Martian meteorites. (abs) *Lunar Planet. Sci.* **XXX**, #1896, Lunar Planetary Institute, Houston (CD-ROM)
Nakhla, Zagami, DaG476

McKay D. S. (1998) Evidence for ancient life in Mars meteorites: Lessons learned. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7050. Lunar Planetary Institute, Houston.

McKay D. S., Gibson E. K., Thomas-Keprta, K. L., Vali H., Romanek C. S., Clemett S. J., Chillier X. D. F., Maechling C. R. and Zare R. N. (1996a) Search for life on Mars: Possible relic biogenic activity in Martian meteorite ALH84001. *Science* **273**, 924-930.
ALH84001

McKay D. S., Thomas-Keprta K. L., Romanek C. S., Gibson E. K. and Vali H. (1996b) Evaluating the evidence for past life on Mars: Responce. *Science* **274**, 2123-2124.
ALH84001

McKay D. S., Gibson E. K., Thomas-Keprta K. L., Romanek C. S. and Allen C. C. (1997a) Possible biofilms in ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 919-920.
ALH84001

McKay D. S., Gibson E. K., Thomas-Keprta K. L. and Vali H. (1997b) Reply to Bradley *et al.* (1997). *Nature* **390**, 455.
ALH84001

McKay D. S., Wentworth S. W., Thomas-Keprta K. L., Westall F. and Gibson E. K. (1999) Possible bacteria in Nakhla. (abs) *Lunar Planet. Sci*. **XXX**, #1816, Lunar Planetary Institute, Houston (CD-ROM)
Nakhla

McKay D. S., Wentworth S. W., Longazo T. G., Thomas-Keprta K. and Gibson E. K. (2001) Textures of secondary alteration zones in Nakhla. (abs) *Lunar Planet. Sci.* **XXXII**, #2040. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

McKay D.S., Clemett S.J., Gibson E.K., Thomas-Keprta K. and Wentworth S.J. (2002) Are carbonate globules, magnetites and PAHs in ALH84001 really terrestrial contaminants? (abs) *Lunar Planet. Sci.* **XXXIII** #1943. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

McKay G.A. (1993) Minor elements in Nakhla cumulus pyroxenes. (abs) *Meteoritics* **28**, 395-396.
Nakhla

McKay G.A., Yang S.-R. and Wagstaff J. (1985) Minor phases, Fe-rich pyroxene and Shergotty chronology. *Meteoritcs* **20**, 710-711.
Shergotty

McKay G.A. and Wagstaff J. (1985) Clinopyroxene REE distribution coefficients for shergottites: REE content of the Shergotty/Zagami melts. (abs) *Lunar Planet. Sci.* **XVI**, 540-541.
Shergotty, Zagami

McKay G.A., Wagstaff J. and Yang S.-R. (1986a) Whitlockite/melt partitioning and Shergotty chronology. (abs) *Meteoritics* **21**, 448-449.
Shergotty

McKay G.A., Wagstaff J. and Yang S.-R. (1986b) Clinopyroxene REE distribution coefficients for shergottites: The REE content of the Shergotty melt. *Geochim. Cosmochim. Acta* **50,** 927-937.
Shergotty

McKay G. A., Wagstaff J. and Le. L. (1986c) Pyroxene distribution coefficients, the Shergotty parent melt and metasomatic alteration. (abs) *Lunar Planet. Sci.* **XVII**, 537-538.
Shergotty

McKay G. A. and Wagstaff J. (1987) Metasomatic alteration of Shergotty? Evidence from petrographic and phase compositions. (abs) *Meteoritics* **22**, 456-457.
Shergotty

McKay G. A., Wagstaff J., Le L., Lindstrom D. J. and Colson R. (1987) Whitlockite/melt partitioning and Henry's law: Shergotty late-stage minerals. (abs) *Lunar Planet. Sci.* **XVIII**, 625-626.
Shergotty

McKay G. A., Le L. and Wagstaff J. (1992) REE partition coefficients for the Nakhla parent melt. (abs) *Lunar Planet. Sci***. XXIII**, 889-890.
Nakhla

McKay G. A., Le L. and Wagstaff J. (1993) The Nakhla parent melt: REE partition coefficients and clues to major element composition. (abs) *Lunar Planet. Sci***. XXIV**, 965-966.
Nakhla

McKay G. A., Le L. and Wagstaff J. (1994) Synthetic and natural Nakhla pyroxenes: Parent melt

composition and REE partition coefficients. (abs) *Lunar Planet. Sci.* **XXV**, 883-884.
Nakhla

McKay G. A., Yang S.-R. and Wagstaff J. (1996) Complex zoned pyroxenes in shergottite QUE94201: Evidence for a two-stage crystallization history. (abs) *Lunar Planet. Sci.* **XXVII**, 851-852.
QUE94201

McKay G. A. and Lofgren G. E. (1997) Carbonates in ALH84001: Evidence for kinetically controlled growth. (abs) *Lunar Planet. Sci*. **XXVII**, 921-922.
ALH84001

McKay G. A., Mikouchi T. and Lofgren G. E. (1997a) Carbonates and feldspathic glass in Allan Hills 84001: Additional complications. (abs) *Meteoritics & Planet. Sci*. **32**, A87-88.
ALH84001

McKay G. A., Lofgren G. E. and Mikouchi T. (1997b) Textural relationships among carbonates, shocked feldspathic glass and pyroxene in Martian meteorite ALH84001. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 106-108. Nat. Inst. Polar Res., Tokyo.
ALH84001

McKay G. A., Mikouchi T., Schwandt C. S. and Lofgren G. (1998a) Fracture fillings in ALH84001 feldspathic glass: Carbonates and silica. (abs) *Lunar Planet. Sci.* **XXIX** #1944, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

McKay G. A., Schwandt C. S. and Mikouchi T. (1998b) Feldspathic glass and silica in ALH84001. (abs) *Meteoritics & Planet. Sci*. **33**, A102.
ALH84001

McKay G. A., Schwandt C. S. and Mikouchi T. (1998c) Aditional petrographic features of Martian meteorite of Martian meteorite ALH84001. (abs) *NIPR Sym. Antarctic Meteorites* **23rd***,* 75-76. Nat. Inst. Polar Res., Tokyo.
ALH84001

McKay G. A., Mikouchi T., Le L., Schwandt C. and Hashimoto M. (2000) The Shergotty paradox: An experimental perspective on intercumulus melt compositions. (abs) *Lunar Planet. Sci.* **XXXI,** #2000. Lunar Planetary Institute, Houston (CD-ROM).

McKay G. A., Koizumi E., Mikouchi T., Le L. and Schwandt C. (2001) Experimental crystallization of the QUE94201 basaltic shergottite: Support for the Martian magma hypothesis. (abs) *NIPR Sym. Antarctic Meteorites* **24th***,* 77-79. Nat. Inst. Polar Res., Tokyo.
QUE94201

McKay G.A., Koizumi E., Mikouchi T., Le L. and Schwandt C. (2002a) Crystallization of shergottite QUE94201: An experimental study. (abs) *Lunar Planet. Sci.* **XXXIII** #2051. Lunar Planetary Institute, Houston. (CD-ROM)
QUE94201

McKay G.A., Koizumi E., Mikouchi T., Le L. and Schwandt C. (2002b) Experimental crystallization of shergottite QUE94201: A Martian magma. (abs) *Antarctic Meteorites* **XXVII**, 80-82, NIPR, Tokyo

McKay G.A., Le L., Koizumi E. and Mikouchi T. (2003) Additional constraints on the crystallization of basaltic shergottite QUE94201. (abs) *Lunar Planet. Sci*. **XXXIV** #2109. Lunar Planetary Institute, Houston
QUE94201

McLennan S. M. (2003) Evidence for a distinctive rare earth element-enriched mantle reservoir on Mars. (abs #1710) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

McSween H. Y., Jr. (1982a) Igneous layering and shock metamorphism in a new Antarctic achondrite. (abs) *NIPR Sym. Antarctic Meteroites* **7th**, 24-25. Nat. Inst. Polar Res., Tokyo.
EETA79001

McSween H. Y., Jr. (1982b) An example of igneous layering on a meteorite parent body. In *Workshop on magmatic processes of early planetary crusts: Magma oceans and stratiform layered intrusions.* (*eds*. Walker and McCallum) *LPI Tech. Rpt*. **82-01**, 106-108. Lunar Planetary Institute, Houston.
EETA79001

McSween H. Y., Jr. (1983) The role of assimilation in shergottite petrogenesis. (abs) *Meteoritics* **18**, 354-355.
EETA79001

McSween H. Y., Jr. (1984) SNC meteorites: Are they Martian rocks? *Geology* **12,** 3-6. *(review paper)*
ALHA77005, EETA79001

McSween H. Y., Jr. (1985a) SNC meteorites: Clues to Martian petrologic evolution? *Rev. Geophys.* **23**, 391-416. *(review paper)*

McSween H. Y., Jr. (1985b) What we know about Mars (but otherwise wouldn't) if it is the shergottite parent body. (abs) *Lunar Planet. Sci.* **XVI**, 546-547.

McSween H. Y., Jr. (1986) Complex igneous processes in the shergottite parent body. (abs) *Lunar Planet. Sci.* **XVII**, 541-542.
EETA79001

McSween H. Y., Jr. (1987) **Meteorites and their Parent Bodies**. Cambridge University Press, NY. 237 pp.

McSween H. Y., Jr. (1994) What we have learned about Mars from SNC meteorites. *Meteoritics* **29**, 757-779. *(review paper)*

McSween H. Y., Jr. (1995) Mars, on the rocks with a bit of seltzer. *Meteoritics* **29**, 241-242. *(editorial)*
ALH84001

McSween H. Y., Jr. (1996) Evidence for ancient life in a Martian meteorite (!or*?) Meteoritics & Planet. Sci*. **31**, 691-692.
ALH84001

McSween H. Y., Jr. (1997) Evidence for life in a Martian meteorite? *GSA Today* **7**-7, 1-7.
ALH84001

McSween H.Y., Jr. (1998) Key research: Martian meteorites and their relationships to planetary geology and perhaps biology. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7005. Lunar Planetary Institute, Houston.

McSween H.Y., Jr. (2001) The rocks from Mars, from far and near. *Meteoritics & Planet. Sci.* **36**, A129-130.

McSween H.Y. Jr. (2002) The rocks of Mars, from far and near. *Meteoritics & Planet. Sci.* **37**, 7-25.

McSween H.Y. Jr. and Stolper E. M. (1978) Petrologic evolution of the shergottite parent body crust. (abs) *Meteoritics* **13**, 560.
Shergotty, Zagami

McSween H.Y., Jr., Taylor L. A. and Stolper E. M. (1979a) Allan Hills 77005**:** A new meteorite type found in Antarctica. *Science* **204,** 1201-1203.
ALHA77005

McSween H.Y. Jr., Stolper E. M., Taylor L. A., Muntean R. A., O'Kelley G. D., Eldridge J. S., Biswas S., Ngo H. T. and Lipschutz M. E. (1979b) Petrogenetic relationship between Allan Hills 77005 and other achondrites. *Earth Planet. Sci. Lett.* **45,** 275-284.
ALHA77005

McSween H.Y. Jr. and Stolper E. M. (1980) Basaltic meteorites. *Scientific American* **242 (6)**, 54-63. (review paper)

McSween H.Y. Jr. and Stöffler D. (1980) Shock metamorphic features in ALHA77005 meteorite. (abs) *Lunar Planet. Sci.* **XI**, 717-719.
ALHA77005

McSween H.Y. Jr. and Reid A. M. (1981) Igneous layering in an achondrite meteorite. (abs) *Meteoritics* **16**, 359.
EETA79001

McSween H.Y. Jr. and Grimm R. E. (1982) Shergottite parent body controversy: The gravity of the situation. (abs) *Meteoritics* **17**, 252-253.
Shergotty, Zagami

McSween H.Y. Jr. and Jarosewich E. (1982) Petrogenesis of the EETA79001 achondrite. (abs) *Lunar Planet. Sci.* **XIII**, 503-504.
EETA79001

McSween H.Y. Jr. and Jarosewich E. (1983) Petrogenesis of the EETA79001 meteorite: Multiple magma pulses on the shergottite parent body. *Geochim. Cosmochim. Acta* **47,** 1501-1513.
EETA79001

McSween H.Y. Jr., Lundberg L. L. and Crozaz G. (1988) Crystallization of the ALHA77005 shergottite: How closed is a closed system? (abs). *Lunar Planet. Sci.* **XIX**, 766-767.
ALHA77005

McSween H.Y. Jr., Lundberg L. L. and Crozaz G. (1990) Petrogenesis of the ALHA77005 shergottite revisited. (abs) *Meteoritics* **25**, 384.
ALHA77005

McSween H. Y., Jr. and Harvey R. P. (1993a) Outgassed water on Mars: Constraints from melt inclusions in SNC meteorites. *Science* **259,** 1890-1892.

McSween H. Y., Jr. and Harvey R. P. (1993b) Wet inside and out? Constraints on water in the Martian mantle and on outgassed water, based on melt inclusions in SNC meteorites. In *Workshop on early Mars: How warm and how wet?* (*eds*. Squyres and Kasting) *LPI Tech. Rpt*. **93-03,** 18-19. Lunar Planetary Institute, Houston

McSween H. Y., Jr. and Eisenhour D. D. (1996) QUE94201, A noncumulate shergottite. (abs) *Lunar Planet. Sci.* **XXVII**, 853-854.
QUE94201

McSween H. Y., Jr., Eisenhour D. D., Taylor L. A., Wadhwa M. and Crozaz G. (1996) QUE94201 shergottite: Crystallization of a Martian basaltic magma. *Geochim. Cosmochim. Acta* **60**, 4563-4569.
QUE94201

McSween H. Y., Jr. and Harvey R. P. (1998a) Brime evaporation: An alternative model for the formation of carboanetes in ALH84001. (abs) *Meteoritics & Planet. Sci.* **33**, A103.
ALH84001

McSween H. Y., Jr. and Harvey R. P. (1998b) An evaporation model for the formation of carbonates in the ALH84001 Martian meteorite. *International Geological Reviews **40***, 774-783.

McSween H. Y., Jr. and Treiman A. H. (1998) **Martian Meteorites**. Chapter 6 in **Planetary Materials**. (Papike J. J. *ed*.) *Reviews of Mineralogy* **36**. *Mineralogical Society of America. (review paper)*

McSween H. Y., Jr, Lentz R.C.F., Grove T. L. and Dann J. C. (2000) Magmatic water in Shergotty, inferred from light-lithophile-element patterns and crystallization experiments. (abs) *Meteoritics & Planet. Sci.* **35**, A107.
Shergotty

McSween H. Y., Jr. and Keil K. (2000) Mixing relationships in Martian regolith and the composition of globally homogeneous dust. *Geochim. Cosmochim. Acta* **64**, 2155-2166.

McSween H.Y., Jr., Grove T.L., Lentz R.C.F., Dann J. C., Riciputi L.R. and Ryan J.G. (2001a) Water in the Shergotty magma and implications for outgassing and magma fractionation on Mars. (abs) *Eleventh Goldschmidt Conf.* 3012. Hot Springs.

McSween H.Y., Jr., Grove T.L., Lentz R.C.F., Dann J.C., Holzheid A.H., Riciputi L.R. and Ryan J.G. (2001b) Geochemical evidence for magmatic water within Mars from pyroxenes in the Shergotty meteorite. *Nature* **409**, 487-490.
Shergotty

McSween H.Y. , Grove T.L. and Wyatt M.B. (2003) Basalt versus andesite in the Martian crust: New geochemical perspectives. (abs. #1189) *Lunar Planet. Sci. Conf.* **34rd** , Lunar Planetary Institute, Houston (CD-ROM).

Melosh H. J. (1984) Impact ejection, spallation, and the origin of meteorites. *Icarus* **59,** 234-260.

Melosh H. J. (1985) Ejection of rock fragments from planetary bodies. *Geology* **13,** 144-148.

Melosh H. J. (1988) The rocky road to panspermia. *Nature* **332**, 687-688.

Melosh H. J., Treiman A. H. and Greive R. A. F. (1983) Olivine composition glass in the Chassigny meteorite: Implications for shock history. (abs) *EOS, Trans.* **64**, 254.
Chassigny

Melosh H. J. and Vickery A. M. (1989) Impact errosion of the primordial atmosphere of Mars. *Nature* **338**, 487-489.

Melosh H. J. and Tonks W. B. (1993) Swapping rocks: Ejection and exchange of surface materials among the terrestrial planets. (abs) *Meteoritics* **28**, 393.

Melosh H. J. (1997) Mars meteorites and panspermian possibilities. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life*. (*eds*. Clifford *et al*.) *LPI Tech. Rpt*. **97-0** , Lunar Planetary Institute, Houston

Mermelengas N., DeLaeter J. R. and Rosman K. J. R. (1979) New data on the abundance of palladium in meteorites. *Geochim. Cosmochim. Acta* **43**, 747-754.
Nakhla

Meunier S. (1911) Examen chimique et lithologique de la meteorite d'El Nakhla. *Séance, 3 Compt. Rend. Acad. Sci. Paris* vol cliii, 524, 785-787.
Nakhla

Michel J. (1912) Die feldspate der meteoriten. *Tschermak's Miner. Petrogr. Mitt.* **31**, 563-658.
Shergotty

Mikouchi T. (1999) Preliminary examination of Dar al Gani 476: A new basaltic Martian meteorite simimilar to lithology A of EETA79001. (abs) *Lunar Planet. Sci.* **XXX**, #1557, Lunar Planetary Institute, Houston (CD-ROM)
DaG476, EETA79001

Mikouchi T. (2000) Pyroxene and plagioclase in the Los Angeles Martian meteorite: Comparison with the Queen Alexandra Range 94201 Martian meteorite and the Asuka 881757 Lunar meteorite. (abs) *Meteoritics & Planet. Sci.* **35**, A110.
Los Angeles, QUE94201

Mikouchi T. (2001) Mineralogical similarities and differences between the Los Angeles basaltic shergottites and the Asuka-881757 lunar mare meteorite. *Antarct. Meteorite Res.,* **14**, 1-20.
Los Angeles

Mikouchi T. and Miyamoto M. (1996a) A new member of lherzolite shergottite from Japanese Antarctic meteorite collection: Mineralogy and petrology of Yamoto- Y793605. (abs) *Proc. NIPR Sym. Antarctic Meteorites* **21st,** 104-106. Nat. Inst. Polar Res., Tokyo.
Y793605

Mikouchi T. and Miyamoto M. (1996b) Comparative mineralogy of Antarctic lherzolitic shergottites Allan Hills 77005**,** Lewis Cliff 88516 and Yamoto 793605. (abs) *Meteoritics & Planet. Sci.* **31**, A89-A90.
ALHA77005, LEW88516, **Y793605**

Mikouchi T. and Miyamoto M. (1997a) Major and minor element distributions inpyroxene and maskelynite from Martian meteorite Yamato-793605 and other lherzolites: Clues to their crystallization histories. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 109-111. Nat. Inst. Polar Res., Tokyo.
Y793603

Mikouchi T. and Miyamoto M. (1997b) Yamoto- Y793605: A lherzolite shergottite from Japanese Antarctic meteorite collection. *Antarctic Meteorite Research* **10,** 41-60. Nat. Inst. Polar Res., Tokyo.
Y793605

Mikouchi T. and Miyamoto M. (1998) Pyroxene and olivine microstructures in Nakhlite Martian meteorites: Implication for their thermal history. (abs) *Lunar Planet. Sci.* **XXIX** #1574, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla, Governador Valadares, Lafayette

Mikouchi T., Miyamoto M. and McKay G. A. (1996) Mineralogy and petrology of new Antarctic shergottite QUE94201: A coarse-grained basalt with unusual pyroxene zoning. (abs) *Lunar Planet. Sci.* **XXVII**, 879-880.
QUE94201

Mikouchi T., Miyamoto M. and McKay G. A. (1997a) Similarities in zoning of pyroxenes from QUE94201 and EETA79001 Martian meteorites. (abs) *Lunar Planet. Sci*. **XXVIII**, 955-956.
QUE94201, EETA79001, ALHA77005, LEW88516, Y793605, Shergotty, Zagami

Mikouchi T., Miyamoto M. and McKay G. A. (1997b) Crystallization histories of basaltic shergottites as inferred from chemical zoning of pyroxene and maskelynite. (abs) *Meteoritics & Planet. Sci*. **32**, A92-93.
Shergotty, Zagami, EETA79001, QUE94201

Mikouchi T., Miyamoto M. and McKay G. A. (1998a) Mineralogy of Antarctic basaltic shergottite Queen Alexandra Range 94201: Similarities to Elephant Moraine A79001 (Lithology B) Martian meteorite. *Meteoritics & Planet. Sci.* **33**, 181-189.
QUE94201, EETA79001

Mikouchi T., Miyamoto M. and McKay G. A. (1998b) Mineralogical characterization of heated "maskelynitized" plagioclase glass in Zagami Martian meteorite. (abs) *Meteoritics & Planet. Sci.* **33**, A109.
Zagami

Mikouchi T., Miyamoto M. and McKay G. A. (1998c) Shocked plagioclase in Martian and lunar meteorites: Textures, chemical compositions, Raman spectra, and implications for their post-shock thermal histories. (abs) *NIPR Sym. Antarctic Meteorites* **23rd***,* 77-79. Nat. Inst. Polar Res., Tokyo.
Zagami

Mikouchi T., Osaka T., Kaneda K. and Ohsumi K. (1998d) X-ray dirraction study of shocked plagioclase in Martian and Lunar meteorites with the micro-area Laure method using synchrotron radiation. (abs) *NIPR Sym. Antarctic Meteorites* **23rd***,* 80-82. Nat. Inst. Polar Res., Tokyo.
ALH77005, Zagami, QUE94201, Y793605, ALH84001

Mikouchi T., Miyamoto M. and McKay G. A. (1998e) What were the major factors that controled minerolgical similarities and differences of basaltic lherzolithic and clinopyroxenic Martian meteorites within each group? (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7016. Lunar Planetary Institute, Houston.

Mikouchi T., Miyamoto M. and McKay G. A. (1999a) Cooling rates of olivine in the Martian meteorites Dar al Gani 476 and Elephant Moraine 79001. (abs) *Meteoritics & Planet. Sci.* **34**, A81-82.
DaG476, EET79001

Mikouchi T. and Miyamoto M. (1999b) Micro Raman spectroscopy of amphiboles and Al-Ti-rich pyroxenes in the Martian meteorites Zagami and LEW88516. (abs) *Lunar Planet. Sci.* **XXX**, #1559, Lunar Planetary Institute, Houston (CD-ROM)
Zagami, LEW88516

Mikouchi T., Miyamoto M. and McKay G. A. (1999c) Olivine megacrysts in the basaltic Martian meteorites Dar al Gani 476 and EETA79001: Cooling rates deduced from Fe-Mg zoning of olivine. (abs) *NIPR Sym. Antarctic Meteorites* **24th***,* 102-104. Nat. Inst. Polar Res., Tokyo.
DaG476, EETA79001

Mikouchi T, Miyamoto M and McKay G. A. (1999d) The role of undercooling in producing igneous zoning trends in proxenes and maskelynites among basaltic Martian meteorites. *Earth Planet. Sci. Lett.* **173**, 235-256.
Shergotty, Zagami, EET79001, QUE94201

Mikouchi T., Yamada I. and Miyamoto M. (2000) Symplectic exsolution in olivine from the Nakhla Martian meteorite. *Meteoritics & Planet. Sci.* **35**, 937-942.

Nakhla

Mikouchi T. and Miyamoto M. (2000a) Lherzolithic Martian meteorites Allan Hills 77005, Lewis Cliff 88516 and Yamoto-793605: Major and minor element zoning in pyroxene and plagioclase glass. *Antarct. Meteorite Res.,* **13**, 256-269.
ALH77005, LEW88516, Y793605

Mikouchi T. and Miyamoto M. (2000b) Micro Raman spectroscopy of amphiboles and pyroxenes in the Martian meteorites Zagami and Lewis Cliff 88516. *Meteoritics & Planet. Sci.* **35**, 155-159.
Zagami, LEW88516

Mikouchi T., Koizumi E., McKay G., Le L. and Schwandt C. (2001a) Experimental crystallization of the QUE94201 basaltic shergottite. (abs) *Lunar Planet. Sci.* **XXXII**, #2100. Lunar Planetary Institute, Houston. (CD-ROM)
QUE94201

Mikouchi T., Miyamoto M. and McKay G. A. (2001b) Mineralogy and petrology of the Dar al Gani 476 Martian meteorite: Implications for its cooling history and relationship to other shergottites. *Meteoritics & Planet. Sci.* **36**, 531-548.
DaG476

Mikouchi T. and Miyamoto M. (2001a) Dhofar 019 shergottite: Mineralogy and petrology of a new member of the basaltic Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1644. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Mikouchi M.E. and Miyamoto M. (2001b) Northwest Africa 817: A new Nakhlite similar to others but distinct. (abs) *Meteoritics & Planet. Sci.* **36**, A134.
NWA817

Mikouchi M.E. and Miyamoto M. (2002a) Comparative cooling rates of nakhlites as inferred from iron-magnesium and calcium zoning of olivines. (abs) *Lunar Planet. Sci.* **XXXIII** #1343. Lunar Planetary Institute, Houston. (CD-ROM)
NWA817

Mikouchi M.E. and Miyamoto M. (2002b) Olivine cooling rate of the Northwest Africa 1068 shergottite. (abs) *Lunar Planet. Sci.* **XXXIII** #1562. Lunar Planetary Institute, Houston. (CD-ROM)
Louise Michel

Mikouchi M.E. and Miyamoto M. (2002c) Mineralogy and olivine cooling rate of the Dhofar 019 shergottite. *Antarct. Meteorite Res.* **15**, 122-142.
Dho019

Mikouchi T., Koizumi E., Monkawa A., Ueda Y. and Miyamoto M. (2002d) Comparative mineralogy of the new nakhlite Yamoto-000593 with other nakhlite Martian meteorites. (abs) *Antarctic Meteorites* **XXVII**, 83-85, NIPR, Tokyo
Y000593

Mikouchi T. (2002e) Maskelynite. (abs*) Meteoritics & Planet. Sci.* **37**, A100.

Mikouchi T. and McKay G. (2003) Shock heating and subsequent cooling of basaltic shergottites: The case for QUE94201 and Dhofar 378. (abs) *Lunar Planet. Sci*. **XXXIV** #1920. Lunar Planetary Institute, Houston
QUE94201, Dhofar378

Mikouchi T., Koizumi E., Monkawa A., Ueda Y. and Miyamoto M. (2003) Mineralogical comparison of Y000593 with other nakhlites: Implications for relative burial depths of nakhlites. (abs) *Lunar Planet. Sci*. **XXXIV** #1883. Lunar Planetary Institute, Houston
Y000593

Minitti M.E., Rutherford M.J., Giletti B.J. and Schultz P.H. (1997) The effects of impact on D/H of hornblends: Applications to SNC petrogenesis. (abs) *Lunar Planet. Sci.* **XXVIII**, 959-960.

Minitti M.E. and Rutherford M. J. (1998) Assesment of shock effects on hornblende water contents and isotopic compositions. (abs) *Lunar Planet. Sci.* **XXIX**, (CD-ROM), Lunar Planetary Institute, Houston.

Minitti M.E. and Rutherford M. J. (2000) Genesis of the Mars Pathfinder "sulfur-free" rock from SNC parental liquids. *Geochim. Cosmochim. Acta* **64**, 2535-2547

Minitti M.E. and Mysen B. O. (2001) Investigation of kaersutite crystallization in SNC basaltic magmas. (abs) Eleventh Goldschmidt Conf. 3419. Hot Springs.

Minitti M.E., Leshin L.A., Guam Y., Luo S. and Ahrens T.J. (2003) The effect of impact shock on water and H isotopes in amphibole. (abs) *Lunar Planet. Sci.* **XXXIV** #1524. Lunar Planetary Institute, Houston.

Misawa K., Nakamura N., Premo W. R. and Tatsumoto M. (1997a) U-Th-Pb isotopic systematics of lherzolitic shergottite Yamato 793605. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 115-117. Nat. Inst. Polar Res., Tokyo.
Y793605

Misawa K., Nakamura N., Premo W. R. and Tatsumoto M. (1997b) U-Th-Pb isotopic systematics of lherzolitic shergottite Yamato 793605. *Antarctic Meteorite Research* **10***,* 95-108. Nat. Inst. Polar Res., Tokyo.
Y793605

Misawa K., Yamazaki F., Sawada S., Sekine T. and Nakamura N. (2000) Incorporation of radiogenic lead into plagioclase during shock metamorphism. (abs) *Meteoritics & Planet. Sci.* **35**, A111.
Y793605

Misawa K., Shih C.-Y., Wiesmann H. and Nyquist L.E. (2003) Crystallization and alteration ages of the Antarctic nakhlite Yamato 000593. (abs) *Lunar Planet. Sci.* **XXXIV** #1556. Lunar Planetary Institute, Houston.
Y000593

Mittlefehldt D. W. (1993) Igneous fractionation and subsolidus equilibration of diogenite meteorites. (abs) *Lunar Planet. Sci.* **XXIV**, 993-994.

Mittlefehldt D. W. (1994a) ALH84001, A cumulate orthopyroxenite member of the Martian meteorite clan. *Meteoritics* **29,** 214-221.
ALH84001

Mittlefehldt D. W. (1994b) ALH84001 cumulate orthopyroxenite: A previously unappreciated Martian meteorite. (abs) *Lunar Planet. Sci.* **XXV**, 911-912.
ALH84001

Mittlefehldt D. W. (1994c) ALH84001, A cumulate orthopyroxenite member of the Martian meteorite clan. *(a correction) Meteoritics* **29**, 900.
ALH84001

Mittlefehldt D. W. (1996) Survey of carbonates in ALH84001. Curator's report. JSC Curator's Office, Houston.
ALH84001

Mittlefehldt D. W. (1997a) The source of ALH84001. *The Planetary Report* **XVII**, 8-11.
ALH84001

Mittlefehldt D. W. (1997b) Macroscopic description of Allan Hills 84001 and the relative timing of events in its history. (abs) *Meteoritics & Planet. Sci*. **32**, A93.
ALH84001

Mittlefehldt D. W. and Lindstrom M. M. (1988) HED petrogenesis. View from the diogenite end. (abs) *Meteoritics* **23**, 290.
ALH84001

Mittlefehldt D. W. and Lindstrom M. M. (1989a) Diogenite petrogenesis: Geochemistry and petrology of whole rocks and coarse-grained separates. (abs) *Lunar Planet. Sci*. **XX**, 697-698.
ALH84001

Mittlefehldt D. W. and Lindstrom M. M. (1989b) Weathering in Antarctic meteorites: an INAA-SEM study. (abs) *Meteoritics* **24**, 304-305.

Mittlefehldt D. W. and Lindstrom M. M. (1991) Generation of abnormal trace element abundances in Antarctic eucrites by weathering processes. *Geochim. Cosmochim. Acta* **55**, 77-87.

Mittlefehldt D. W. and Lindstrom M. M. (1994a) Geochemical evidence for mixing of three components in Martian orthopyroxenite ALH84001. (abs) *Meteoritics* **29**, 504.
ALH84001

Mittlefehldt D. W. and Lindstrom M. M. (1994b) ALH84001 orthopyroxenite: Comparison with other Martian meteorites and Yamato 75032-type and LEW88xxx ferroan diogenites. (abs) *NIPR Sym. Antarctic Meteorites,* **19th,** 179-182. Nat. Inst. Polar Res., Tokyo.
ALH84001

Mittlefehldt D. W., Lindstrom M. M. and Gibson E. K., Jr. (1995) ALH84001: Trace element geochemical similarities of its trapped melt component to Nakhla, Lafayette and Chassigny. (abs) *Lunar Planet. Sci.* **XXVI**, 983-984.
Nakhla, Lafayette, Chassigny, ALH84001

Mittlefehldt D. W. and Lindstrom M. M. (1996) Martian meteorites QUE94201, an unusual basalt, and Governador Valadares, a typical clinopyroxenite: Geochemistry. (abs) *Lunar Planet. Sci.* **XXVII**, 887-888.
QUE94201, Governador Valadares

Mittlefehldt D. W., Lindstrom D. J. and Lindstrom M. M. (1996) Martian alteration effects on bulk compositions of Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **31**, A90-A91.
Lafayette

Mittlefehldt D. W. and Lindstrom M. M. (1997) Early Mars evolution: Clues from Martian meteorties. (abs) *7th Goldschmidt Conf., LPI Contribution* **921**, 142. Tucson.

Mittlefehldt D. W., Lindstrom D. J., Lindstrom M. M. and Martinez R. R. (1997a) Lithology A in EETA79001-Product of impact melting on Mars. (abs) *Lunar Planet. Sci*. **XXVIII**, 961-962.
EETA79001

Mittlefehldt D. W., Wentworth S. J., Wang M.-S., Lindstrom M. M. and Lipschutz M. E. (1997b) Geochemistry of and alteration phases in Martian lherzolite Y-793605. *Antarctic Meteorite Research* **10**, 109-124. Nat. Inst. Polar Res., Tokyo.
Y793605, LEW88516, ALHA77005

Mittlefehldt D. W. and Lindstrom M. M. (1999) Petrology and geochemistry of Martian meteorites EETA79001 and ALHA77005. (abs) *Lunar Planet. Sci.* **XXX**, #1817, Lunar Planetary Institute, Houston (CD-ROM)
EETA79001, ALHA77005

Mittlefehldt D. W., Lindstrom D. J., Lindstrom M. M. and Martinez R. R. (1999) An impact-melt origin for lithology A of martian meteorite Elephant Moraine A79001. *Meteoritics & Planet. Sci.* **34**, 357-367.
EET79001

Mittlefehldt D.W. (2002) Geochemistry of Martian meteorites and the petrological evolution of Mars. (abs) Un-mixing SNCs. 37-38. LPI Contribution No. 1134.

Miura Y. N. (1995) *Studies on differentiated meteorites: Evidence from ^{244}Pu-derived fission Xe, ^{81}Kr, other noble gases and nitrogen.* PhD Dissertation, Univ. Tokyo, Tokyo.
ALH84001

Miura Y. N., Okamoto M. and Iancu O. G. (1993) Ejection process of Martian meteorites from shock metamorphism. (abs) *Meteoritics* **28**, 402.

Miura Y. N., Sugiura N. and Nagao K. (1994) New SNC meteorite ALH84001: Evidence for SNC meteorite from noble gases. (abs) *Lunar Planet. Sci.* **XXV**, 919-920.
ALH84001

Miura Y. N. and Sugiura N. (1994) Heavy nitrogen in a SNC orthopyroxenite ALH84001. (abs) *NIPR Sym. Antarctic Meteorites* **19th,** 151-153. Nat. Inst. Polar Res., Tokyo.
ALH84001

Miura Y. N., Nagao K., Sugiura N., Sagawa H. and Matsubara K. (1995) Orthopyoxenite ALH84001 and shergottite ALHA77005: Additional evidence for a Martian origin from noble gases. *Geochim. Cosmochim. Acta* **59**, 2105-2113.
ALH84001, ALHA77005

Miura Y. N. and Sugiura N. (2000) Martian atmosphere-like nitrogen in the orthopyroxenite ALH84001. *Geochim. Cosmochim. Acta* **64**, 559-572.
ALH84001

Mohapatra R. K., Mahajan R. R. and Murty S. V. S. (1998) Nitrogen and argon in Shergotty. (abs) *Meteoritics & Planet. Sci.* **33**, A112.
Shergotty

Mohapatra R. K. and Ott U. (2000) Trapped noble gases in Sayh al Uhaymir 005: A new Martian meteorite from Oman. (abs) *Meteoritics & Planet. Sci.* **35**, A113.
SaU005

Mohapatra R.K. and Murty S.V.S. (2001) Precursors of Mars – Clues from nitrogen and oxygen isotopes. *Meteoritics & Planet. Sci.* **36**, A138-139.

Mohapatra R.K., Schwenzer S. P., Hermann S. and Ott U. (2001) Trapped nitrogen and Noble gases in a shock-glass from Sayh al Uhaymir 005 – The Martian meteorite from Oman. (abs) *Meteoritics & Planet. Sci.* **36**, A139.
SaU005

Mohapatra R.K., Schwenzer S.P. and Ott U. (2002a) Krypton and xenon in Martian meteorites from hot deserts – the low temperature component. (abs) *Lunar Planet. Sci.* **XXXIII** #1532. Lunar Planetary Institute, Houston. (CD-ROM)
SaU005

Mohapatra R.K., Schwenzer S.P., Hermann S. and Ott U. (2002b) Nitrogen and noble gases in the basaltic shergottite QUE94201. (abs) *Meteoritics & Planet. Sci*. **37**, A102.
QUE94201

Mohapatra R.K. and Murty S.V.S. (2002) Silicon in Mars' core: A prediction based on Mars model using nitrogen and oxygen isotopes in SNC meteorites. (abs) Un-mixing SNCs. 39-40. LPI Contribution No. 1134.

Mojzsis S. J. and Arrhenius G. (1998) Phosphates and carbon on Mars: Exobiological implications and sample return considerations. *J. Geophys. Res*. **103**, 28,495-28,511.

Molini-Velsko C., Mayeda T.K. and Clayton R.N. (1986) Isotopic composition of silicon in meteorites. *Geochim. Cosmochim. Acta* **50**, 2719-2726.
Nakhla, Zagami, Shergotty

Monkawa A., Makino K., Ishii T., Ohtsuki M., Mikouchi T. and Miyamoto M. (2001) The determination of Fe2+/Fe ratios of Kaersutite in the Martian meteorite LEW88516 by electron microprobe. (abs) *Meteoritics & Planet. Sci.* **36**, A140.
LEW88516

Monkawa A., Makino K., Mikouchi T., Koizumi E., Ishii T. and Miyamoto M. (2002a) Characteristics of titanium-rich kaersutites in Martian meteorites and terrestrial rocks. (abs) *Lunar Planet. Sci.* **XXXIII** #1440. Lunar Planetary Institute, Houston. (CD-ROM)

Monkawa A., Mikouchi T., Miyamoto M. and Koizumi E. (2002b) Formation of titanium-rich kaersutites in shergottitic Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **37**, A103.

Monkawa A., Mikouchi T., Miyamoto M., Koisumi E., Miyata Y. and Ohsumi K. (2002c) On the formation of Ti-rich kaersutite amphiboles in Martian meteorites. (abs) *Antarctic Meteorites* **XXVII**, 102-104, NIPR, Tokyo
LEW88516, Zagami, NWA856

Monkawa A., Mikouchi T., Sekine T., Koizumi E. and Miyamoto M. (2003) Shock formation of kaersutite in Martian meteorites: An experimental study. (abs) *Lunar Planet. Sci.* **XXXIV** #1534. Lunar Planetary Institute, Houston.

Moore H. J., Hutton R. E., Clow G.D. and Spitzer C. R. (1987) Physical properties of the surface materials at the Viking landing sites on Mars. *U. S. Geol. Sur. Prof. Paper* **1389**, 222 pages
Shadow, Sponge, Metate, Grumpy, Bashful etc.

Morgan J. W. and Lovering J. F. (1964) Uranium and thorium abundances in stony meteorites 2. The achondrite meteorites. *J. Geophys. Res.* **69**, 1989-1994.

Morgan J. W. and Lovering J. F. (1973) Uranium and thorium in achondrites. *Geochim. Cosmochim. Acta* **37**, 1697-1707.

Nakhla, Shergotty

Morgan J. W. and Anders E. (1979) Chemical composition of Mars. *Geochim. Cosmochim. Acta* **43,** 1601-1610.

Mori H. and Takeda H. (1983) An electron petrographic study of shock deformation textures of the Antarctic shergottite, Allan Hills 77005. *Proc. 16th ISAS Lunar Planet. Symp*. 105-108. ISAS, Tokyo.
ALH77005

Mori H. and Takeda H. (1984) Shock deformation texture of olivine crystals of the EETA79001 shergottite. (abs) *Meteoritics* **19**, 275.
EETA79001

Morikawa N., Kondorosi G., Nakamura N. and Misawa K. (1999) Rb-Sr isotopic systematics and REE-pattern of the Y793605 lherzolitic shergottite. (abs) *NIPR Sym. Antarctic Meteorites* **23rd***,* 91-92. Nat. Inst. Polar Res., Tokyo.
Y793605

Morikawa N., Misawa K., Kondorosi G., Premo W. R., Tatsumoto M. and Nakamura N. (2001) Rb-Sr isotopic systematics of lherzolitic shergottite Yamoto-793605. *Antarct. Meteorite Res.,* **14**, 47-60.
Y793605

Morris R. V. (1989) Reflectivity spectra (320-200 nm) of SNC meteorites. (abs) *Lunar Planet. Sci.* **XX**, 719-720.
Shergotty, Zagami, ALHA77005, EETA79001

Morris R. V., Agresti D. G., Shelfer T. D. and Wdowiak T. J. (1989) Mössbauer backscatter spectrometer: A new approach for mineralogical analysis on planetary surfaces. (abs) *Lunar Planet. Sci.* **XX**, 723-724.
EETA79001

Morris and eleven authors (2000) Mineralogy, composition, and alteration of Mars Pathfindr rocks and soils: Evidence from multispectral, elemental, and magnetic data on terrestrial analogue, SNC meteorite and Pathfinder samples. *J. Geophys. Res*. **105**, 1757-1817.

Mouginis-Mark P. J., McCoy T. J., Taylor G. J. and Keil K. (1992) Martian parent craters for the SNC meteorites. *J. Geophys. Res.* **97**, 10,213-10,225.

Muenow D. W. and Gooding J. L. (1985) "Martian" volatiles in shergottite EETA79001: Possible significance of secondary minerals. (abs) *Lunar Planet. Sci.* **XVI**, 593-594.
EETA79001

Müller H. W. and Zähringer J. (1969) Rare gases in stony meteorites. In ***Meteorite Research*** (*ed.* Millmann) 845 Reidel, Dordrecht.
Shergotty

Müller W. F. (1993) Thermal and deformational history of the Shergotty meteorite deduced from clinopyroxene microstructure. *Geochim. Cosmochim. Acta* **57**, 4311-4322.
Shergotty

Münker C., Mezger K. and Bischoff A. (2001) Nb-Zr constraints on eary silicate differentiation on Mars. *Meteoritics & Planet. Sci.* **36**, A143.
Nakhla, Lafayette, Chassigny, Zagami, Shergotty, ALH77005, EETA79001, DaG476, SaU005, ALH84001

Murthy M. V. N., Srivastava S. N. P. and Dube A. (1969) *Indian Meteorites.* Geol. Survey India Mem. Vol. 99. with 30 plates! Calcutta.
Shergotty

Murty S. V. S., Mohapatra R. K. and Clement C. J. (1995) Nitrogen and noble gas components in the Martian orthopyroxenite ALH84001. (abs) *Lunar Planet. Sci.* **XXVI**, 1019-1020.
ALH84001

Murty S. V. S. and Mohapatra R. K. (1997) Nitrogen and heavy noble gasses in ALH84001: Signatures of ancient Martian atmosphere. *Geochim. Cosmochim. Acta* **61**, 5417-5428.
ALH84001

Murty S.V.S. and Mohapatra R. K. (1999) Cosmogenic and trapped gas components in the Martian meteorite Dar al Gani 476 from hot desert. *In* Workshop on Extraterrestrial Materials from Cold and Hot Deserts. LPI Cont. 997. (*eds*. Schultz *et al*.) Lunar Planetary Institute, Houston.
DaG476

Murthy S.V.S, Mohapatra R. K., Goswami J. N. and Sinha N. (1999) Cosmogenic records and trapped gasses in the Nakhla meteorite. (abs) *Meteoritics & Planet. Sci.* **34**, A84-85.
Nakhla

Musselwhite D.M., Drake M. J. and Swindle T. D. (1991) Early outgassing of Mars supported by differential water solubility of iodine and xenon. *Nature* **352**, 697-699.

Musselwhite D.M. and Drake M.J. (2000) Early outgassing of Mars: Implications from experimentally determined solubility of iodine in silicate magmas. *Icarus* **148**, 160-175.

Musselwhite D.M., Swindle T. D. and Lunine J. I. (2000) Is polar clathrate storage fractionation of the Martian atmosphere the cause of the nakhlite krypton to xenon ration? (abs) *Meteoritics Planet. Sci.* **35**, A115.
Nakhla

Musselwhite D.M. and Swindle T.D. (2001) Is release of Martian atmosphere from polar clathrate the cause of the Nakhlite and ALH84001 Ar/Kr/Xe ratios? *Icarus* **154**, 207-215.

Musselwhite D.S. and Jones J.H. (2002a) Calibration of the europium redox indicator at conditions relevant to the Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXIII** #1712. Lunar Planetary Institute, Houston. (CD-ROM)

Musselwhite D.S. and Jones J.H. (2002b) Variation in the augite/melt partioning of Sm, Eu and Gd with fO2: Implications for the oxidation state of the Martian mantle. (abs) *Meteoritics & Planet. Sci*. **37**, A101.

Musselwhite D.S. and Wadhwa M. (2002) REE in shergottite augites and whole rocks. (abs) Un-mixing SNCs. 41-42. LPI Contribution No. 1134.

Musselwhite D.S. and Jones J.H. (2003) Oxygen fugacity of the Martian mantle from pyroxene/melt partitioning of REE. (abs #2032) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Mustard J. F. and Sunshine J. M. (1995) Seeing through the dust: Martian crustal heterogenity and links to the SNC meteorites. *Science* **267**, 1623-1626.

Mysen B. O., Virgo D., Popp R. K. and Bertka C. M. (1997) Amphibole inclusions in SNC meteorites:

Evidence for a dry Martian interior? (abs) *7th Goldschmidt Conf.*, LPI Contribution **921**, 147. Tucson.

Mysen B. O., Virgo D., Popp R. K. and Bertka C. M. (1998) The role of H_2O in Martian magmatic systems. *Amer. Mineral.* **83**, 942-946.

N TOP

Nagao K. (1987) Rare gas isotopic composition of achondrites from Antarctica. (abs) *NIPR Sym. Antarctic Meteorites* **12th,** 49-50. Nat. Inst. Polar Res., Tokyo.
ALHA77005

Nagao K., Nakamura T., Miura Y. N., Okazaki R. and Takaoka N. (1997a) Noble gas studies of Martian meteorite Yamata 793605. (abs) *Meteoritics & Planet. Sci*. **32**, A95-96.
Y793605

Nagao K., Nakamura T., Miura Y. N. and Takaoka N. (1997b) Noble gas studies of primary igneous materials of Y-793605. (abs) *NIPR Sym. Antarctic Meteorites* **22nd***,* 131-134. Nat. Inst. Polar Res., Tokyo.
Y793605

Nagao K., Nakamura T., Miura Y. N. and Takaoka N. (1997c) Noble gas and mineralogy of primary igneous materials of Y-793605 shergottite. *Antarctic Meteorite Research* **10***,* 125-142. Nat. Inst. Polar Res., Tokyo.
Y793605

Nagao K., Nakamura T., Okazaki R., Miura Y. N. and Takaoka N. (1998) Two-stage irradiation of the Y-793605 Martian meteorite. (abs) *Meteoritics & Planet. Sci.* **33**, A114.
Y793605

Nagata T. (1980a) Magnetic classification of Antarctic meteorites. *Proc. Lunar Planet. Sci. Conf.* **11th**, 1789-1799.
ALHA77005

Nagata T. (1980b) Paleomagnetism of Antarctic achondrites. *Mem. Natl. Inst. Polar Res., Spec. Issue* **17**, 233-242.

Nakamura N. and Masuda A. (1973) Chondrites with peculiar rare-earth patterns. *Earth Planet. Sci. Lett.* **19**, 429-437.
Nakhla

Nakamura N., Unruh D. M., Tatsumoto M. and Hutchison R. (1977) Nakhla**:** further evidence for a young crystallization age. (abs) *Meteoritics* **12**, 324-325.
Nakhla

Nakamura N., Unruh D. M. and Tatsumoto M. (1978) The young magmatic event in the Nakhla achondrite parent body. In *Short Papers of the 4th ICOG* (*ed.* Zartman). *USGS Open file report* **78-701,** 305-306.
Nakhla

Nakamura N., Masuda A., Coffrant D. and Tatsumoto M. (1979) REE abundances and Sm-Nd systematics of Antarctic eucrite, Allan Hills No. 5. (abs) *Meteoritics* **14**, 492-493.
NOT a Martian meteorite!

Nakamura N., Unruh D. M., Tatsumoto M. and Hutchison R. (1982a) Origin and evolution of the Nakhla

meteorite inferred from the Sm-Nd and U-Pb systematics and REE, Ba, Sr, Rb abundances. *Geochim. Cosmochim. Acta* **46,** 1555-1573.
Nakhla

Nakamura N., Komi H. and Kagami H. (1982b) Rb-Sr isotopic and REE abundances in the Chassigny meteorite. (abs) *Meteoritics* **17,** 257-258.
Chassigny

Nakamura N., Komi H., Nishiykawa Y. and Pellas P. (1982c) REE abundances in the Chassigny meteorite. (abs) *NIPR Sym. Antarctic Meteorites,* **7th** *,* 47-48. Nat. Inst. Polar Res., Tokyo.
Chassigny

Nakamura N., Yamakawa A.,Yamashita K., Kobayashi T., Imae N., Misawa K. and Kojima H. (2002) REE abundances and Rb-Sr age of a new Antarctic nakhlite Yamoto 000593. (abs) *Antarctic Meteorites* **XXVII**, 112-114, NIPR, Tokyo
Y000593

Neal C.R. (2000) Issues involved in a Martian sample return: Integrity preservation and the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM) position. *J. Geophys. Res*. **105**, 22,487-22,506.

Neal C. R., Taylor L. A., Ely J. C., Jain J. C. and Nazarov M. A. (2001a) Detailed geochemistry of new Shergottite, Dhofar 019. (abs) *Lunar Planet. Sci.* **XXXII**, #1671. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Neal C. R., Ely J. C. and Jain J. C. (2001b) New platinum-group element (PGE) data for Martian meteorites: The influence of igneous processing. (abs) *Lunar Planet. Sci.* **XXXII**, #1682. Lunar Planetary Institute, Houston. (CD-ROM)
ALH77005, EETA79001

Nealson K. H., Carr M. H., Clark B. C., Doolittle R. F., Jakosky B. M., Korwek E. L., Pace N. R., Poindexter J. S., Race M. S., Reysenbach A.-L., Schopf J. W. and Stevens T. O. (1997) ***Mars Sample Return: Issues and Recomendations***. Space Studies Board, National Research Council, Washington D. C.

Nealson K. H. (1997) The limits of life on Earth and searching for life on Mars. *J. Geophys. Res*. **102**, 23675-23686.

Nehru C. E., Prinz M. and Zucker S. M. (1979) Brachina: Origin, melt inclusions and relationship to Chassigny. (abs) *Meteoritics* **14**, 493-494.
Chassigny

Nevle R. J. (1987) Phosphates in Shergotty and EETA79001: Geochemistry and petrogenesis. (abs) *Lunar Planet. Sci.* **XVIII**, 714-715.
Shergotty, EETA79001

Newsom H. E. (1980) Hydrothermal alteration of impact melt sheets with implications for Mars. *Icarus* **44**, 207-216.

Newsom H. E. and Drake M. J. (1987) Formation of the Moon and terrestrial planets: Constraints from V, Cr and Mn abundances in planetary mantles and from new partioning experiments. (abs) *Lunar Planet. Sci.* **XVIII**, 716-717.

Newsom H. E., Shearer C. K. and Treiman A. H. (2001) Mobile elements determined by SIMS analysis in

hydrous alteration materials in the Lafayette Martian meteorite. (abs) *Lunar Planet. Sci.* **XXXII**, #1396. Lunar Planetary Institute, Houston. (CD-ROM)
Lafayette

Nichiporuk W., Chodos A., Helin E. and Brown H. (1967) Determination of iron, nickel, cobalt, calcium, chromium and manganese in stony meteorites by X-ray fluorescence. *Geochim. Cosmochim. Acta* **31**, 1911-1930.
Lafayette

Niles P.B., Leshin L.A., Guan Y. and Hervig R.L. (2002) Carbon isotopic compositions of ALH84001 carboantes: An ion microprobe study. (abs) *Lunar Planet. Sci.* **XXXIII** #1655. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Nininger H. H. (1935) The Lafayette meteorite. *Popular Astronomy* **43**, 404.
Lafayette

Nishiizumi K. (1987) ^{53}Mn, ^{26}Al, ^{10}Be and ^{36}Cl in meteorites: Data compilation. *Nucl. Tracks Radiat. Meas.* **13**, 209-273.

Nishiizumi K. (1997) Exposure history of shergottite Yamato 793605. (abs) *NIPR Symp. Martian Meteorites* **22nd**, 149-151. Nat. Inst. Polar Res., Tokyo.
Y793605

Nishiizumi K. (2001) Surficial studies of Mars using cosmogenic nuclides. *Workshop on the Martian highlands and Mojavie desert analogs.* Lunar Planet. Institute, Houston

Nishiizumi K., Arnold J. R., Goswami N., Klein J. and Middleton R. (1986a) Solar cosmic ray effects in ALHA77005. (abs) *Meteoritics* **21**, 472-473.
ALHA77005

Nishiizumi K., Klein J., Middleton R., Elmore D., Kubik P. W. and Arnold J. R. (1986b) Exposure history of shergottites. *Geochim. Cosmochim. Acta* **50**, 1017-1021.
Shergotty, ALHA77005, EETA79001

Nishiizumi K., Elmore D. and Kubik P. W. (1989) Update on terrestrial ages of Antarctic meteorites. *Earth Planet. Sci. Lett.* **93**, 299-313.
ALHA77005, ALH84001, EETA79001

Nishiizumi K., Arnold J. R., Caffee M. W., Finkel R. C. and Southon J. (1992) Exposure histories of Calcalong Creek and LEW88516 meteorites. (abs) *Meteoritics* **27**, 270.
LEW88516

Nishiizumi K., Caffee M. W. and Finkel R. C. (1994) Exposure histories of ALH84001 and ALHA77005. (abs) *Meteoritics* **29**, 511.
ALH84001, ALHA77005

Nishiizumi K. and Caffee M. W. (1996) Exposure history of shergottite Queen Alexandra Range 94201. (abs) *Lunar Planet. Sci.* **XXVII**, 961-962.
QUE94201

Nishiizumi K., Masarik J., Welton K. C., Caffee M. W., Jull A. J. T. and Klandrud S. E. (1999) Exposure history of new Martian meteorite Dar al Gani 476. (abs) *Lunar Planet. Sci.* **XXX**, #1966, Lunar Planetary Institute, Houston (CD-ROM).
DaG476

Nishiizumi K., Caffee M. W. and Masarik J. (2000) Cosmogenic radionuclides in the Los Angeles Martian meteorite. (abs) *Meteoritics & Planet. Sci.* **35**, A120.
Los Angeles

Nishiizumi K., Caffee M. W., Jull A. J. T. and Klandrud S. E. (2001) Exposure history of shergottites Dar al Gani 476/489/670/735 and Sayh al Uhaymir 005. (abs) *Lunar Planet. Sci.* **XXXII**, #2117. Lunar Planetary Institute, Houston. (CD-ROM)
DaG476, SaU005

Nishiizumi K., Okazaki R., Park J., Nagao K., Masarik J. and Finkel R.C. (2002) Exposure and terrestrial histories of Dhofar 019 Martian meteorite. (abs) *Lunar Planet. Sci.* **XXXIII** #1366. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Noll K., Doebeli M., Tobler L., Grambole D. and Krähenbühl U. (1997) Flourine profiles in achondrites and chondrites from Antarctica by Nuclear Reaction Analysis (NRA). (abs) *Meteoritics & Planet. Sci*. **32**, A101.
ALH84001

Norman M.D. (1999) The composition and thickness of the crust of Mars estimated from rare earth elements and neodymium-isotopic compositions of Martian meteorites. *Meteoritics & Planet. Sci*. **34**, 439-449.

Norton R.D. (1994) *Rocks from Space: Meteorites and meteorite hunters*. 449 pages, Mountain Press, Missoula.

Norton O.R. (2002) The Cambridge Encylopedia of Meteorites. 354 pages, Cambridge Univ. Press, Cambridge.

Nyquist L.E. (1983a) Do oblique impacts produce Martian meteorites? *Proc. Lunar Planet. Sci. Conf.* **13th**, *J. Geophys. Res.* **88**, A785-A798.

Nyquist L.E. (1983b) Meteorites from Mars - A status report. (abs) *Meteoritics* **18**, 367-368.

Nyquist L.E. (1983c) The oblique impact hypothesis. (abs) *Lunar Planet. Sci.* **XIV**, 574-575.

Nyquist L.E. (1984) The oblique impact hypothesis and relative probabilities of lunar and Martian meteorites. *J. Geophys. Res.* **89**, B631-B640.

Nyquist L.E., Shih C.-Y., Bansal B.M., Wooden J., Wiesmann H. and McKay G.A. (1978a) Rb-Sr and Sm-Nd chronology of the Shergotty achondrite. In *Short Papers of the 4th ICOG*. (*ed*. Zartman) *USGS Open file report* **78-701**, 315-317.
Shergotty

Nyquist L.E., Wooden J., Bansal B.M. and Wiesmann H. (1978b) A shocking Rb/Sr age for the Shergotty achondrite. (abs) *Lunar Planet. Sci.* **IX**, 820-822.
Shergotty

Nyquist L.E., Bogard D.D., Wooden J., Wiesmann H., Shih C.-Y. and Bansal B.M. (1979a) Early differentiation, late bombardment and recent bombardmant on the shergottite parent planet. (abs) *Meteoritics* **14**, 502.
Shergotty, Zagami, ALHA77005

Nyquist L. E., Wooden J., Bansal B., Wiesmann H., McKay G.A. and Bogard D.D. (1979b) Rb-Sr age of

the Shergotty achondrite and implications for the metamorphic resetting of isochron ages. *Geochim. Cosmochim. Acta* **43**, 1057-1074.
Shergotty

Nyquist L. E., Wooden J., Bansal B., Wiesmann H. and Shih C.-Y. (1984) Sr and Nd isotopic systematics of EETA79001**.** (abs) *Meteoritics* **19**, 284.
EETA79001

Nyquist L. E., Wiesmann H., Shih C.-Y. and Bansal B. (1986) Sr isotopic systematics of EETA79001 glass. (abs) *Lunar Planet. Sci.* **XVII**, 624-625.
EETA79001

Nyquist L. E., Hörz F., Wiesmann H., Shih C.-Y. and Bansal B. (1987a) Isotopic studies of shergottite chronology: I. Effect of shock metamorphism on the Rb-Sr system. (abs) *Lunar Planet. Sci.* **XVIII,** 732-733.

Nyquist L. E., Bansal B., Wiesmann H., Shih C.-Y. and McKay G. (1987b) Isotopic studies of shergottite chronology: II. Possible effect of contamination on the Sm-Nd system. (abs) *Lunar Planet. Sci.* **XVIII,** 730-731.

Nyquist L. E., Harper C. L., Wiesmann H., Bansal B. and C.-Y. Shih (1991) $^{142}Nd/^{144}Nd$ in SNCs and lunar samples: Implications for early differentiation of a heterogeneous Martian (?) mantle. (abs) *Meteoritics* **26,** 381.
Shergotty, Zagami, ALHA77005, EETA79001, Nakhla, Lafayette, Governador Valadares, Chassigny

Nyquist L. E., Bansal B., Wiesmann H. and C.-Y. Shih (1995) "Martians" young and old: Zagami and ALH84001. (abs) *Lunar Planet. Sci.* **XXVI**, 1065-1066.
Zagami, ALH84001

Nyquist L. E., Borg L. E. and Shih C.-Y. (1997) The shergottite age paradox. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life. (eds*. Clifford *et al*.) *LPI Contribution* **916,** 64. Lunar Planetary Institute, Houston.
EETA79001, Zagami

Nyquist L. E., Bogard D. D., Garrison D. H. and Reese Y. (1998a) A single-crater origin for Martian Shergottites: Resolution of the age paradox? (abs) *Lunar Planet. Sci.* **XXIX** #1688, Lunar Planetary Institute, Houston (CD-ROM).

Nyquist L. E., Borg L. E. and Shih C.-Y. (1998b) The shergottite age paradox and the relative probabilities for Martian meteorites of differing ages. *J. Geophys. Res.* **103**, 31,445-31,455.

Nyquist L. E., Reese Y. D., Wiesmann H., Shih C-Y. and Schwandt C. (2000) Rubidium-strontium age of the Los Angeles Shergottite. (abs) *Meteoritics & Planet. Sci.* **35**, A121-122.
Los Angeles

Nyquist L. E., Bogard D. D., Shih C-Y., Greshake A., Stoffler D. and Eugster O. (2001a) Ages and geologic histories of Martian meteorites. *In* Chron. & Evol. of Mars (ISSI) **96**, 105-164. Kluwer Academic Publishers. The Netherlands. (a review)

Nyquist L.E., Bogard D.D. and Shih C-Y. (2001b) Radiometric chronology of the Moon and Mars. *In* The Century of Space Science. Vol. II, ch. 55, 1325-1376. (*ed.* Bleeker, Geiss and Huber) Kluwer Academic Publishers. The Netherlands. (a review) www.thecenturyofspacescience.com

Nyquist L. E., Reese Y., Wiesmann H. and Shih C.-Y. (2001c) Age of EET79001B and implications for shergottite origins. (abs) *Lunar Planet. Sci.* **XXXII**, #1407. Lunar Planetary Institute, Houston. (CD-ROM)
EETA79001

Nyquist L.E., Shih C.-Y., Wiesmann H. and Barrat J.A. (2002) An "andesitic" component in shergottites with restored LREE abundances? (abs) Un-mixing SNCs. 43-44. LPI Contribution No. 1134.

O TOP

Ocker K. D. and Gilmour J. D. (2001a) Martian atmospheric Xenon and Martian 'interior' Xenon components in Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1782. Lunar Planetary Institute, Houston. (CD-ROM)

Ocker K. D. and Gilmour J. D. (2001b) Martian atmospheric and 'interior' Xenon components in Shergotty mineral separates. *Meteoritics & Planet. Sci.* **36**, A152.

Ocker K.D. and Gilmour J.D. (2002) Martian atmospheric and interior xenon components in EETA79001 lith-B mineral separates. (abs) *Lunar Planet. Sci.* **XXXIII** #1603. Lunar Planetary Institute, Houston. (CD-ROM)
EETA79001

Ocker K.D., Holland G. and Gilmour J.D. (2002) Evolution of Martian atmospheric, crustal, and mantle Xenon components in basaltic shergottites. (abs) Un-mixing SNCs. 45-46. LPI Contribution No. 1134.

Oe K., McKay G. and Le L. (2001) REE and strontium partition coefficients for Nakhla pyroxenes. (abs) *Lunar Planet. Sci.* **XXXII**, #2174. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Oe K., McKay G., Le L., Miyamoto M. and Mikouchi T. (2002) REE and Sr partition coefficients for Nakhla pyroxenes: Their relationships to other element abundance. (abs) *Lunar Planet. Sci.* **XXXIII** #2065. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

O'Keefe J. D. and Ahrens T. J. (1983) Constraints on the impact-on-Mars origin of SNC meteorites. (abs) *Lunar Planet. Sci.* **XIV**, 578-579.

O'Keefe J. D. and Ahrens T. J. (1986) Oblique impact: A process for obtaining meteorite samples from other planets. *Science* **234,** 346-349.

O'Neill C., Ikeda Y. and Delaney J. S. (1987) The compositional zoning of feldspathic phases in Allan Hills 77005,32. (abs) *Lunar Planet. Sci.* **XVIII,** 750-751.
ALHA77005

Onuma N. and Hirano M. (1981) Sr/Ca-Ba/Ca systematics in Antarctic Ca-rich achondrites and their origins. *Proc. 6th Sym. Antarctic Meteorites. Mem. Natl. Inst. Polar Res. Spec. Iss.* **20**, 211-220. Nat. Inst. Polar Res., Tokyo.
ALHA77005

Oró J. (1998) The case for life on Mars, part 1: an "open" skeptical view. *BioAstronomy News* 10, 1-6.

Oró J. (1999) The case for life on Mars, data are as good as our interpretations. *BioAstromomy News* 10, 1-4.

Ostertag R., Amthauer G. and McSween H. Y., Jr. (1983) Fe^{3+} in shocked olivine crystals of the ALHA77005 meteorite. (abs) *Meteoritics* **18**, 368-369.
ALHA77005

Ostertag R., Amthauer G., Rager H. and McSween H. Y., Jr. (1984) Fe^{3+} in shocked olivine crystals of the ALHA77005 meteorite. *Earth Planet. Sci. Lett.* **67,** 162-166.
ALHA77005

Ostertag R., Stöffler D., James C. and Phannschmidt G. (1985) Shock effects in the Shergotty meteorite - Evidence for only one shock event. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 19-20.
Shergotty

Ott U. (1988) Noble gases in SNC meteorites: Shergotty, Nakhla, Chassigny. *Geochim. Cosmochim. Acta* **52,** 1937-1948.
Shergotty, **Nakhla**, **Chassigny**

Ott U. (1991) Composition of the Martian atmosphere. *Space Science Reviews* **56**, 23-29.

Ott U., Begemann F. and Löhr H.-P. (1983) Noble gases in the Brachina and Chassigny meteorites. (abs) *Lunar Planet. Sci.* **XIV**, 586-587.
Chassigny

Ott U. and Begemann F. (1985a) Martian meteorites: Are they (all) from Mars: Evidence from trapped noble gases. (abs) *Meteoritics* **20**, 721-722.

Ott U. and Begemann F. (1985b) Are all the "Martian" meteorites from Mars? *Nature* **317,** 509-512.
Shergotty, Nakhla, Chassigny, EETA79001

Ott U., Löhr H.-P. and Begemann F. (1985) Noble gases and the classification of Brachina. *Meteoritics* **20**, 69-78.

Ott U., Löhr H.-P. and Begemann F. (1988) New noble gas data for SNC meteorites: Zagami, Lafayette and etched Nakhla. (abs) *Meteoritics* **23**, 295-296.
Zagami, **Lafayette, Nakhla**

Ott U. and Löhr H.-P. (1992) Noble gases in the new shergottite LEW88516. (abs) *Meteoritics* **27**, 271.
LEW88516

Ott U., Löhr H.-P. and Begemann F. (1996) Etching and crushing SNCs: More noble gas data. (abs) *Meteoritics & Planet. Sci.* **31**, A103.
Nakhla, LEW88516

Oura Y., Shirai N. and Ebihara M. (2002) Chemical composition of Y000593 and Y000749. (abs) *Antarctic Meteorites* **XXVII**, 143-145, NIPR, Tokyo
Y000593, Y000749

Owen T., Maillard J.P., De Bergh C. and Lutz B.L. (1988) Deuterium on Mars: The abundance of HDO and the value of D/H. *Science* **240**, 1767-1770.

P TOP

Pal D.K., Tuniz C., Moniot R.K., Savin W., Druse T. and Herzog G.F. (1986) Beryllium-10 contents of shergottites, nakhlites, and Chassigny. *Geochim. Cosmochim. Acta* **50,** 2405-2409.
Chassigny, Shergotty, Zagami, ALHA77005, EETA79001, Nakhla, Lafayette, Governador Valadares

Palme H. (1985) Rare and unique meteorites from Antarctica. In *International workshop on Antarctic meteorites.* (*ed.* Annexstad) *LPI Tech. Rpt.* **86-1,** 77-79. Lunar Planetary Institute, Houston.

Palme H., Borisov A. and Holzheid A. (1997) The significance of highly siderophile elements during planetary differentiation. (abs) *Meteoritics & Planet. Sci*. **32**, A103.

Pan V., Holloway J. R. and Bertka C. M. (1991) The role of CO_2 in the formation of the nakhlites: metasomatism in the Martian mantle? (abs) *Lunar Planet. Sci.* **XXII**, 1017-1018.

Papanastassiou D. A. and Wasserburg G. J. (1974) Evidence for late formation and young metamorphism in the achondrite Nakhla. *Geophys. Res. Lett.* **1,** 23-26.
Nakhla

Papike J. J. (1996) Pyroxene as a recorder of cumulate formational processes in Asteroids, Moon, Mars, Earth: Reading the record with the ion microprobe. *Amer. Mineralogist* **81**, 525-544.

Papike J. J. ed. (1998) **Planetary Materials**. *Reviews of Mineralogy* **36**. *Mineralogical Society of America.*

Papike J. J., Fowler G. W., Layne G. D., Spilde M. N. and Shearer C. K. (1994) ALH84001 A "SNC orthopyroxenite": Insights from SIMS analysis of orthopyroxene and compositions to diogenites. (abs) *Lunar Planet. Sci.* **XXV**, 1043-1044.
ALH84001

Papike J.J., Kramer J.M. and Shearer C.K. (2003) Determination of planetary basalt parentage: A simple technique using the electron microprobe. (abs) *Lunar Planet. Sci.* **XXXIV** #1018. Lunar Planetary Institute, Houston.

Pätsch M., Altmaier M., Herpers U., Kosuch H., Michel R. and Schultz L. (2000) Exposure age of the new SNC meteorite Sayh al Uhaymir 005. (abs) *Meteoritics & Planet. Sci.* **35**, A124-125.
SaU005

Park J., Okazaki R., and Nagao K. (2001) Noble gases in SNC meteorites: Dar al Gani 489, Sayh al Uhaymir 005 and Dhofar 019. (abs) *Meteoritics & Planet. Sci.* **36**, A121-122.
DaG489, SaU005, Dho019

Park J., Okazaki R. and Nagao K. (2003) Noble gas studies of Martian meteorites: Dar al Gani 476/489, Sayh al Uhaymir 005/060, Dhofar019, Los Angeles 001and Zagami. (abs) *Lunar Planet. Sci.* **XXXIV** #1213. Lunar Planetary Institute, Houston.
DaG476, DaG489, SaU005, SaU060, Dho019, LosAngeles, Zagami

Pellas P. (1987) Are SNC meteorite samples from Mars? *Bull. Soc. Geologique de France* **3**, 21-29.

Pepin R. O. (1985) Evidence of Martian origins. *Nature* **317**, 473-475.
EETA79001

Pepin R. O. (1987) Volatile inventories of the terrestrial planets. *Rev. Geophys.* **25**, 293-296.

Pepin R. O. (1991) On the origin and early evolution of terrestrial planet atmospheres and meteoritic volatiles. *Icarus* **92**, 2-79.

Pepin R. O. (1992) Origin of noble gases in the terrestrial planets. *Ann. Rev. Earth Planet. Sci*. **20**, 389-430. (*review paper*)

Pepin R. O. (1994) Evolution of the Martian atmosphere. *Icarus* **111**, 289-304.

Pepin R. O. (2000) Xenon in the primordial Martian atmosphere. (abs) *Meteoritics &Planet. Sci.* **35**, A126.

Pepin R. O. and Becker R. H. (1983) Noble gases in EETA79001. (abs) *Meteoritics* **18**, 375-376.
EETA79001

Pepin R. O. and Becker R. H. (1984) Galactic-cosmic-ray exposure histories of the Antarctic shergottite EETA79001. (abs) *Lunar Planet. Sci.* **XV**, 637-638.
EETA79001

Pepin R. O., Becker R. H. and Wiens R. C. (1985) Review of relative and absolute abundances of atmophilic gases in glass from the EETA79001 shergottite, and comparison with the Martian and terrestrial atmospheres. (abs) *Meteoritics* **20**, 728-729.
EETA79001

Pepin R. O. and Becker R. H. (1985) Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites. (abs) In *Terrestrial Planets: Comparative Planetology*, 2. *LPI Tech. Rpt*. Lunar Planetary Institute, Houston.

Pepin R. O. and Carr M. H. (1992) Major issues and outstanding questions. In ***Mars*** (*eds*. Kieffer *et al.*), pp. 120-143. Univ. Arizona Press, Tucson.

Pepin R.O. (2002) Noble gases in the terrestrial planets, with focus on what the SNC meteorites tell us about Mars. (abs) Un-mixing SNCs .4 7-48. LPI Contribution No. 1134.

Philpotts J. A. and Schnetzler C. C. (1970) Apollo 11 lunar samples: K, Rb, Sr, Ba and rare-earth concentrations in some rocks and separated phases. *Proc. Apollo 11 Lunar Science Conf.,* 1471-1486.
Shergotty

Pillinger C. T. (1984) Light element stable isotopes in meteorites - from grams to picograms. *Geochim. Cosmochim. Acta* **48**, 2739-2766.

Pillinger C. T., Grady M. M. and Wright I. P. (1991) Light elements and their isotopes in SNC meteorites and the Martian atmosphere. *Space Science Reviews* **56**, 31-35. *(review paper)*

Pilcher C. (1999) "Martian Meteorites: Where do we stand and where are we going?" *Meteoritics & Planet. Sci.* **34**, 3-4. *editorial*

Pinson W. H., Schnetzler C. C., Beiser E., Fairbairn H. W. and Hurley P. M. (1965) Rb-Sr age of stony meteorites. *Geochim. Cosmochim. Acta* **29**, 455-466.
Nakhla

Pistollet (1816) The circumstances of the Chassigny meteorite shower. *Ann. Chim. Phys. (Paris)* **1**, 45-48.
Chassigny

Plumlee G. S., Ridley W. I., DeBraal J. D. and Reed M. H. (1993) The mineralogical evolution of the Martian surface through time: Implications from chemical reaction-path modeling studies. (abs) In *Mars: Past present and future - results from the MSATT program.* (*ed*. Haberle) *LPI Tech. Rpt*. **93-06**, Lunar Planetary Institute, Houston.

Podosek F. A. (1973) Thermal history of the nakhlites by the $^{40}Ar/^{39}Ar$ method. *Earth Planet. Sci. Lett.* **19,** 135-144.
Lafayette, Nakhla

Podosek F. A. and Huneke J. C. (1973) Argon 40 - argon 39 chronology of four calcium-rich achondrites. *Geochim. Cosmochim. Acta* **37,** 667-684.
Lafayette

Pollack J. B., Kasting J. F., Richardson S. M. and Poliakkoff K. (1987) The case for a wet, warm climate on early Mars. *Icarus* **71**, 203-224.

Prewitt C. T., Dera P., Boctor N. Z. and Hemley R. J. (2001) High-pressure phase of silica from the Martian meteorite Shergotty. (abs) *Eleventh Goldschmidt Conf.* 3077. Hot Springs.

Prinz M., Hlava P. H. and Keil K. (1974) The Chassigny meteorite: A relatively iron-rich cumulate dunite. (abs) *Meteoritics* **9**, 393-394.
Chassigny

Prior G. T. (1912) The meteoritic stones of El Nakhla El Baharia (Egypt). *Min. Mag.* **XVI**, 274-281.
Nakhla

Protheroe W. J. Jr. and Sterling J. (1998) Cathodoluminescence study of fragments of the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1569, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Protheroe W. J. Jr. and Stirling J. (2000a) Cathodoluminescence analysis of Mars Meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1980. Lunar Planetary Institute, Houston (CD-ROM).

Protheroe W. J. Jr. and Stirling J. (2000b) Preliminary results of cathodoluminescence spectral analysis of beta-Ca-phosphases ("Whitlockite") in the Mars meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXXI,** #2021. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Protheroe W. J. Jr., Venance K. and Stirling J. A. R. (2001a) Cathodoluminescence analysis of Nakhla 1401 chloroapatites. (abs) *Lunar Planet. Sci.* **XXXII**, #1638. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Protheroe W. J. Jr., Venance K. and Stirling J. A. R. (2001b) Nakhla 1911-369 chloroapatites. (abs) *Lunar Planet. Sci.* **XXXII**, #1642. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Puga E., Jagoutz E., Nieto J.M., Diaz de Federico A. and Ruiz-Cruz M. D. (1998) On the origin of the brown color in ALHA77005 olivine. (abs) *Lunar Planet. Sci.* **XXIX** #1375, Lunar Planetary Institute, Houston (CD-ROM).
ALHA77005

R TOP

Race M. S. (1996) Planetary protection: Legal ambiguity and the decision making process for Mars Sample Return. *Adv. Space Res.* **18**, 345-350.

Rajan R. S., Rambaldi E., Tamhane A. S. and Poupeau G. (1984) Possible neutron effects in the Elephant Moraine shergottite. (abs) *Meteoritics* **19**, 293-294.
EETA79001

Rajan R. S. and Lugmair G. W. (1985) Search for neutron effects in the Elephant Moraine shergottite.

(abs) *Lunar Planet. Sci.* **XVI**, 681-682.
EETA79001

Rajan R. S., Lugmair G. W., Tamhane A. S. and Poupeau G. (1986) Nuclear tracks, Sm isotopes and neutron capture effects in the Elephant Moraine shergottite. *Geochim. Cosmochim. Acta* **50,** 1039-1042.
EETA79001

Rao M. N. (1986) Rare gases in Shergotty maskelynite. (abs) *Meteoritics* **21**, 488.
Shergotty

Rao M. N., Wentworth S. J., Yang S.-R. and McKay D. S. (1998) Records of molten Martian soil in EET 79001 meteorite. (abs) *Lunar Planet. Sci.* **XXIX** #1524, Lunar Planetary Institute, Houston (CD-ROM).
EETA79001

Rao M. N., Schwandt C. and McKay D. S. (1999a) Trapped argon and xenon in EETA79001 and ALH84001: Clues to low temperature aqueous activity on Mars. (abs) *Lunar Planet. Sci.* **XXX**, #1389, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001, EETA79001

Rao M. N., Wentworth S. J., Schwandt C., Yang S. R. and McKay D. S. (1999b) Molten Martian soil in Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XXX**, #1626, Lunar Planetary Institute, Houston (CD-ROM).
Shergotty

Rao M. N., Borg L. E., McKay D. S. and Wentworth S. J. (1999c) Martian soil component in impact glasses in a Martian meteorite. *Geophys. Res. Letters* **26,** 3265-3268.
EETA79001

Rao M.N. and McKay D.S. (2002a) Martian soil records in Shergotty glass veins. (abs) *Meteoritics & Planet. Sci*. **37**, A121.

Rao M.N. and McKay D.S. (2002b) Shergottite impact melt glasses contain soil from Martian uplands. (abs) Un-mixing SNCs. 49-50. LPI Contribution No. 1134.

Rao M.N. and McKay D.S. (2003) Characterization of Martian soil fines fraction in SNC meteorites. (abs. #1252) *Lunar Planet. Sci. Conf.* **34rd** , Lunar Planetary Institute, Houston (CD-ROM).
EETA79001

Rasool S.I., Hunten D.M. and Kaula W. (1977) What the exploration of Mars tells us about the Earth. *Physics Today* **7-77**, 23-32.

Reed G.W. and Jovanovic S. (1969) Some halogen measurements on chondrites. *Earth Planet. Sci. Lett.* **6**, 316-320.
Shergotty

Reedy R.C. (1984a) Cosmogenic radionuclides and exposure histories of SNC meteorites. (abs) *Meteoritics* **19,** 297-298.

Reedy R.C. (1984b) Calculated production rates of noble gases in the SNC meteorites. (abs) *Lunar Planet Sci.* **XV**, 677-678.

Reedy R.C. (1989) Cosmogenic nuclides and the exposure histories of the SNC meteorites. (abs) Intl. Conf. on Mars 4th, LA-UR-88-3242.

Reid A.M. and Bunch T.E. (1975) The nakhlites, part II. Where, when and how? *Meteoritics* **10**, 317-324.
Lafayette, Nakhla

Reid A.M. and Score R. (1981) A preliminary report on the achondrite meteorites in the 1979 U. S. Antarctic Meteorite Collection. *Proc. 6th Sym. Antarctic Meteorites. Mem. Natl. Inst. Polar Res. Spec. Iss.* **20**, 33-52. Nat. Inst. Polar Res., Tokyo.
EETA79001

Reid A.M. (1981) EETA79001 physical and petrographic description. *Antarctic Meteorite Newsletter* **3(3), 4**. JSC Curator's Office.
EETA79001

Reyes D.P. (1992) Mid-infrared spectra of Martian komatiite. (abs) In *Workshop on the Martian surface and atmosphere through time*. *LPI Tech. Rpt*. **92-0**, 122-123. Lunar Planetary Institute, Houston.

Rieder R., Economou T., Wanke H., Turkevich A., Crisp J., Bruckner J., Dreibus G. and McSween H. Y., Jr. (1997) The chemical composition of Martian soil and rocks returned by the mobile alpha proton X-ray spectrometer: Preliminary results from the X-ray mode. *Science* **278**, 1771-1774.

Rice J.W. (1997) Searching for the ALH84001 "smoking gun" (parent crater). (abs) *Lunar Planet. Sci.* **XXVIII**, 1159.
ALH84001

Ridley W.I., Plumlee G.S., DeBraal J.D. and Reed M.H. (1995) Alteration of a Martian surface throught time: A reaction path modeling approach. (abs) *Meteoritics* **30**, 565.

Ridley W.I. and Plumlee G.S. (1997) On Martian alteration as a function of climate and volcanism. (*brief abs*) *Lunar Planet. Sci.* **XXVIII**, 1165.

Rieder R., Economou T., Wänke H., Turkevich A., Crisp J., Bruckner J., Dreibus G. and McSween H.Y., Jr. (1997) The chemical composition of Martian Soil and rocks returned by the mobile alpha proton X-ray spectrometer: Preliminary results from the X-ray mode. *Science* **278**, 1771-1774.
Barnacle Bill, Yogi, Wedge, Shark, Half Dome, Zagami

Rietmeijer F.J.M. (1983) Shock induced chemical reactions in Allan Hills achondrite ALHA77005,21. (abs) *Meteoritics* **18**, 387.
ALHA77005

Righter K. and Drake M.J. (1996) Core formation in the Earth's Moon, Mars and Vesta. *Icarus* **124**, 513-529.

Righter K. and Drake M.J. (1997) Core formation in Earth and Mars. (abs*) 7th Goldschmidt Conf.*, LPI Contribution **921**, 174. Tucson.

Righter K., Hervig R.L. and Kring D.A. (1997) Ion microprobe analyses of SNC meteorite melt inclusions. (abs) *Lunar Planet. Sci*. **XXVIII**, 1181-1182.
Chassigny, LEW88516

Righter K., Hervig R.L. and Kring D.A. (1998) Accretian and core formation on Mars: Molybdenum contents of melt inclusion glasses in three SNC meteorites. *Geochim. Cosmochim. Acta* **62**, 2167-2177.
LEW88516, Governador Valadares, Chassigny

Robbins L.L., Van Cleave K. and Ryan J. (1999) Comparison of carbonate textural features in ALH84001 and microbially induced textures in orthopyroxene. (abs) *Lunar Planet. Sci.* **XXX**, #1464, Lunar

Planetary Institute, Houston (CD-ROM).
ALH84001

Rochette P., Lorand J-P., Fillion G. and Sautter V. (2001a) Pyrrhotite and the remanent magnetization of SNC meteorites: a changing perspctive on Martian magnetism. *Earth Planet. Sci. Lett.* **190**, 1-12.

Rochette P., Lorand J. P., Fillion G., Brunet F. and Sautter V. (2001b) Implications of pyrrhotite being the major magnetic carrier in SNCs. (abs) *Meteoritics Planet. Sci.* **36**, A176.

Romanek C. S., Grady M. M., Wright I. P., Mittlefehldt D. W., Socki R. A., Pillinger C. T. and Gibson E. K., Jr. (1994a) Record of fluid-rock interactions on Mars from the meteorite ALH84001. *Nature* **372**, 655-657.
ALH84001

Romanek C. S., Mittlefehldt D. W., Gibson E. K., Jr. and Socki R. A. (1994b) Martian carbonates in ALH84001**:** Textural, elemental, and stable isotopic compositional evidence on their formation. (abs) *Meteoritics* **29**, 523.
ALH84001

Romanek C. S., Thomas K. L., Gibson E. K., Jr., McKay D. S. and Socki R. A. (1995a) Petrogenesis of carbon and sulfur-bearing minerals in the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVI**, 1183-1184.
ALH84001

Romanek C. S., Thomas K. L., Gibson E. K., Jr., McKay D. S. and Socki R. A. (1995b) Carbon and sulfur-bearing minerals in the Martian meteorite Allan Hills 84001**.** (abs) *Meteoritics* **30**, 567-568.
ALH84001

Romanek C. S., Perry E. C., Gibson E. K., Jr. and Socki R. A. (1996a) Stable isotopic analysis of diatomic oxygen from SNC meteorites. (abs) *Lunar Planet. Sci.* **XXVII**, 1097-1098.
ALH84001, Lafayette, Chassigny, EETA79001, Zagami

Romanek C. S., Treiman A.H., Jones J. H., Gibson E.K. and Socki R.A. (1996b) Oxygen isotopic evidence for aqueous activity on Mars: Delta $^{18}0$ of Lafayette iddingsite. (abs) *Lunar Planet. Sci.* **XXVII**, 1099-1100.
Lafayette

Romanek C. S., Gibson E. K., Jr., Socki R. A. and Perry E. C. (1996c) Oxygen isotopes in Martian SNC meteorites. (abs) In *Workshop on evolution of Martian volatiles.* (*eds.* Jakosky and Treiman) *LPI Tech. Rpt.* **96-01**, 39-40. Lunar Planetary Institute, Houston.
ALH84001

Romanek C. S., Perry E. C., Treiman A. H., Socki R. A., Jones J. H. and Gibson E.K.(1998) Oxygen isotopic record of silicate alteration in the Shergotty-Nakhla-Chassigny meteorite Lafayette. *Meteoritics Planet. Sci.* **33**, 775-784.
Shergotty, EET79001, Zagami, Lafayette, Chassigny

Rost D., Greshake A., Stephan T. and Jessberger E. K. (2000) Time-of-flight secondary ion mass spectrometer analysis of the Los Angeles basaltic shergottite: Prelude to a comprensive study of all Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **35**, A138.
Los Angeles

Rost D., Greshake A., Stephan T., Fritz J., Weber I and Jessberger E. K. (2001) First results from a comprehensive study of melt inclusions in Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **36**,

A177-178.

Rost D., Fritz J., Geshake A., Jesseberger E.K., Stephan T. and Weber I. (2002) Characterization of melt inclusions in Martian meteorites by using TOF-SIMS, EMPA and SEM. (abs) *Meteoritics & Planet. Sci.* **37**, A122.

Rowe M. W., Bogard D. D. and Kuroda P. K. (1966) Mass yield spectrum of cosmic-ray-produced xenon. *J. Geophys. Res.* **71**, 4679-4681.
Nakhla, Lafayette

Rubin A.E. (1997a) Mineralogy of meteorite groups. *Meteoritics & Planet. Sci*. **32**, 231-247.

Rubin A.E. (1997b) Mineralogy of meteorite groups: an update. *Meteoritics & Planet. Sci*. **32**, 733-734..

Rubin A.E., Warren P. H., Greenwood J. P., Verish R. S., Leshin L. A. and Hervig R. L. (2000a) Petrology of Los Angeles: A new basaltic shergottite find. (abs) *Lunar Planet. Sci.* **XXXI,** #1963. Lunar Planetary Institute, Houston (CD-ROM).
Los Angeles

Rubin A.E., Warren P. H., Greenwood J. P., Verish R. S., Leshin L. A., Hervig R. L., Clayton R. N. and Mayeda T. K. (2000b) Los Angeles: The most differentiated basaltic Martian meteorite. *Geology* **28**, 1011-1014.
Los Angeles

Rudnick R. L., Ashwal L. D., Henry D. J., Gibson E. K., Jr., Roedder E., Belkin H. E. and Colucci M. T. (1985) Fluid inclusions in stony meteorites - a cautionary note. *Proc.* ***15th*** *Lunar Planet. Sci. Conf., J. Geophys. Res.* **90**, C669-C675.
EETA79001

Russell S.S., Zipfel J., Grossman J.N. and Grady M.M. (2002) The meteoritical bulletin, No. 86, 2002 July. *Meteoritics & Planet. Sci.* **37**, A157-A184.
Dho378, Gro99027, NWA856, NWA1068, NWA1110, SaU060, SaU090

Ruzicka A., Snyder G.A. and Taylor L.A. (2002) Comparative geochemistry of basalts from the Moon, Earth, HED asteroid, and Mars: Implication for the origin of the Moon. *Geochim. Cosmochim. Acta* **65**, 979-997.

Ryder G. (1982a) A note against a small-body origin for shergottites, nakhlites and chassignites. *Proc. Lunar Planet. Sci. Conf.* **13th**, *J. Geophys. Res.* **87**, A401-402.

S TOP

Sack R. O., Azeredo W. J. and Lipschutz M. E. (1991) Olivine diogenites: The mantle of the eucrite parent body. *Geochim. Cosmochim. Acta* **55**, 1111-1120.
ALHA84001 (NOT)

Salisbury J. and Hunt J. (1975) Visible and near-infrared spectra: X. Stony meteorites. *Modern Geology* **5**, 115-126.
Nakhla

Salisbury J. W., D'Ana D. M. and Jaroswich E. (1991) Mid-infrared (2.5 -13.5 micrometers) reflectance spectra of powdered stony meteorites. *Icarus* **92**, 280-297.
ALHA77005, EETA79001

Sandford S. A. (1984) Infrared Transmission Spectra from 2.5 to 25 microns of various meteorite classes.

Icarus **60**, 115-126.
Nakhla, Lafayette, Shergotty

Sanloup C., Jambon A. and Gillet P. (1999) A simple chondrite model for Mars. *Earth Planet. Sci. Lett.* **112**, 43-54.

Sanloup C., Blichert-Troft J., Telouk P., Gillet P. and Albarede F. (2000) Evidence for extinct ^{92}Nb radioactivity in chondrites and SNC meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1247. Lunar Planetary Institute, Houston (CD-ROM).

Sano Y., Terada K., Takeno S., Taylor L. A. and McSween H. Y., Jr. (2000) Ion microprobe uranium-thorium-lead dating of Shergotty phosphates. *Meteoritics & Planet. Sci.* **35**, 341-346.
Shergotty

Sarafin R. (1985) *^{10}Be, ^{26}Al, ^{36}Cl und ^{53}Mn in steinmeteoriten und gedanken zum noch ungeklarten ursprung der Shergottite*. Thesis, Univ. Köln., Köln.

Sarafin R., Herpers U., Signer P., Wieler R., Bonani G., Hofmann H. J., Morenzoni E., Nessi M., Suter M. and Wölfli W. (1985) ^{10}Be, ^{26}Al, ^{53}Mn and light noble gases in the Antarctic shergottite EETA79001(A). *Earth Planet. Sci. Lett.* **75**, 72-76.
EETA79001

Satterwhite C. and Mason M. (1991) Macroscopic and thin section description of LEW88516. In *Antarctic Meteorite Newsletter* **14 (2)**, 19. JSC Curator's Office, Houston.
LEW88516

Sautter V., Barrat J. A., Gillet Ph., Jambon A., Lorand J. P., Jovoy M., Joron J. L. and Lesourd M. (2001) A new Martian meteorite from Morocco the Nakhlite NWA817. (abs) *Meteoritics & Planet. Sci.* **36**, A182.
NWA817

Sautter V., Barrat J. A., Jambon A., Lorand J. P., Gillet P., Jovoy M., Joron J. L. and Lesourd M. (2002) A new Martian meteorite from Morocco: the nakhlite North West Africa 817. *Earth Planet. Sci. Letters* **195**, 223-238.
NWA817

Sautter V., Barrat J.A. and Jambon A. (2002) Is olivine speedometer a reliable tool to constrain thermal story of SNC meteorite? (abs) Un-mixing SNCs. 51. LPI Contribution No. 1134.

Sawyer D. J., McGehee, M. D., Canepa J. and Moore C. B. (2000) Water soluble ions in the Nakhla Martian meteorites. *Meteoritics & Planet. Sci.* **35**, 743-747.
Nakhla, Lafayette, Chassigny, Shergotty

Saxton J. M., Lyon I. C. and Turner G. (1997a) Oxygen isotope ratio zoning in ALH84001 carbonates. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds*. Clifford *et al*.) *LPI Contribution* **916,** 70. Lunar Planetary Institute, Houston.
ALH84001

Saxton J. M., Lyon I. C., Chatzitheodoridis E. and Turner G. (1997b) Oxygen isotopic composition of Nakhla carbonate. (abs*) Meteoritics & Planet. Sci*. **32**, A113-114.
Nakhla

Saxton J. M., Lyon I. C. and Turner G. (1997c) Correlated oxygen isotope ratios and chemistry in Allan

Hills 84001 carbonates. (abs) *Meteoritics & Planet. Sci*. **32**, A114-115.
ALH84001

Saxton J. M., Lyon I. C. and Turner G. (1998a) Oxygen isotopic composition of Nakhla siderite: Implications for Martian volatiles. (abs) *Meteoritics & Planet. Sci.* **33**, A172.
Nakhla

Saxton J. M., Lyon I. C. and Turner G. (1998b) Oxygen iotopic composition of Nakhla siderite: Implications for Martian volatiles. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7021. Lunar Planetary Institute, Houston.

Saxton J. M., Lyon I. C. and Turner G. (1998c) Correlated chemical and isotopic zoning in carbonates in the Martian meteorite ALH84001. *Earth Planet. Sci. Lett.* **160**, 811-822.
ALH84001

Saxton J. M., Lyon I. C. and Turner G. (1999) Oxygen-isotopic composition of Nakhla anhydrite. (abs) *Meteoritics & Planet. Sci.* **34**, A101-102.
Nakhla

Saxton J. M., Lyon I. C. and Turner G. (2000) Ion probe studies of deuterium/hydrogen in the Nakhlite meteorites. (abs) *Meteoritics & Planet. Sci.* **35**, A142-143.
Nakhla, Lafayette

Saxton J. M., Lyon I. C., Chaztitheodoridis E. and Turner G. (2000) Oxygen isotopic composition of carbonate in the Nakhla meteorite: Implications for the hydrosphere and atmosphere of Mars. *Geochim. Cosmochim. Acta* **64**, 1299-1309.
Nakhla

Schaal R. B. and Hörz F. (1977) Shock metamorphism of lunar and terrestrial basalts. *Proc. Lunar Sci. Conf.* **8th**, 1697-1729.

Schade U. and Wasch R. (1999) Near-infrared reflectance spectra from bulk samples of two Martain meteorites Zagami and Nakhla. *Meteoritics & Planet. Sci.* **34**, 417-424.
Zagami, Nakhla

Schaeffer O. A. and Warasila R. (1981) ^{39}Ar-^{40}Ar study of Allan Hills meteorite A77005**,** A unique achondrite. (abs) *Lunar Planet. Sci.* **XII**, 932-933.
ALHA77005

Scherer P. and Schultz L. (1999) Noble gases in the SNC meteorite Dar al Gani 476. (abs) *Lunar Planet. Sci.* **XXX**, #1144, Lunar Planetary Institute, Houston (CD-ROM).
DaG476

Schnabel C., Ma. P., Herzog G. F., Faestermann T., Knie K. and Korschinek G. (2001) ^{10}Be, ^{26}Al and ^{53}Mn in Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #1353. Lunar Planetary Institute, Houston. (CD-ROM)
EETA79001, QUE94201, Zagami, ALH77005, LEW88516, ALH84001

Schneider D. M., Hartmann W. K., Benoit P. H. and Sears D. W. (2000) Fusion crust simulation and the search for Martian sediments on Earth. (abs) *Lunar Planet. Sci.* **XXXI,** #1388. Lunar Planetary Institute, Houston (CD-ROM).

Schnetzler C. C. and Philpotts J. A. (1969) Genesis of the calcium-rich achondrites in light of rare earth and barium concentrations. In ***Meteorite Research*** (*ed.* Millman) 206-216. Springer-Verlag, NY.

Shergotty

Schmitt R. A. and Smith R. H. (1963) Implications of the similarity in rare earth fractionation of nakhlitic meteorites and terrestrial basalts. *Nature* **199**, 550-551.
Lafayette, Nakhla

Schmitt R. A., Goles G. G., Smith R. H. and Osborn T. W. (1972) Elemental abundances in stone meteorites. *Meteoritics* **7,** 131-160.
Lafayette, Nakhla, Shergotty(?)

Schlüter J., Schultz L., Thiedig F., Al-Mahdi B.O. and Abu Aghreb A.E. (2002) The Dar al Gani meteorite field (Libyan Sahara): Geologic setting, pairing of meteorites and recovery densisty. *Meteoritics & Planet. Sci*. **37**, 1079-1093.

Schultz L. (1985) Terrestrial ages of Antarctic meteorites: Implications for concentration mechanisms. In *International Workshop on Antarctic Meteorites.* (*ed*. Annexstad) *LPI Tech. Rpt.* **86-1,** 80-82. Lunar Planetary Institute, Houston.

Schultz L. (1998) Der meteoritenschatz in der Sahara. *Max-Planck-Gesellschaft* vol. **3**, 3-7.

Schultz L. and Freundel M. (1984) Terrestrial ages of Antarctic meteorites. (abs) *Meteoritics* **19**, 310.
ALHA77005

Schultz L. and Kruse H. (1978) Light noble gases in stony meteorites- a compilation. *Nuc. Track Detection* **2**, 65-103.

Schultz L., Frank L. and Kruse H. (1996) Helium, Neon and Argon in Meteorites: *A data compilation*. Max-Planck-Inst., Mainz.

Schultz L. and Sears D. (1997) In the tracks of Martians. *Meteoritics & Planet. Sci.* **32**, 3-4. (*editorial*)
ALH84001

Schultz L., Franchi I. A., Reid A. M. and Zolensky M. E. (1999) ***Workshop on Extraterrestrial Materials from Cold and Hot Deserts.*** LPI Cont. **997**. Lunar Planetary Institute, Houston.

Schutt J., Fessler B. and Cassidy W. A. (1993) Antarctic meteorite location and mapping project, 2nd edition. *LPI Tech. Rpt.* **93-07** Lunar Planetary Institute, Houston.

Schwandt C. S., Hörz F., Haynes G. and Lofgren G. E. (1998) Shock experiments using Homestake Formation as an analog for the carbonate in Meteorite ALH84001. *(abs) Meteoritical Society, Dublin.*

Schwandt C. S., McKay G. A. and Lofgren G. E. (1999a) Silica in Martian meteorites, there are differences. (abs) *Lunar Planet. Sci.* **XXX**, #1637, Lunar Planetary Institute, Houston (CD-ROM).
Shergotty, Zagami, ALH84001

Schwandt C. S., McKay G. A. and Lofgren G. E. (1999b) FESEM imaging reveals previously unseen detail and enhances interpretations of ALH84001 carbonate petrogenesis. (abs) *Lunar Planet. Sci.* **XXX**, #1346, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Schwandt C. S., Jones J. H., Mittlefehldt D. W. and Treiman A. H. (2001) The magma composition of EET79001A: The first recount. (abs) *Lunar Planet. Sci.* **XXXII**, #1913. Lunar Planetary Institute, Houston. (CD-ROM)
EETA79001

Schwenzer S.P., Mohapatra R.K., Hermann S. and Ott U. (2002a) Noble gas distribution in the Martian meteorites Sayh al Uhaymir 005 (SaU 005). (abs) *Lunar Planet. Sci.* **XXXIII** #1624. Lunar Planetary Institute, Houston. (CD-ROM)
SaU005

Schwenzer S.P., Mohapatra R.K., Hermann S. and Ott U. (2002b) Nitrogen and noble gases in mineral separates from Nakhla. (abs*) Meteoritics & Planet. Sci.* **37**, A127.
Nakhla

Schwenzer S.P., Mohapatra R.K., Hermann S. and Ott U. (2002c) Nitrogen and noble gases in mineral separates from Zagami. (abs) Un-mixing SNCs. 53-54. LPI Contribution No. 1134.

Schwenzer S.P., Mohapatra R.K. and Ott U. (2002c) Nitrogen and noble gases in calichi from the Martian meteorite SaU008. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A693. Davos
SaU008

Schwenzer S.P., Mohapatra R.K., Hermann S. and Ott U. (2003) Nitrogen and heavy noble gases in sands that hosted Sayh al Uhaymir 008 in Oman desert. (abs) *Lunar Planet. Sci.* **XXXIV** #1694. Lunar Planetary Institute, Houston.

Sclar C. B. and Morzenti S. P. (1971) Shock-induced planer deformation structures in olivine from the Chassigny meteorite. *Meteoritics* **6**, 310-311.
Chassigny

Score R. (1997) Finding ALH84001. *The Planetary Report* **XVII**, 5-7.
ALH84001

Score R. and Reid A. M. (1981) Physical and petrographic description of EETA79001. In *Antarctic Meteorite Newsletter* **4(1),** 133. JSC Curator's Office, Houston.
EETA79001

Score R., King T. V. V., Schwarz C. M., Reid A. M. and Mason B. (1982) Descriptions of stony meteorites. In *Smithson. Contrib. Earth Sci.* **24**, 44. Washington, DC.
EETA79001

Score R. and MacPherson G. (1985) Macroscopic and thin section description of ALH84001. In *Antarctic Meteorite Newsletter* **8 (2),** 5. JSC Curator's Office, Houston.
ALH84001

Score R. and Lindstrom M. M. (1990) Guide to US collection of Antarctic meteorites 1976-1988. In *Antarctic Meteorite Newsletter* **13 (1),** 1-135**.** JSC Curator's Office, Houston.

Score R. and Lindstrom M. M. (1993a) List of special meteorites. In *Antarctic Meteorite Newsletter* **16 (2)**, 5. JSC Curator's Office, Houston.

Score R. and Lindstrom M. M. (1993b) Mix-up in labeling of ALH84001 and EETA79002 thin sections. In *Antarctic Meteorite Newsletter* **16 (3)**, 2. JSC Curator's Office, Houston.
ALH84001

Score R. and Mittlefehldt D. W. (1993) Macroscopic and thin section description of ALH84001. In *Antarctic Meteorite Newsletter* **16 (3)**, 3. JSC Curator's Office, Houston.
ALH84001

Score R. and Mason B. (1995) Macroscopic and thin section description of QUE94201. In *Antarctic Meteorite Newsletter* **18 (2),** 20. JSC Curator's Office, Houston.

QUE94201

Scott E. R. D. (1998) Biogenic or abiogenic origin of carbonate-magnetitie-sulfide assemblages in Martian meteorite Allan Hills 84001. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7041. Lunar Planetary Institute, Houston.

Scott E. R. D (1999) Origin of carbonate-magnetite-sulfide assemblages in martian meteorite ALH84001. *J. Geophys. Res.* **104**, 3803-3813.
ALH84001

Scott E. R. D., Yamaguchi A. and Krot A. N. (1997a) Shock melting of carbonate, plagioclase and silica in the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 1271-1272.
ALH84001

Scott E. R. D., Yamaguchi A. and Krot A. N. (1997b) Petrological evidence for shock melting of carbonates in the Martian meteorite ALH84001. (abs) *Nature* **387**, 377-379.
ALH84001

Scott E. R. D., Krot A. N. and Yamaguchi A. (1997c) Formation of carbonates in Martian meteorite Allan Hills 84001 from shock melts. (abs) *Meteoritics & Planet. Sci.* **32**, A117-118.
ALH84001

Scott E. R. D. and Krot A. N. (1998a) Carbonates in Martian meteorite ALH84001: Petrologic evidence for an impact origin. (abs) *Lunar Planet. Sci.* **XXIX** #1786, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Scott E. R. D. and Krot A. N. (1998b) Formation of pre-impact, interstitial carbonates in the ALH84001 Martian meteorite. (abs) *Meteoritics & Planet. Sci.* **33**, A139-140.
ALH84001

Scott E. R. D., Krot A. N. and Yamaguchi A. (1998c) Carbonates in fractures of Martian meteorite Allan Hills 84001: Petrologic evidence for impact origin. *Meteoritics & Planet. Sci.* **33**, 709-719.
ALH84001

Scott E. R. D. and Krott A. N. (`1998d) Origin of carbonate in Martian meteorite ALH84001. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7032. Lunar Planetary Institute, Houston.

Scott E. R. D., Krot A. N. and Yamaguchi A. (1999) Comment on "Petrologic evidence for low-temperature, possibly flood-evaporitic origin of carbonates in the ALH84001 meteorite" by Paul H. Warren. *J. Geophys. Res.* **104**, 24,211-24,215.
ALH84001

Scott E.R.D. and Barber D.J. (2002a) Origin of magnetite in Martian meteorite Alan Hills 84001. (abs) *Meteoritics & Planet. Sci.* **37**, A128.
ALH84001

Scott E.R.D. and Barber D.J. (2002b) Resolution of a big argument about tiny magnetic minerals in Martian meteorite. http://www.psrd.hawaii.edu/May02/ALH84001magnetite.html

Sears D. W. G. (1999) A review of "Planetary Materials" by Papike *et al. (ed.). Meteoritics Planet. Sci.* **34**, 303-304.

Sears D. W. G. (2000) The exploration of Mars, martian meteorites and the search for life. *Meteoritics & Planet. Sci.* **35**, 891-893. *(an editorial)*

Sears D. W. G. and Hasan F. A. (1985) Thermoluminescence and Antarctic meteorites. In *International Workshop on Antarctic Meteorites.* (*ed.* Annexstad) *LPI Tech. Rpt.* **86-1,** 83-100. Lunar Planetary Institute, Houston.
Shergotty, EETA79001

Sears D. W. G and Kral T. A. (1998a) SEM imaging of Martian and Lunar meteorites and implications for microfossils in Martian meteorites. (abs) *Lunar Planet. Sci.* **XXIX** #1934, Lunar Planetary Institute, Houston (CD-ROM).

Sears D. W. G and Kral T. A. (1998b) Martian "microfossils" in lunar meteorites? *Meteoritics Planet. Sci.* **33**, 791-794.
ALH84001

Sen Gupta P. R. (1995) Petrographic shock features of the Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 21-22. Lunar Planetary Institute, Houston.
Shergotty

Sephton M. A. and Gilmour I. (1998) A "unique" distribution of polycyclic hydrocarbons in Allan Hills 84001, or a selective attack in meteorites from Mars? (abs) *Meteoritics & Planet. Sci.* **33**, A142-143.
ALH84001

Sephton M. A., Gilmour I., Wright I. P., DeLeeuw J. W., Grady M. M., Pillinger C. T. (2000) High molecular weight organic matter in Nakhla. (abs) *Lunar Planet. Sci.* **XXXI,** #1786. Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Sharma M., Papanastassiou D. A., Wasserburg G. J. and Dymek R. F. (1994) The problem of high precision measurements of $^{142}Nd/^{144}Nd$: The terrestrial record of ^{146}Sm. (abs) *Lunar Planet. Sci.* **XXV,** 1253-1254.

Sharp T. G., El Goresy A., Dubrovinsky L. and Chen M. (1998) Microstructures of shocked silicon dioxide in Shergotty: Evidence for multiple post-stishovite silicon dioxide polymorphs and extreme shock pressures. *(abs) Meteoritics & Planet. Sci.* **33**, A144.
Shergotty

Sharp T. G., El Gorsey A., Dubrovinsky L. and Chen M. (1999a) Very-dense silica minerals in the Shergotty SNC meteorite: Evidence for extreme shock pressures. (abs) *Lunar Planet. Sci.* **XXX**, #1827, Lunar Planetary Institute, Houston (CD-ROM)
Shergotty

Sharp T. G., El Goresy A., Wopenka B. and Chen M. (1999b) A post-stishovite SiO_2 polymorph in the meteorite Shergotty: implications for impact events. *Science* **284**, 1511-1514.
Shergotty

Shaw J., Hill M. J. and Openshaw S. J. (2001) Investigating the ancient Martian magnetic field using microwaves. *Earth Planet. Sci. Lett.* **190**, 103-109.
Nakhla

Shearer C. K. (1997) Sulfur isotopic systematics in ALH84001: Open- and closed-system behavior of sulfur in a Martian hydrothermal system. (abs) *Lunar Planet. Sci.* **XXVIII**, 1289-1290.
ALH84001

Shearer C. K. and Brearley A. J. (1992) Trace element zoning and subsolidus microstructure of pigeonite

in the Zagami shergottite. (abs) *Lunar Planet. Sci.* **XXIII**, 1275-1276.
Zagami

Shearer C. K. and Papike J. J. (1992) Origin of olivine diogenites and their relationship to basaltic magmatism on the eucrite parent body. (abs) *Lunar Planet. Sci.* **XXIII**, 1279-1280.
ALH84001

Shearer C. K., Spilde M. N., Papike J. J. and Layne G. D. (1996a) Hydrothermal systems on Mars. Insights from sulfur isotopic systematics in alteration assemblages in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVII**, 1183-1184.
ALH84001

Shearer C. K., Layne G. D., Papike J. J. and Spilde M. N. (1996b) Sulfur isotopic systematics in alteration assemblages in Martian meteorite ALH84001. *Geochim. Cosmochim. Acta* **60**, 2921-2926.
ALH84001

Shearer C. K. and Papike J. J. (1996) Evaluating the evidence for past life on Mars. *Science* **274**, 2121.
ALH84001

Shearer C. K., Spilde M. N., Wiedenbeck M. and Papike J. J. (1997) The petrogenic relationship between carbonates and pyrite in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci*. **XXVIII**, 1293-1294.
ALH84001

Shearer C. K. and Adcock C. T. (1998a) The relationship between the carbonate and shock-produced glass in ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1280, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Shearer C. K. and Adcock C. T. (1998b) The composition and distribution of feldspathic shock glass in ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1754, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Shearer C. K. and Adcock C. T. (1998c) The origin of olivine in Martian meteorite ALH84001. The distribution of olivine. (abs) *Lunar Planet. Sci.* **XXIX** #1281, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Shearer C. K. and Leshin L A. (1998d) The origin of olivine in Martian meteorite ALH84001. The oxygen isotopic systematics of the olivine. (abs) *Lunar Planet. Sci.* **XXIX** #1286, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Shearer C. K. and Adcock C. (1998e) A comparison between sulfide assemblages in Martian meteorites ALH84001 and Governador Valadares. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7031. Lunar Planetary Institute, Houston.

Shearer C. K. and Brearley A. (1998f) Evidence for a late-stage thermal overprint in ALH84001 and implications for biomarkers. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7024. Lunar Planetary Institute, Houston.

Shearer C. K., Leshin L. A. and Adcock C. T. (1999) Olivine in Martian meteorite Allan Hills 84001: Evidence for a high-temperature origin and implications for signs of life. *Meteoritics Planet. Sci.* **34**, 331-339.
ALH84001

Shearer C. K., Taylor L. A., Nazarov M. A. (2001) Trace element crystal chemistry of minerals in Dhofar

019. Implications for the petrogenesis of Martian magmas. (abs) *Lunar Planet. Sci.* **XXXII**, #1881. Lunar Planetary Institute, Houston. (CD-ROM)
Dho019

Shih C.-Y., Nyquist L. E., Bansal B. M., Wiesmann H., Wooden J. L. and McKay G. A. (1981) REE, Sr and Nd istopic studies on shocked achondrites - Shergottty, Zagami and ALHA77005. *Lunar Planet. Sci*. **XII**, 973-975.
Shergottty, **Zagami**, **ALHA77005**

Shih C.-Y., Nyquist L. E., Bogard D. D., McKay G. A., Wooden J. L., Bansal B. M. and Wiesmann H. (1982) Chronology and petrogenesis of young achondrites, Shergotty, Zagami, and ALHA77005: Late magmatism on a geologically active planet. *Geochim. Cosmochim. Acta* **46,** 2323-2344.
Shergottty, **Zagami**, **ALHA77005**

Shih C.-Y., Nyquist L. E. and Wiesmann H. (1996) Sm-Nd systematics of nakhlite Governador Valadares. (abs) *Lunar Planet. Sci.* **XXVII**, 1197-1198.
Governador Valadares, Nakhla

Shih C.-Y., Nyquist L. E., Reese Y. and Wiesmann H. (1998) The chronology of the nakhlite, Lafayette: Rb-Sr and Sm-Nd isotopic ages. (abs) *Lunar Planet. Sci.* **XXIX** #1145, Lunar Planetary Institute, Houston (CD-ROM).
Lafayette

Shih C.-Y., Nyquist L. E. and Wiesmann H. (1999) Samarium-neodymium and rubidium-strontium systematics of nakhlite Governador Valadares. *Meteoritics & Planet. Sci*. **34**, 647-655.
Governador Valadares

Shih C.-Y., Wiesman H., Nyquist L.E. and Misawa K. (2002) Crystallization age of Antarctic nakhlite Y000593: Further evidence of nakhlite launch pairing. (abs) *Antarctic Meteorites* **XXVII**, 151-153, NIPR, Tokyo
Y000593

Shih C.-Y., Nyquist L.E., Wiesmann H. and Barret J.A. (2003) Age and petrogenesis of picritic shergottite NWA 1068: Sm-Nd and Rb-Sr isotopic studies. (abs) *Lunar Planet. Sci.* **XXXIV** #1439. Lunar Planetary Institute, Houston.
NWA1068

Shimizu H. and Masuda A. (1981) REE, Ba, Sr and Rb abundances in some unique Antarctic achondrites. *Proc. 6th Sym. Antarctic Meteorites. Mem. Natl. Inst. Polar Res. Spec. Iss.* **20**, 211-220. Nat. Inst. Polar Res., Tokyo.
ALHA77005

Shirai N., Oura Y. and Ebihara M. (2002) Chemical composition of newly collected Antarctic nakhlites, Y000593 and Y000749. (abs) Un-mixing SNCs. 55-56. LPI Contribution No. 1134.
Y000593

Shukolyukov Yu. A., Nazarov M. A. and Schultz L. (2000) Dhofar 019: A shergottite with an approximately 20 million-year exposure age. (abs) *Meteoritics & Planet. Sci.* **35**, A147.
Dho019

Shukolyukov Yu. A., Nazarov M. A. and Schultz L. (2002) A new Martian meteorite: the Dhofar 019 shergottite with an exposure age of 20 million years. *Solar System Research* **36**, issue 2, 125-135. Kluwer
Dho019

Silberrad C. A. (1932) Place of fall, Shergahti. *Min. Mag.* **23**, 294.
Shergotty

Simon S. B., Papike J. J. and Beauchamp R. H. (1985) Petrography and silicate mineral chemistry of the Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 23-24. Lunar Planetary Institute, Houston.
Shergotty

Simonds C. H., Warner J. L., Phinney W. C. and McGee P. E. (1976) Thermal model for impact breccia lithification: Manicouagan and the moon. *Proc. Lunar Sci. Conf.* **7th**, 2509-2528.

Singer A. V. and Melosh H. J. (1981) The origin of SNC meteorites: An alternative to Mars. (abs) *EOS Trans. AGU* **62**, 941.

Singer A. V. and Melosh H. J. (1982) Possible asteroidal origin of SNC meteorites. (abs) *Lunar Planet. Sci.* **XIII**, 472-473.

Singer R. B. and McSween H. Y., Jr. (1992) Compositon of the Martian crust: Evidence from spectroscopy and SNC meteorites. (abs) *Lunar Planet. Sci.* **XXIII**, 1303-1304.

Sinha N. and Goswami J. N. (1994) Nuclear track studies of the SNC meteorite ALH84001. (abs) *Meteoritics* **29**, 534.
ALH84001

Sippel R. F. (1971) Luminescence petrography of the Apollo 12 rocks and comparative features in terrestrial rocks and meteorites. *Proc. Lunar Sci. Conf.* **2nd**, 247-263.
Shergotty

Slater V.P. and McSween H.Y. Jr. (2002) What do oxygen isotopes in basaltic shergottites record? (abs) *Meteoritics & Planet. Sci.* **37**, A133.

Smith C. L., DeLaeter J. R. and Rosman K. J. R. (1977) Mass spectrometric isotope dilution analysis of tellurium in meteorites and standard rocks. *Goechim. Cosmochim. Acta* **41**, 676-681.
Nakhla

Smith J. V. and Hervig R. L. (1978) Shergotty meteorite: Mineralogy, petrography, and minor elements. (abs) *Meteoritics* **13**, 635-636.
Shergotty

Smith J. V. and Hervig R. L. (1979) Shergotty meteorite: Mineralogy, petrography, and minor elements. *Meteoritics* **14**, 121-142.
Shergotty

Smith J. V. and Steele I. M. (1982) Petrography and mineralogy of two basalts and olivine-pyroxene-spinel fragments in achondrite EETA79001. (abs) *Meteoritics* **17**, 281.
EETA79001

Smith J. V. and Steele I. M. (1983) Pre-terrestrial alteration of achondrite ALHA77005: Effect of Martian volatiles? (abs) *Lunar Planet. Sci.* **XIV**, 712-713.
ALHA77005

Smith J. V., Steele I. M. and Leitch C. A. (1983) Mineral chemistry of the shergottites, nakhlites, Chassigny, Brachina, pallisites and ureilites. *Proc. Lunar Sci. Conf.* **14th**; *J. Geophys. Res.* **88** (suppl.), B229-B236.
Shergotty, Zagami, Nakhla, Lafayette, Governador Valadares, Chassigny

Smith J. V. and Steele I. M. (1984) Achondrite ALHA77005: Alteration of chromite and olivine. *Meteoritics* **19,** 121-133.
ALHA77005

Smith M. R. and Schmitt R. A. (1983) Petrogenesis of shergottites. (abs) *Lunar Planet. Sci.* **XIV**, 717-718.

Smith M. R., Laul J. C., Ma M.-S., Huston T., Verkouteren R. M., Lipschutz M. E. and Schmitt R. A. (1984) Petrogenesis of the SNC (shergottites, nakhlites, chassignites) meteorites: Implications for their origin from a large, dynamic planet, possibly Mars. *Proc. Lunar Planet. Sci. Conf.* **14th**; *J. Geophys. Res.* **89** (suppl.), B612-B630.
EETA79001, ALHA77005, Shergotty, Zagami

Smith M. R. and Laul J. C. (1985) Rare earth abundances in EETA79001 phosphates. (abs) *Meteoritics* **20**, 760-761.
EETA79001

Socki R. A., Romanek C. S. and Gibson E. K., Jr. (1993) D/H exchange reaction in salts extracted from LEW85320. (abs) *Meteoritics* **28**, 440.

Socki R. A., Gibson E. K., Jr. and Romanek C. S. (1995) Stable isotope enrichment of carbonate from the Martian meteorite Allan Hills 84001: Test of a hypothesis at Wright Valley, Antarctica. (abs) *Meteoritics* **30**, 580-581.
ALH84001

Sohl F. and Spohn T. (1997) The interior structure of Mars: implications from SNC meteorites. *J. Geophys*. **102**, 1613-1635.

Solberg T. C. and Burns R. G. (1987) Iron oxidation state and weathering studies of SNC and other Antarctic meteorites. (abs) *Lunar Planet. Sci.* **XVIII**, 936-937.
EETA79001, ALHA77005, Nakhla

Solberg T. C. and Burns R. G. (1989) Iron Mössbauer spectral study of weathered Antarctic and SNC meteorites. *Proc. Lunar Planet. Sci. Conf.* **19th**, 313-322. Lunar Planetary Institute, Houston.
EETA79001

Squyres S. W. and Kasting J. F. (1994) Early Mars: How warm and how wet? *Science* **265**, 744.

Stauffer H. (1962) On the production rates of rare gas isotopes in stone meteorites. *J. Geophys. Res.* ***67***, 2023-2028.
Nakhla

Steele I. M. and Smith J. V. (1982a) Mineralogy of Elephant Moraine A79001 two-component achondrite with resemblages to Shergotty. (abs) *Lunar Planet. Sci.* **XIII**, 764-765.
EETA79001, Shergotty

Steele I. M. and Smith J. V. (1982b) Petrography and mineralogy of two basalts and olivine-pyroxene-spinel fragments in achondrite EETA79001. *Proc. Lunar Planet. Sci. Conf.* **13th;** *J. Geophys. Res.* **87**, A375-384.
EETA79001

Steele A., Goddard D. T., Grimes G. W., Stapleton D., Smith J., Tapper R., Grady M. M., McKay D. S., Gibson E. K., Jr. Thomas-Keprta K. L. and Beech I. B. (1997a) Scanning proton microprobe analysis of fragments of ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 1367-1368.

ALH84001

Steele A., Goddard D. T., Stapleton D., Smith J., Tapper R., Grady M. M., McKay D. S., Gibson E. K., Jr., Thomas-Keprta K. L. and Beech I. B. (1997b) Atomic force microscopy imaging of ALH84001 fragments. (abs) *Lunar Planet. Sci.* **XXVIII**, 1369-1370.
ALH84001

Steele A., Goddard D. T., Toporski J. K. W., Stapleton D., Wynn-Williams D. D. and McKay D. S. (1998a) Terrestrial contamination of an Antarctic chondrite. (abs) *Meteoritics & Planet. Sci.* **33**, A149.

Steele A., Goddard D. T., Beech I. B., Tapper R. C., Stapleton D. and Smith J. R. (1998b) Atomic force microscopy imaging of fragments of Martian meteorite ALH84001. *J. Microscopy* **189**, 2-7.

Steele A., Goddard D.T., Stapleton D., Toporski J. K. W., Sharples G., Wynn-Williams D. D. and McKay D. S. (1999a) Imaging of an unknown organism on ALH84001. (abs) *Lunar Planet. Sci.* **XXX**, #1326, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Steele A., Westall F., Goddard D.T., Stapleton D., Toporski J. K. W., Sharples G. and McKay D. S. (1999b) Imaging of the biological contamination of meteorites: A practical assessment. (abs) *Lunar Planet. Sci.* **XXX**, #1321, Lunar Planetary Institute, Houston (CD-ROM)
ALH84001, Nakhla

Steele A., Toporski J. K. W., Wesall F. W., Thomas-Keprta K., Gibson E. K., Avci R., Whitby C., Griffin C. and McKay D. S. (2000a) The microbiological contamination of meteorites: a Null Hypothesis. (abs) *Lunar Planet. Sci.* **XXXI,** #1670. Lunar Planetary Institute, Houston (CD-ROM).

Steele A., Goddard D. T., Stapleton D., Toporski J. K. W., Peters V., Bassinger V., Sharples G., Wynn-Williams D. D. and McKay D. S. (2000b) Investigations into an unknown organism on the Martian meteorites Allan Hills H4001. *Meteoritics & Planet. Sci.* **35**, 237-241.
ALH84001

Steele A., Toporski J. K. W. and McKay D. S. (2001) The terrestrial contamination of meteorites. An update. (abs) *Meteoritics & Planet. Sci.* **36**, A197.
Nakhla, ALH84001

Stephan T., Rost D., Jessberger E. K. and Greshake A. (1998a) Polycyclic aromatic hydrocarbons in ALH84001 analyzed with time-of-flight secondary ion mass spectrometry. (abs) *Lunar Planet. Sci.* **XXIX** #1263, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Stephan T., Rost D., Jessberger E. K. and Greshake A. (1998b) Polycyclic aromatic hydrocarbons are everywhere in Allan Hills 84001. (abs) *Meteoritics & Planet. Sci.* **33**, A149-150.

Stephan T. Rost D., Heiss C. H., Jessberger E. K. and Greshke A. (1998c) The lateral distribution of polycylic aromatic hydrocarbons in Allan Hills 84001 – Implications for their origin. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7017. Lunar Planetary Institute, Houston.

Stephan T., Heiss C. H., Rost D. and Jessberger E. K. (1999) Polycyclic aromatic hydrocarbons in meteorites: Allan Hills 84001, Murchison and Orgueil. (abs) *Lunar Planet. Sci.* **XXX**, #1569, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Stephan T. and Jessberger E. K. (2000a) Polycyclic aromatic hydrocarbons in Allan Hills 84001 –

Implications from time-of-flight secondary ion mass spectrometry analyses. (abs) *Lunar Planet. Sci.* **XXXI** #1326. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Stephan T. and Jessberger E. K. (2000b) Polycylic aromatic hydrocarbons in Allan Hills 84001: A result of terrestrial contamination? (abs) *Meteoritics & Planet. Sci.* **35**, A152.
ALH84001

Stockstill K. R., Dodnar R. J. and McSween H. Y., Jr. (2001a) Melt inclusions in Nakhla as monitors of parental melts on Mars. (abs) *Lunar Planet. Sci.* **XXXII** #1788. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Stockstill K.R., Bodnar R. J., McSween H. Y., Jr. and Benedix G. K. (2001b) Melt inclusions in Nakhla and ALH77005: Indicators of parental magmas on Mars. (abs) *Meteoritics & Planet. Sci.* **36**, A198.
Nakhla, ALH77005

Stockstill K.R., Bodnar R. J., McSween H. Y., Jr. and Benedix G. K. (2001c) Melt inclusions in Nakhla as monitors of parantal melts on Mars. (abs) *Eleventh Goldschmidt Conf.* 3672. Hot Springs.
Nakhla

Stockstill K.R., Bodnar R.J., McSween H.Y. and Lentz R.C.F. (2002) Melt inclusions in SNC meteorites as indicators of parental melts on Mars. (abs) *Lunar Planet. Sci.* **XXXIII** #1644. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Stöffler D. (1974) Deformation and transformation of rock-forming minerals by natural and experimental shock processes: II Physical properties of shocked minerals. *Fortschr. Mineral*. **51**, 256-289.

Stöffler D. and Ostertag R. (1985) Shock history of the shergottites. (abs) *Meteoritics* **20**, 764-765.
Shergotty, Zagami, EETA79001, ALHA77005.

Stöffler D., Ostertag R., Jammes C., Pfannschmidt G., Sen Gupta P. R., Simon S. B., Papike J. J. and Beauchamp R. H. (1986) Shock metamorphism and petrography of the Shergotty achondrite. *Geochim. Cosmochim. Acta* **50,** 889-913.
Shergotty

Stöffler D. (2000) Maskelynite confirmed as diaplectic glass: Indication for peak shock pressures below 45 GPA in all Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1170. Lunar Planetary Institute, Houston (CD-ROM).

Stolper E. M. (1979) *Igneous petrology of differentiated meteorites*. PhD Thesis, Harvard University, Cambridge.
Shergotty, Zagami

Stolper E. M. (1980) Trace elements in shergottite meteorites: Implications for the origins of planets. *Earth Planet. Sci. Lett.* **42**, 239-242.
Shergotty, Zagami

Stolper E. M., Hays J. F. and McSween H. Y., Jr. (1978) A petrogenetic model relating basaltic achondrites, the shergottites, the nakhlites and the chassignites. (abs) *Meteoritics* **13**, 640-641.

Stolper E. M., McSween H. Y., Jr. and Hays J. F. (1979) A petrogenetic model of the relationships among achondritic meteorites. *Geochim. Cosmochim. Acta* **43,** 589-602.
Shergotty, Zagami, Nakhla, Chassigny

Stolper E. M. and McSween H. Y., Jr. (1979) Petrology and origin of the shergottite meteorites. *Geochim. Cosmochim. Acta* **43**, 1475-1498.
Shergotty, Zagami

Sugiura N. and Strangway D. W. (1988) Magnetic studies of meteorites. In ***Meteorites and the Early Solar System*** (*eds.* Kerridge and Matthews). 595-615. Univ. Arizona Press, Tucson.
ALHA77005, Shergotty

Sugiura N. and Hoshino H. (1999a) Hydrogen isotopic compositions of carbonate in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXX**, #1324, Lunar Planetary Institute, Houston (CD-ROM)
ALH84001

Sugiura N. and Hoshino H. (1999b) H isotopic compositions in ALH84001. (abs) *Antarctic Meteorites* **XXIV**. NIPR, Tokyo.

Sugiura N. and Hoshino H. (2000) Hydrogen-isotopic compositions in Allan Hills 84001 and the evolution of the Martian atmosphere. *Meteoritics & Planet. Sci.* **35**, 373-380.
ALH84001

Sunshine J. M., McFadden L. A. and Pieters C. M. (1993) Reflectance spectra of the Elephant Moraine A79001 meteorite: Implications for remote sensing of planetary bodies. *Icarus* **105**, 79-91.
EETA79001

Sutton S.R., Rao M.N., Dreibus G., McKay D.S., Wanke H., Wentworth S., Newville M., Trainor T. and Flynn G.J. (2002) Chlorine/bromine ratios in fracture-filling aqueous alteration products in Nakhla olivine. (abs) *Lunar Planet. Sci.* **XXXIII** #1278. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Swartz M. (1996) It came from outer space. *Texas Monthly* 122

Swindle T. D. (1988) Noble gases as tracers of the origin and evolution of the Martian atmosphere and the degassing history of the planet. In *Workshop on Mars sample return science*. (*eds.* Drake *et al.*) *LPI Tech. Rpt*. **88-07**, 164-165. Lunar Planetary Institute, Houston.

Swindle T. D. (1995) How many Martian noble gas resevoirs have we sampled? In *Volatiles in the Earth and Solar system.* (*ed.* Farley) *AIP Cong. Proc.* **341**, 175-185. Am. Institute of Physics, NY.

Swindle T. D. (1997a) Noble gases on Earth and Mars: Key similarities and differences. (abs) *7th Goldschmidt Conf.*, *LPI Contribution* **921**, 203. Tucson.

Swindle T. D. (1997b) Life on Mars: What are the chances? (abs) *Meteoritics & Planet. Sci*. **32**, A126-127.
ALH84001

Swindle T.D. (2002) Martian Noble Gases. *In Reviews of Miner. and Geochem*. Vol **41**, 171-190.

Swindle T. D., Caffee M. W., Hohenberg C. M., Hudson G. B. and Rajan R. S. (1984) Noble gases in SNC meteorites. (abs) *Meteoritics* **19**, 318-319.

Swindle T. D., Caffee M. W. and Hohenberg C. M. (1986) Xenon and other noble gases in shergottites. *Geochim. Cosmochim. Acta* **50,** 1001-1015.
EETA79001

Swindle T. D., Garrison D., Hohenberg C. M. and Olinger C. T. (1987) Xenon and Argon in Nakhla and

Lafayette: Evidence for multiple "Martian" components. (abs) *Lunar Planet. Sci.* **XVIII,** 984-985.
Nakhla, Lafayette

Swindle T. D., Nichols R. and Olinger C. T. (1989) Noble gases in the nakhlite Governador Valadares. (abs) *Lunar Planet. Sci*. **XX**, 1097-1098.
Governador Valadares

Swindle T. D., Burkland M. K. and Grier J. A. (1994) Noble gases in ALH84001: Not just another SNC. (abs) *Meteoritics* **29,** 538.
ALH84001

Swindle T. D., Burkland M. K., Grier J. A., Lindstrom D. L. and Treiman A. H. (1995a) Noble gas analysis and INAA of aqueous alteration products from the Lafayette meteorite: Liquid water on Mars <350 Ma ago. (abs) *Lunar Planet. Sci.* **XXVI**, 1385-1386.
Lafayette

Swindle T. D., Grier J. A. and Burkland M. K. (1995b) Noble gases in orthopyroxenite ALH84001: A different kind of Martian meteorite with an atmospheric signature. *Geochim. Cosmochim. Acta* **59**, 793-801.
ALH84001

Swindle T. D., Li B. and Kring D. A. (1996) Noble gases in Martian meteorite QUE94201. (abs) *Lunar Planet. Sci.* **XXVII**, 1297-1298.
QUE94201

Swindle T. D. and Jones J. H. (1997) The xenon isotopic composition of the primordial Martian atmosphere: Contributions from solar and fission components. *J. Geophys. Res.* **102**, 1671-1678.

Swindle T. D. and Kring D. A. (1997) Studies of weathering products in Lafayette meteorite: Implications for the distribution of water on both early and recent Mars. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds*. Clifford *et al*.) *LPI Contribution* **916,** 74. Lunar Planetary Institute, Houston.
Lafayette, ALH84001

Swindle T. D., Grier J. A., Li B., Olsen E., Lindstrom D. J. and Treiman A. H. (1997) K-Ar ages for the near-surface liquid water on Mars in the last few hundred million years. (abs*) Lunar Planet. Sci.* **XXVIII**, 1403-1404.
Lafayette

Swindle T. D., Treiman A. H., Lindstrom D. J., Burkland M. K., Cohen B. A., Grier J. A., Li B. and Olsen E. K. (2000) Noble gases in iddingsite from the Lafayette meteorite: Evidence for liquid water on Mars in the last few hundred million years. *Meteoritics & Planet. Sci.* **35**, 107-115.
Lafayette

Swindle T.D. and Olson E.K. (2002) The timing of aqueous weathering on Mars: Clues from argon-40-Argon-39 analysis of whole rock samples of the nakhlites Nakhla and Lafayette. (abs) *Meteoritics & Planet. Sci.* **37**, A138.
Nakhla, Lafayette

Swindle T.D. (2002) Some puzzles about what noble gas components were mixed into the nakhlites and how. (abs) Un-mixing SNCs. 57-58. LPI Contribution No. 1134.

Szymanski A., Brenker F.E., El Goresy A. and Palme H. (2003) Complex thermal history of Nakhla and Y000593. (abs) *Lunar Planet. Sci.* **XXXIV** #1922. Lunar Planetary Institute, Houston.

Nakhla, Y000593

T TOP

Tatsumoto M. and Premo W. R. (1988) U-Th-Pb, Sm-Nd, Rb-Sr and Lu-Hf systematics of returned Mars samples. (abs) In *Workshop on Mars sample return science*. (*eds.* Drake *et al.*) *LPI Tech. Rpt*. **88-07**, 167-168. Lunar Planetary Institute, Houston.
Nakhla, Shergotty, EETA79001, Zagami

Taunton A. E. (1997) SEM studies of Antarctic lunar and SNC meteorites with implications for Martian nanofossils: A progress report. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds*. Clifford *et al*.) *LPI Contribution* **916,** 76. Lunar Planetary Institute, Houston.

Taunton A. E. (1997) Scanning Electron Microscopy of Lunar and Martian Meteorites: Implications for Extraterrestrial Life. Honors Thesis, Univerisity of Arkansas 98 pp

Taylor H. P., Jr., Duke M. B., Silver L. T. and Epstein S. (1965) Oxygen isotope studies of minerals in stony meteorites. *Geochim. Cosmochim. Acta* **29**, 489- 513.
Shergotty

Taylor L. A., Nazarov M. A., Ivanova M. A., Patchen A., Clayton R. N. and Mayeda T. K. (2000) Petrology of the Dhofar 019 shergottite. (abs) *Meteoritics & Planet. Sci.* **35**, A155.
Dho019

Taylor L.A. and ten authors (2002) Martian meteorite Dhofar 019: a new shergottite. *Meteoritics & Planet. Sci*. **37**, 1107-1128.
Dho019

Taylor A. P., Barry J. C. and Webb R. I. (2001) Structural and morphological anomalies in magnetosomes: possible biogenic origin for magnetite in ALH84001. *J. Microscopy* **201**, 84-106.

Terada K., Monde T. and Sano Y. (2002) Ion microporbe U-Pb dating and REE analyses of apatites in nakhlites. (abs) *Meteoritics & Planet. Sci.* **37**, A140.

Terho M., Pesonen L.J. and Kukkonen I. T. (1996) Magnetic propoerties of asteroids from meteorite data - Implications for magnetic anomaly detections. *Earth, Moon and Planets* **72**, 225-231. Kluwer, Netherlands.
Chassigny, Nakhla, Governador Valadares, Shergotty, Zagami, ALHA77005, EETA79001

Terho M. (1997) M. Sc. Thesis. Univ. Helsinki, Finland
Zagami, EETA79001

Terho M. (1998) Magnetic properties and paleointensity studies of two SNC's. (abs) *Meteoritics & Planet. Sci*. **33**, A153-154.
Zagami, EETA79001

Terribilini D., Eugster O., Burger M., Jakob A. and Krahenbuhl U. (1998) Nobel gases and chemical composition of Shergotty mineral fractions, Chassigny and Yamoto 793605: The trapped argon-40/argon-36 ratio and ejection times of Martian meteorites. *Meteoritics & Planet. Sci.* **33**, 677-684.
Shergotty, Chassigny, Y793605

Terribilini D., Busemann H and Eugster O. (2000) Krypton-81-Krypton cosmic-ray exposure ages of the Martian meteorites including the new shergottite Los Angeles. (abs) *Meteoritics & Planet. Sci.* **35**, A155-156.

Los Angeles, QUE94201, Shergotty, Zagami, Nakhla, Chassigny, ALH84001

Thomas K. L., Clemett S. J., Romanek C. S., Maechling C R., Gibson E. K., McKay D. S., Score R. and Zare R. N. (1995a) Polycyclic aromatic hydrocarbons in the Martian (SNC) meteorite Allan Hills 84001: Hydrocarbons from Mars, terrestrial contaminants or both? (abs) *Meteoritics* **30**, 587.
ALH84001

Thomas K. L., Romanek C. S., Clemett S. J., Gibson E. K., McKay D. S., Maechling C. R. and Zare R. N. (1995b) Preliminary analysis of polycyclic aromatic hydrocarbons in the Martian (SNC) meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVI**, 1409-1410.
ALH84001

Thomas K. L., Romanek C. S., McKay D. S., Keller L. P. and Gibson E. K. (1996) Microanalysis of unique fine-grained minerals in the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVII**, 1327-1328.
ALH84001

Thomas-Keprta K. L., Romanek C., Wentworth S. J., McKay D. S., Fisler D., Golden D. C. and Gibson E. K. (1997a) TEM analysis of fine-grained minerals in the carbonate globules of Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 1433-1434.
ALH84001

Thomas-Keprta K. L., Wentworth S. J., McKay D. S., Stevens T. O., Golden D. C., Allen C. C. and Gibson E. K. (1997b) The search for terrestrial nanobacteria as possible analogs for the purported Martian nanofossils in the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 1435-1436.
ALH84001

Thomas-Keprta K. L., Wentworth S. J., McKay D. S., Taunton A. E., Allen C. C. Romanek C. S. and Gibson E. K. (1997c) Subsurface terrestrial microfossils from Columbia River basalt samples: Analogs of features in Martian meteorite Allan Hills 84001? (abs) *Meteoritics & Planet. Sci*. **32**, A128.
ALH84001

Thomas-Keprta K. L., Bazylinski D. A., Goldin D. C., Wentworth S. J., Gibson E. K. and McKay D. S. (1998a) Magnetite from ALH84001 carbonate globules: Evidence of biogenic signatures? (abs) *Lunar Planet. Sci.* **XXIX** #1494, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Thomas-Keprta K. L., McKay D. S., Wentworth S. J., Stevens T. O., Taunton A. E., Allen C. C., Gibson E. K. and Romanek C. S. (1998b) Mineralization of bacteria in terrestrial basaltic environments: Comparison with possible life forms in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1489, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Thomas-Keprta K. L., McKay D. S., Wentworth S. J., Stevens T. O., Taunton A. E., Allen C. C., Coleman A., Gibson E. K. and Romanek C. S. (1998c) Bacterial mineralization patterns in basaltic aquifers: Implications for possible life in Martian meteorite ALH84001. *Geology* **26**, 1031-1034.
ALH84001

Thomas-Keprta and many authors (1998d) Mineral biomarkers in Martian meteorite ALH84001? (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7029. Lunar Planetary Institute, Houston.

Thomas-Keprta K. L., Wentworth S. J., McKay D. S., Bazylinski D. A., Bell M. S., Romanek C. S. and Gibson E. K. (1999a) On the origins of magnetite in Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXX**, #1856, Lunar Planetary Institute, Houston (CD-ROM)

ALH84001

Thomas-Keprta K. L., Bazylinski D. A., Wentworth S. J., McKay D. S., Kirschvink J. L., Clemett S., Bell M. S., Vali H. and Gibson E. K. (1999b) Elongated prismatic magnetite crystals in Martian meteorite ALH84001: Evidence of biogenic signatures? P-130, GSA, Denver.
ALH84001

Thomas-Keprta and seven authors (2000a) Statistical analysis comparing prismatic magnetite crystals in the ALH84001 carbonate globules with those from the terrestrial magnetotactic bacteria strain MV-1. (abs) *Lunar Planet. Sci.* **XXXI,** #1683. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Thomas-Keprta K. L., Wentworth S. J., McKay D. S. and Gibson E. K. (2000b) Field emission gun scanning electron and transmission electron microscopy of phyllosilicates in Martian meteorites ALH84001, Nakhla and Shergotty. (abs) *Lunar Planet. Sci.* **XXXI,** #1690. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001, Nakhla, Shergotty

Thomas-Keprta and seven authors (2000c) Biogenic Martian magnetic crystals? A comparison of prismatic magnetite crystals in the Allan Hills 84001 carbonate globules with those from magnetotactic bacteria strain MV-1. (abs) *Meteoritics & Planet. Sci.* **35**, A156.
ALH84001

Thomas-Keprta K. L., Bazylinski D. A., Kirschvink J. L., Clemett S. J., McKay D. S., Wentworth S. J., Vali H., Gibson E. K. and Romanek C. S. (2000) Elongated prismatic magnetite crystals in ALH84001 carboante globules: Potential Martian magnetofossils. *Geochim. Cosmochim. Acta* **64**, 4049-4081.
ALH84001

Thomas-Keprta and eight authors (2001a) Truncated hexa-octahedral magnetites: Biosignatures in terrestrial samples and Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXII**, #2017. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Thomas-Keprta K. L, Clemett S. J., Bazylinski D. A., Kirschvink J. L., McKay D. S., Wentworth S. J., Vali H., Gibson E. K., McKay M. F. and Romanek C. S. (2001b) Truncated hexa-octahedral magnetite crystals in ALH84001: Presumptive biosignatures. *Proc. Nat. Acad. Sci.* **98**, 2164-2169.
ALH84001

Thomas-Keprta and eight authors (2002a) Multiple origins of magnetite crystals in ALH84001 carbonates. (abs) *Lunar Planet. Sci.* **XXXIII** #1911. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Thomas-Keprta and the same 8 authors (2002b) Magnetofossils from ancient Mars: a robust biosignature in the Martian meteorite ALH84001. *Applied Environmental Microbiology* **68**, 3663-3672.
ALH84001

Thomas-Keprta and 11 authors (2003) Three-dimensional morphological analysis of ALH84001 magnetite using electron tomography. (abs) *Lunar Planet. Sci.* **XXXIV** #1669. Lunar Planetary Institute, Houston.
ALH84001

Toporski J.K.W., Steele A., Stapleton D. and Goddard D.T. (1999) Contamination of Nakhla by terrestrial microorganisms. (abs) *Lunar Planet. Sci.* **XXX**, #1526, Lunar Planetary Institute, Houston (CD-ROM)

Nakhla

Toporski and six authors (2000) Electron microscopy studies, surface analysis and microbial culturing experiments on a depth profile through Martian meteorite Nakhla. (abs) *Lunar Planet. Sci.* **XXXI,** #1636. Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Toporski J., Steele A. and McKay D. S. (2001) Electron microscopy studies and microbial culturing experiments on a depth profile through Martian meteorite Nakhla. (abs) *Meteoritics & Planet. Sci.* **36**, A207-208.
Nakhla

Toulmin P., Baird A. K., Clark B. C., Keil K., Rose H. J., Christian R. P., Evans P. H. and Kelliher W. C. (1977) Geochemical and mineralogical interpretation of the Viking inorganic chemical results. *J. Geophys. Res.* **82,** 4625-4634.

Treiman A. H. (1983) Amphibole in the Shergotty meteorite. (abs) *Meteoritics* **18**, 409-410.
Shergotty

Treiman A. H. (1985a) Amphibole and hercynite spinel in Shergotty and Zagami: Magmatic water, depth of crystallization, and metasomatism. *Meteoritics* **20,** 229-243.
Shergotty, Zagami

Treiman A. H. (1985b) The Nakhla meteorite: Evidence for origin in an ultramafic lava flow. (abs) *Lunar Planet. Sci.* **XVI**, 866-867.
Nakhla

Treiman A. H. (1986) The parental magma of the Nakhla achondrite: Ultrabasic volcanism on the shergottite parent body. *Geochim. Cosmochim. Acta* **50**, 1061-1070.
Nakhla

Treiman A. H. (1987a) Geology of the nakhlite and Chassigny meteorites. (abs) *Meteoritics* **22**, 517-518.
Chassigny, **Nakhla, Lafayette, Governador Valadares**

Treiman A. H. (1987b) Geology of the nakhlite meteorites: Cumulate rocks from flows and shallow intrusions. (abs) *Lunar Planet. Sci.* **XVIII,** 1022-1023.

Treiman A. H. (1988a) Crystal fractionation in the SNC meteorites: Implications for surface units on Mars. In *Workshop on nature and composition of surface units on Mars. LPI Tech. Rpt.* **88-05**, 127. Lunar Planetary Iinstitute, Houston.

Treiman A. H. (1988b) Crystal fractionation in the SNC meteorites: Implications for sample selection. In *Workshop on Mars sample return science*. (*eds.* Drake *et al.*) *LPI Tech. Rpt*. **88-07,** 171. Lunar Planetary Institute, Houston.
Shergotty, Zagami, Nakhla, Chassigny, ALHA77005, EETA79001

Treiman A. H. (1989a) Mineralogy of the SNC meteorites: Primary and secondary. *EOS* **70**, 378.

Treiman A. H. (1989b) Origin of olivine in the Nakhla achondrite, with implications for distribution of Fe/Mg between olivine and augite. (abs) *Lunar Planet. Sci.* **XX**, 1130-1131.
Nakhla

Treiman A. H. (1990) Complex petrogenesis of the Nakhla (SNC) meteorite: Evidence from petrography and mineral chemistry. *Proc. Lunar Planet. Sci. Conf.* **20**, 273-280. Lunar Planetary Institute, Houston.

Nakhla

Treiman A. H. (1992) The parent magma of the Nakhla (SNC) meteorite: Constraints from magmatic inclusions in olivine. (abs) *Lunar Planet. Sci.* **XXIII**, 1447-1448.
Nakhla

Treiman A. H. (1993a) The parent magma of the Nakhla (SNC) meteorite: Reconciliation of composition estimates from magmatic inclusions and element partitioning. (abs) *Lunar Planet. Sci.* **XXIV**, 1441-1442.
Nakhla

Treiman A. H. (1993b) Fall days of the SNC meteorites: Evidence for an SNC meteoroid stream, and a common site of origin. *Meteoritics* **27,** 93-95.
Chassigny, Zagami

Treiman A. H. (1993c) Xenoliths in the EETA79001 shergottite: Geological and astronomical implications of similarities to the ALHA77005 and LEW88516 shergottites. (abs) *Meteoritics* **28,** 451.
EETA79001, ALHA77005, LEW88516

Treiman A. H. (1993d) The parent magma of the Nakhla (SNC) meteorite, inferred from magmatic inclusions. *Geochim. Cosmochim. Acta* **57,** 4753-4767.
Nakhla

Treiman A. H. (1993e) The Martian sources of the SNC meteorites (two, not one), and what can and can't be learned from the SNC meteorites. (abs) In *Mars: Past, present, and future results from the MSATT program*. (*ed*. Haberle) *LPI Tech. Rpt*. **93-06**, 49-51. Lunar Planetary Institute, Houston.

Treiman A. H. (1994a) An ancient age for ALH84001? Petrographic evidence for multiple shock events. (abs) *Meteoritics* **29**, 542.
ALH84001

Treiman A. H. (1994b) Two source areas for the SNC meteorites: Petrologic, chemical and chronologic evidence. (abs) *Lunar Planet. Sci.* **XXV**, 1413-1414.

Treiman A. H. (1995a) S $\neq$ NC: Multiple source areas for Martian meteorites. *J. Geophys. Res.* **100**, 5329-5340.
Chassigny, Nakhla, Lafayette, Governador Valadares, Shergotty, Zagami, EETA79001, ALH84001, ALHA77005, LEW88516

Treiman A. H. (1995b) A petrographic history of Martian meteorite ALH84001: Two shocks and an ancient age. *Meteoritics* **30**, 294-302.
ALH84001

Treiman A. H. (1996a) The perils of partition: Difficulties in retrieving magma compositions from chemically equilibrated basaltic meteorites. *Geochim. Cosmochim. Acta* **60**, 147-155.
ALH84001

Treiman A. H. (1996b) An early warm, wet Mars? Little support from the Martian meteorite ALH84001. (abs) In *Workshop on evolution of Martian volatiles*. (*eds.* Jakosky and Treiman) *LPI Tech. Rpt.* **96-01**, 45-46. Lunar Planetary Institute, Houston.
ALH84001

Treiman A. H. (1996c) To see a world in 80 kilograms of rock. *Science* **272**, 1447-1448. *(editorial)*

Treiman A. H. (1997a) Chemical disequilibrium in carbonate minerals of the Martian meteorite

ALH84001: Inconsistent with high formation temperature. (abs) *Lunar Planet. Sci.* **XXVIII**, 1445-1446.
ALH84001

Treiman A. H. (1997b) Thinking about life on Mars: Dangers and visions. (abs) *Lunar Planet. Sci.* **XXVIII**, 1447-1448.
ALH84001

Treiman A. H. (1997c) The Martian meteorite ALH84001: A short review. In *Origins of life and evolution of the biosphere* (*submitted*)

Treiman A. H. (1997d) Amphibole in Martian meteorite Elephant Moraine 79001. (abs) *Meteoritics Planet. Sci*. **32**, A129.
EETA79001

Treiman A. H. (1997e) Early silicate differentiation in Mars. (abs) *7th Goldschmidt Conf*., *LPI Contribution* **921**, 207. Tucson.

Treiman A. H. (1997f) Surface materials of Mars. In *Mars 2005 sample return workshop*. (*ed*. Gulick) *LPI Tech. Rpt.* **97-1,** 73-77. Lunar Planetary Institute, Houston.

Treiman A. H. (1998a) The history of ALH84001 revised: Multiple shock events. (abs) *Lunar Planet. Sci.* **XXIX** #1195, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Treiman A.H. (1998b) Amphiboles in more Martian meteorites: Elephant Moraine 79001B, Elephant Moraine 79001X and Lewis Cliff 88516. *(abs) Meteoritics & Planet. Sci*. **33**, A156.
EETA79001, LEW88516

Treiman A.H. (1998c) The history of Allan Hills revised: Multiple shock events. *Meteoritics & Planet. Sci.* **33**, 753-764.
ALH84001

Treiman A.H. (1998d) Controversies. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7043. Lunar Planetary Institute, Houston.

Treiman A.H. (1999) Bad water: Origin of Phoenicochroite-Lanarkite solid solution, $Pb_2O(CrO_4SO_4)$, in Martian meteorite EETA79001. (abs) *Lunar Planet. Sci.* **XXX**, #1124, Lunar Planetary Institute, Houston (CD-ROM)
EETA79001

Treiman A.H. (2000) Heterogeneity of remnant magnetism in ALH84001: Petrologic constraints. (abs) *Lunar Planet. Sci.* **XXXI,** #1225. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Treiman A.H. (2001) A hypothesis for the abiotic & non-Martian origins of putative signs of ancient Martian life in ALH84001. (abs) *Lunar Planet. Sci.* **XXXII**, #1304. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Treiman A.H. (2002) The timing of magnetite formation in ALH84001 carbonate globules. (abs) *Meteoritics & Planet. Sci.* **37**, A141.
ALH84001

Treiman A.H. and Drake M. J. (1984) Core formation in the shergottite parent body (SPB). (abs)

Meteoritics **19**, 324-325.

Treiman A.H., Jones J. H. and Drake M. J. (1984) The SNC/Mars connection: Geochemical inconsistencies. (abs) *Lunar Planet. Sci.* **XV**, 864-865.

Treiman A.H., Drake M. J., Hertogen J., Janssens M.-J., Wolf R. and Ebihara M. (1985) Siderophile and chalcophile elements in the shergottite parent body (SPB) and the Earth. (abs) *Lunar Planet. Sci*. **XVI**, 868-869.

Treiman A.H., Drake M. J., Janssens M.-J., Wolf R. and Ebihara M. (1986a) Core formation in the Earth and shergottite parent body (SPB): Chemical evidence from basalts. *Geochim. Cosmochim. Acta* **50,** 1071-1091. *(appendix has a useful compilation of old data)*
ALHA77005, Chassigny, EETA79001, Governador Valadares, Lafayette, Nakhla, Shergotty, Zagami

Treiman A.H., Jones J. H. and Drake M. J. (1986b) Core formation in the shergottite parent body (SPB). (abs) *Lunar Planet. Sci.* **XVII**, 901-902.

Treiman A.H., Jones J. H. and Drake M. J. (1987) Core formation in the shergottite parent body and comparison with the Earth. *Proc. Lunar Planet. Sci. Conf.* **17th**; *J. Geophys. Res.* **92** (suppl.), E627-E632.

Treiman A.H. and Gooding J. L. (1991) Iddingsite in the Nakhla meteorite: TEM study of mineralogy and texture of pre-terrestrial (Martian?) alterations. (abs) *Meteoritics* **26**, 402.
Nakhla

Treiman A.H. and Sutton S. R. (1991) Zagami: Trace element zoning of pyroxenes by synchrotron X-ray (SXRF) microprobe and implications for rock genesis. (abs) *Lunar Planet. Sci.* **XXII**, 1411-1412.
Zagami

Treiman A.H. and Sutton S. R. (1992) Petrogenesis of the Zagami meteorite: Inferences from synchrotron X-ray (SXRF) microprobe and electron microprobe analyses of pyroxenes. *Geochim. Cosmochim. Acta* **56,** 4059-4074.
Zagami

Treiman A.H. and Gooding J. L. (1992) Aqueous-alteration products on the S-N-C meteorites and implications for volatile/regolith interactions. In *Workshop on Martian surface and atmosphere through time. LPI Tech. Rpt*. **92-02.** Lunar Planetary Institute, Houston.

Treiman A. ., Barrett R. A. and Gooding J. L. (1992a) The Lafayette meteorite: Preterrestrial aqueous alterations. (abs) *Lunar Planet. Sci.* **XXIII**, 1451-1452.
Lafayette

Treiman A.H., Barrett R. A. and Gooding J. L. (1992b) Geochemistry and setting of Martian (?) "weathering": The Lafayette meteorite. *In Workshop on chemical weathering on Mars.* (*eds.* Burns and Banin) *LPI Tech. Rpt*. **92-04**, 37-39. Lunar Planetary Institute, Houston.
Lafayette

Treiman A.H., Barrett R. A. and Gooding J. L. (1993a) Preterrestrial aqueous alteration of the Lafayette (SNC) meteorite. *Meteoritics* **28,** 86-97.
Lafayette

Treiman A.H., McKay G. A., Bogard D. D., Wang M.-S., Lipschutz M. E., Mittlefehldt D. W., Keller L., Lindstrom M. M. and Garrison D. (1994a) Comparison of the LEW88516 and ALHA77005 Martian meteorites: Similar but distinct. *Meteoritics* **29,** 581-592.

EETA79001, LEW88516, ALHA77005

Treiman A.H., Lindstrom D. J. and Martinez R. R. (1994b) The parent magma of xenoliths in shergottite EETA79001: Bulk and trace element composition inferred from magmatic inclusions. (abs) *Lunar Planet. Sci.* **XXV**, 1417-1418.
EETA79001

Treiman A.H., Taylor G. J. and Friedman R. (1995) Nakhla and its look-alikes: Al-depleted magmas and mantle differentiation on Mars and the Earth. (abs) *Lunar Planet. Sci.* **XXVI**, 1419-1420.
Nakhla

Treiman A.H., Norman M., Mittlefehldt D. W. and Crisp J. (1996) 'Nakhlites' on Earth: Chemistry of clinopyroxenites from Theo's Flow, Ontario, Canada. (abs) *Lunar Planet. Sci.* **XXVII**, 1341-1342.

Treiman A.H. and Lindstrom D. J. (1997) Trace element geochemistry of Martian iddingsite in the Lafayette meteorite. *J. Geophys. Res.* **102**, 9153-9163.
Lafayette

Treiman A.H., Ionov D. A., Amundsen H. E. F., Bunch T. and Blake D. F. (1998) A terrestrial analog for carboantes in ALH84001: Ankerite-magnesite carbonates in mantle xenoliths and basalts from Spetzbergen. (abs) *Lunar Planet. Sci.* **XXIX** #1630, Lunar Planetary Institute, Houston (CD-ROM).

Treiman A.H. and Treado P. (1998) Martian maskelynite? Raman spectra of plagioclase-composition glasses from ALH84001, EETA79001 and ALHA77005. (abs) *Lunar Planet. Sci.* **XXIX** #1196, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001, EETA79001, ALHA77005

Treiman A.H. and Romanek C.S. (1998) Bulk and stable isotopic compositions of carbonate minerals in martian meteorite Allan Hills 84001: No proof of high formation temperature. *Meteoritics & Planet. Sci.* **33**, 737-742.
ALH84001

Treiman A.H. and Keller L.P. (2000) Magnetite-bearing layers in Allan Hills 84001 carbonate globules: Bulk and mineral compositions. (abs) *Meteoritics & Planet. Sci.* **35**, A158-159.
ALH84001

Treiman A.H., Gleason J.D. and Bogard D.D. (2000) The SNC meteorites are from Mars. *Planet. Space Sci.* **48**, 1213-1230. (a review)

Treiman A.H. and Goodrich C.A. (2001) A parant magma for the Nakhla Martian meteorite: Reconciliation of estimates from 1-bar experiments, magmatic inclusions in olivine and magmatic inclusions in augite. (abs) *Lunar Planet. Sci.* **XXXII** #1107. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Treiman A.H. and Goodrich C.A. (2002) Pre-terrestrial aqueous alteration of the Y000749 Nakhlite meteorite. (abs) *Antarctic Meteorites* **XXVII**, 166-167, NIPR, Tokyo
Y000749

Treiman A.H., Amundsen H.E.F., Blake D.F. and Bunch T. (2002) Hydrothermal origin for carbonate globules in ALH84001 by analogy with similar carbonates from Spitsbergan (Norway). (abs) *Lunar Planet. Sci.* **XXXIII** #1552. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Treiman A.H. (2002) Element-element correlations amoung Martian meteorite bulk compositions:

Peculiarities explained(?) by mixing, with implications for the composition of Mars. (abs) Un-mixing SNCs. 59-60. LPI Contribution No. 1134.

Treiman A.H., Amundsen H.E.F., Blake D.F. and Bunch T. (2003) Hydrothermal origin for carbonate globules in Martian meteorite ALH84001: a terrestrial analogue from Spitzbergen (Norway). *Earth Planet. Sci. Lett.* **204**, 323-332.

Treiman A.H. (2003) Mantle metasomatism in Mars: Evidence from bulk chemical compositions of Martian basalts. (abs #1413) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Tschermak G. (1872) Die meteoriten von Shergotty und Gopalpur. *Sitzungsber. Math.-Naturw. Classe. Akad. Wiss. Wien* **65**, 122-146.
Shergotty

Tschermak G. (1885) Die mikroskopische beschaffenheit der meteoriten. (*translated by* Wood and Wood, 1964) *Smithson. Contrib. Astrophysics* **4**, number 6. Smithson. Inst. Wash. DC
Shergotty, Chassigny

Tsuchiyama A., Hirai H., Koishikawa A., Bunno M., McKay G. A. and Lofgren G. E. (1998) An X-ray CT study of ALH84001 analog. (abs) *Sym. NIPR Antarcitc Meteorites* **XXIII**, 154-156. Nat. Inst. Polar Res. Japan.
ALH84001

Tsuchiyama A., Kawabata T., McKay G. A. and Lofgren G. E. (1999) Three-dimensional structure of Martian meteorite ALH84001 by X-ray CT method. (abs) *Lunar Planet. Sci.* **XXX** #1539. Lunar Planetary Institute, Houston (CD-ROM)
ALH84001

Turner G., Burgess R. and Chatzitheodoris E. (1989) Is there Martian water in Nakhla? (abs) *Meteoritics* **24**, 333.
Nakhla

Turner G., Whitby J. A. and Gilmour J. D. (1996) Xenon isotopes in individual minerals in Nakhla: Implications for the noble gas budget of Mars. (abs) *Meteoritics & Planet. Sci.* **31**, A143-144.
Nakhla

Turner G., Knott S. F., Ash R. D. and Gilmour J.D. (1997) Ar-Ar chronology of the Martian meteorite ALH84001: Evidence for the timing of the early bombardment of Mars. *Geochim. Cosmochim. Acta* **61**, 3835-3850.
ALH84001

U TOP

Uchida K. and Takeda H. (1991) Mineralogy of Zagami meteorite with reference to the evolution of materials of achondrite parent body. *Proc. 24th ISAS Lunar Planet. Symp*. 262-268. ISAS, Tokyo.
Zagami

Ueda Y., Mikouchi T. Miyamoto M. and Hiroi T. (2002) First analysis of the reflectance spectrum of Yamoto-000593: The spectroscopic similarity between Yamoto-000593 and Nakhla. (abs) *Antarctic Meteorites* **XXVII**, 171-173, NIPR, Tokyo
Y000593, Nakhla

Urey H. C. and Craig H. (1953) The composition of stone meteorites and the origin of meteorites. *Geochim. Cosmochim. Acta* **4**, 36-82.

Shergotty, Nakhla

V TOP

Vali H., Zhang C., Sears S. K., Lin S., Phelps T. J., Cole D., Onstott T. C., Kirschvink J. L., Williams-Jones A. E. and McKay D. S. (1997) Formation of magnetite and Fe-rich carbonates by thermophilic bacteria from deep terrestrial subsurface: A possible mechanism for biomineralization in ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 1473-1474.
ALH84001

Vali H., Sears S. K., Ciftcioglu N. and Kajander E. O. (1999) Nanofossils and the size limits of life. (abs) *Lunar Planet. Sci.* **XXX**, #1890, Lunar Planetary Institute, Houston (CD-ROM)
ALH84001

Valley J.W., Eiler J.M., Graham C.M., Gibson E.K., Romanek C.S. and Stolper E.M. (1997a) Low-temperature carbonate concretions in the Martian meteorite ALH84001: Evidence from stable isotopes and mineralogy. *Science* **275**, 1633-1637.
ALH84001

Valley J.W., Eiler J.M., Graham C.M., Gibson E.K.. and Romanek C.S. (1997b) Ion microprobe analysis of oxygen and carbon isotope ratios in the ALH84001 meteorite. (abs) *Lunar Planet. Sci.* **XXVIII**, 1475-1476.
ALH84001

van der Bogert C.H. and Schultz P. H. (1998) High strain-rate deformation and friction melting as a possible origin for "shock" features in Allan Hills 84001. (abs) Workshop on the Issue Martian Meteorites: Where - - - - #7023. Lunar Planetary Institute, Houston.

van der Borgert C.H., Schultz P.H. and Spray J.G. (1999) Experimental frictional heating of dolomitic marble: New insights for Martian meteorite Allan Hills 84001. (abs) *Lunar Planet. Sci.* **XXX**, #1970, Lunar Planetary Institute, Houston (CD-ROM)
ALH84001

Varela M.E., Clocchiatti R., Kurat G. and Massare D. (1997) Glass and multiphase inclusions in Chassigny olivines. (abs) *Meteoritics & Planet. Sci*. **32**, A130.
Chassigny

Varela M.E., Clocchiatti R., Kurat G. and Massare D. (1998a) Glass-bearing inclusions in Chassigny olivine: Heating experiments suggest non-igneous origin. (abs) *Meteoritics & Planet. Sci*. **33**, A158.
Chassigny

Varela M. E., Kurat G., Clocchiatti R. and Schiano P. (1998b) The ubiquitous presence of silica-rich glass insclusions in mafic minerals: Examples from Earth, Mars, Moon and the aubrite parent body. *Meteoritics & Planet. Sci*. **33**, 1041-1051.
Chassigny

Varela M. E., Kurat G. and Clocchiatti R. (1999) Glass-bearing inclusions in Nakhla augite: Heating experiments suggest a new parental magma composition. (abs) *Meteoritics & Planet. Sci.* **34**, A115-116.
Nakhla

Varela M. E., Kurat G., Bonnin-Mosbah M., Clocchiatti R. and Massare D. (2000) Glass-bearing inclusions in olivine of the Chassigny achondrite: Heterogeneous trapping at sub-igneous temperatures. *Meteoritics & Planet. Sci.* **35**, 39-52.
Chassigny

Vauquelin L. N. (1816) Chemical analysis of Chassigny meteorite. *Ann. Chim. Phys. (Paris)* **1**, 49-54.
Chassigny

Vecht A. and Ireland T. G. (2000) The role of vaterite and aragonite in the formation of pseudo-biogenic carbonate structures: Implications for Martian exobiology. *Geochim. et Cosmochim. Acta* **64**, 2719-2725.
ALH84001

Verish R.S. (2002) Meteorite recovery on Dry Lakes – follow the ice rafts. (abs) *Meteoritics & Planet. Sci*. **37**, A143.

Vicenzi E.P., Tobin K., Heaney P. J., Onstott T. C. and Chun J. (1997) Carbonate in Lafayette meteorite: A detailed microanalytical study. (abs) *Meteoritics & Planet. Sci*. **32**, A132-133.
Lafayette

Vicenzi E.P. and Eiler J. (1998) Oxygen isotopic composition of Martian carbonate and high-resolution secondary ion mass spectrometric imaging of the alteration assemblage in Lafayette meteorite. (abs) *Meteoritics & Planet. Sci*. **33**, A159-160.
Lafayette

Vicenzi E.P. and Heaney P. J. (1999) Examining Martian alteration products using *in situ* TEM sectioning: A novel application of the focused ion beam (FIB) for the study of extraterrestrial materials. (abs) *Lunar Planet. Sci.* **XXX**, #2005, Lunar Planetary Institute, Houston (CD-ROM)
Lafayette

Vicenzi E.P. and Heaney P. J. (2000) Multiple Martian fluids: The alteration sequence in the Lafayette SNC meteorite. (abs) *Meteoritics & Planet. Sci.* **35**, A164-165.
Lafayette

Vicenzi E.P., Ries B. L. and Chun J. (2000) A reflectance infrared microprobe study of low temperature alteration products in the Lafayette (SNC) meteorite. (abs) *Lunar Planet. Sci.* **XXXI,** #1755. Lunar Planetary Institute, Houston (CD-ROM).
Lafayette

Vicenzi E.P. and Fahey A. J. (2001) Chemical imaging of Nakhlite secondary mineralization at the sub-micrometer length scale: a TOF-SIMS study. (abs) *Lunar Planet. Sci.* **XXXII**, #2105. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla, Lafayette

Vicenzi E.P. (2001) Sulfate in the Lafayette meteorite: Evaporitic precipitation beneath Mars or terrestrial alteration. (abs) *Meteoritics & Planet. Sci.* **36**, A214.
Lafayette

Vicenzi E.P., Fisk M.R., Treiman A. and Wilson S. (2002) Comparison of clay minerals produced during low-temperature alteration of mafic rocks from Earth and Mars. (abs) *Meteoritics & Planet. Sci.* **37**, A144.

Vickery A. M. and Melosh H. J. (1987) The large crater origin for SNC meteorites. *Science* **237**, 738-743.

Vieira V.W.A., Costa T.V.V., Knudsen J.M., Jensen H.G., Kemp K. and Bastholm N.H. (1985) Rare earth oxides and the contamination problem in meteorite research. *Physica Scripta* **31**, 303-304.

Vieira V.W.A., Costa T.V.V., Jensen H.G., Knudsen J.M., Olsen M. and Vistisen L. (1986) Oxidation state of iron in SNC meteorites as studied by Mössbauer spectroscopy. *Physica Scripta* **33**, 180-186.

Vistisen L., Roy-Poulsen N.O., Jensen H.G., Knudsen J.M., Madsen M.B. and Olsen M. (1990) Mössbauer spectroscopy of pyroxenes from the SNC-Meteorite Nakhla. (abs) *Meteoritics* **25**, 417-418.
Nakhla

Vistisen L., Petersen D. and Madsen M. B. (1992) Mössbauer spectroscopy showing large scale inhomogeniety in the presumed Martian meteorite Zagami. *Physica Scripta* **46**, 94-96.
Zagami

W TOP

Wadhwa M. (1994) *Geochemical studies of two unusual groups of meteorites: Trace elements in SNC meteorites and Mn-Cr systematics in unequilibrated enstatite chondrites.* PhD dissertation, Washington Univ., St. Louis.

Wadhwa M. (2000) Quantitative constraints on the redox state of Martian magmas from Eu anomalies in pyroxenes of basaltic Shergottites. (abs) *Lunar Planet. Sci.* **XXXI,** #1966. Lunar Planetary Institute, Houston (CD-ROM).

Wadhwa M. (2001) Redox state of Mars' upper mantle and crust from Eu anomalies in shergottite pyroxenes. *Science* **291**, 1527-1530.

Wadhwa M., McSween H. Y., Jr. and Crozaz G. (1991) Trace element distributions in minerals of EETA79001: clues to the petrogensis of a unique shergottite. (abs) *Meteoritics* **26**, 404.
EETA79001

Wadhwa M. and Crozaz G. (1992a) Trace element microdistributions in the nakhlites: implications for parent melt compositions. (abs) *Meteoritics* **27**, 302.

Wadhwa M. and Crozaz G. (1992b) REE in minerals in Nakhla and Lafayette: A comparative study of trace element microdistributions. (abs) *Lunar Planet. Sci.* **XXIII**, 1483-1484.
Nakhla, Lafayette

Wadhwa M. and Crozaz G. (1992c) Trace element characteristics of the shergottite LEW88516. (abs) *Meteoritics* **27**, 302-303.
LEW88516.

Wadhwa M. and Crozaz G. (1993) Rare earth elements in individual minerals in shergottites. (abs) *Lunar Planet. Sci.* **XXIV**, 1473-1474.
Shergotty, Zagami, EETA79001, ALHA77005, LEW88516

Wadhwa M., McCoy T. J., Keil K. and Crozaz G. (1993) The chemical and physical evolution of late stage melt in Zagami. (abs) *Meteoritics* **28,** 453-454.
Zagami

Wadhwa M., McSween H. Y., Jr. and Crozaz G. (1994) Petrogenesis of shergottite meteorites inferred from minor and trace element microdistributions. *Geochim. Cosmochim. Acta* **58**, 4213-4229.
Shergotty, Zagami, EETA79001

Wadhwa M. and Crozaz G. (1994a) Rare earth element distributions in Chassigny: Clues to its petrogenesis and relation to the nakhlites. (abs) *Lunar Planet. Sci.* **XXV**, 1451-1452.
Chassigny

Wadhwa M. and Crozaz G. (1994b) First evidence for infiltration metasomatism in a Martian meteorite,

ALH84001. (abs) *Meteoritics* **29,** 545.
ALH84001

Wadhwa M. and Crozaz G. (1995a) Trace and minor elements in minerals of nakhlites and Chassigny: Clues to their petrogenesis. *Geochim. Cosmochim. Acta* **59**, 3629-3647.
Chassigny, Lafayette, Nakhla

Wadhwa M. and Crozaz G. (1995b) Constraints on the rare earth element characteristics of metasomatizing fluids in the Martian meteorite ALH84001. (abs) *Lunar Planet. Sci.* **XXVI**, 1451-1452.
ALH84001

Wadhwa M. and Crozaz G. (1996) QUE94201: A new and different shergottite. (abs) *Lunar Planet. Sci.* **XXVII**, 1365-1366.
QUE94201

Wadhwa M. and Lugmair G. W. (1996) The formation age of carbonates in ALH84001. (abs) *Meteoritics & Planet. Sci.* **31**, A145.
ALH84001

Wadhwa M. and Lugmair G. W. (1997) The controversy of young vs. old age of formation of carbonates in ALH84001. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds.* Clifford *et al.*) *LPI Contribution* **916,** 79. Lunar Planetary Institute, Houston.
ALH84001

Wadhwa M., Crozaz G., Taylor L. A., McSween H. Y., Jr. (1997a) Martian basalt (shergottite) QUE94201 and lunar basalt 15555: A tale of two pyroxenes. (abs) *Lunar Planet. Sci*. **XXVIII**, 1485-1486.
QUE94201

Wadhwa M., McKay G. A. and Crozaz G. (1997b) Trace element distributions in Yamato 793605, a chip off the "Martian lherzolite" block. (abs*) NIPR Sym. Antarctic Meteorites* **22nd**, 197-199. Nat. Inst. Polar Res., Tokyo.
Y793605

Wadhwa M., Crozaz G., Taylor L. A. and McSween H. Y., Jr. (1998a) Martian basalt (shergottite) Queen Alexandra Range 94201 and lunar basalt 15555; A tale of two pyroxenes. *Meteoritics & Planet. Sci.* **33**, 321-328.
QUE94201

Wadhwa M. and Crozaz G. (1998b) The igneous crystallization history of an ancient Martian meteorite from rare earth element microdistributions. *Meteoritics & Planet. Sci.* **33**, 685-692.
ALH84001

Wadhwa M., Crozaz G., Lentz R. and McSween H. Y., Jr. (1999a) Trace-element diustributions in the new Saharan Martian meteorite Dar al Gani 476: Another bridge between lherzolitic and basaltic shergottites. (abs) *Meteoritics & Planet. Sci.* **34**, A117-118.
DaG476

Wadhwa M., McKay G. A. and Crozaz G. (1999b) Trace element distributions in Yamato-793605, a chip off the "Martian Lherzolite" block. *Antarct. Meteorite Res.* **12**, 168-182.
Y793605

Wadhwa M., Lentz F., McSween H. Y. Jr. and Crozaz G. (2000) Dar al Gani 476 and Dar al Gani 489, twin shergotittes from Mars. (abs) *Lunar Planet. Sci.* **XXXI,** #1413. Lunar Planetary Institute,

Houston (CD-ROM).
DaG476, DaG489

Wadhwa M., Crozaz G., Lentz R. C. F. and McSween H. Y., Jr. (2001a) Trace element microdistributions in Los Angeles: a new basaltic shergottite similar to, yet distinct from the others. (abs) *Lunar Planet. Sci.* **XXXII**, #1106. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles

Wadhwa M., Barret J. A. and Crozaz G. (2001b) Petrogenesis of a new Nakhlite from rare earth and other trace element microdistributions. (abs) *Meteoritics & Planet. Sci.* **36**, A217-218.
NWA817

Wadhwa M., Lentz R. C. F., McSween H. Y., Jr. and Crozaz G. (2001c) A petrologic and trace element study of Dar al Gani 476 and Dar al Gani 489: Twin meteorites with affinities to basaltic and lherzolithic shergottites. *Meteoritics & Planet. Sci.* **36**, 195-208.
DaG476, DaG489

Wadhwa M., Sutton S.R., Flynn G.J. and Newville M. (2002) Microdistributions of Rb and Sr in ALH84001 carbonates: Chronological implications for secondary alteration on Mars. (abs) *Lunar Planet. Sci.* **XXXIII** #1362. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Wadhwa M. and Crozaz G. (2002) Trace element abundances in minerals of two new and distinct basaltic shergottites, NWA 856 and NWA 1068. (abs) *Meteoritics & Planet. Sci*. **37**, A145
NWA856, NWA1068

Wadhwa M. and Grove T.L. (2002) Archean cratorns on Mars?: Evidence from trace elements, isotopes and oxidation states of SNC magmas. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A816. Davos

Wadhwa M. and Crozaz T.L. (2003) Trace element geochemistry of new nakhlites from the Antarctic and the Sharan desert: Further constraints on Nakhlite petrogenesis on Mars. (abs) *Lunar Planet. Sci.* **XXXIV** #2075. Lunar Planetary Institute, Houston.

Wagner J. K., Cohen A. J., Hapke B. W. and Partlow W. D. (1980) Vacuum ultraviolet refectance spectra of groups L, LL, and E chondrites and of achondrites. *Proc. Lunar Planet. Sci. Conf.* **11th**, 775-797.
Nakhla, Lafayette, Shergotty, Chassigny

Walker D., Stolper E. M. and Hays J. F. (1979) Basaltic volcanism: The importance of planet size. *Proc. Lunar Planet. Sci. Conf.* **10th**, 1995-2015.

Walker R. J., Asuquo B., Prichard H. M. and Brandon A. D. (1999) Osmium-186-Osmium-187 isotopic systematics on the early evolution of the mantles of the Earth, Moon and Mars. (abs) *Ninth Annual V. M. Goldschmidt Conference* 315, Cambridge

Walker R.J., Brandon A.D., Nazarov M.A., Mittlefehldt D., Jagoutz E. and Taylor L.A. (2002) 187Re-187Os isotopic studies of SNC meteorites: An update. (abs) *Lunar Planet. Sci.* **XXXIII** #1042. Lunar Planetary Institute, Houston. (CD-ROM)
DaG, SaU, Lafayette, ALH84001, Dho019, EETA79001

Wallis M. K. (1989) C, N, O isotope fractionation on Mars: Implications for crustal H_20 and SNC meteorites. *Earth Planet. Sci. Lett.* **93**, 321-324.

Walter M. R. and DesMarais D. J. (1993) Preservation of biological information in thermal spring deposits: Developing a strategy for fossil life on Mars. *Icarus* **101**, 129-143.

Walton E.L. and Spray J.G. (2002a) Mineralogy and microtextures of melt pockets in the Los Angeles basaltic shergottite. (abs) *Meteoritics & Planet. Sci.* **37**, A146.
Los Angeles

Walton E.L. and Spray J.G. (2002b) Chemistry and microtextures of melt pockets in the Los Angeles basaltic shergottite. (abs) Un-mixing SNCs. 61. LPI Contribution No. 1134.

Wang A., Jolliff B. L. and Haskin L. A. (1998) Raman spectroscopic characterization of Martian meteorite Zagami. (abs) *Lunar Planet. Sci.* **XXIX** #1523, Lunar Planetary Institute, Houston (CD-ROM).
Zagami

Wang A., Jolliff B.L. and Haskin L.A. (1999) Raman spectroscopic characterization of a Martian SNC meteorite: Zagami. *J. Geophys. Res.* **104**, 8509-8519.
Zagami

Wang A., Kuebler K. E. and Jolliff B. L. (2000) Mineral features of EETA79001 Martian meteorite revealed by point-counting Raman measurements as anticipated for in-situ exploration of planetary surfaces. (abs) *Lunar Planet. Sci.* **XXXI,** #1887. Lunar Planetary Institute, Houston (CD-ROM).
EETA79001

Wang A., Kuebler K. E., Freeman J and Jolliff B.L. (2001a) Preliminary Raman spectroscopic survey on a Martian meteorite – Los Angeles. (abs) *Lunar Planet. Sci.* **XXXII**, #1427. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles

Wang A., Kuebler K.E. and Jolliff B.L. (2001b) Raman spectroscopy of opaque minerals and applications to EETA79001 Martian meteorite. (abs) *Lunar Planet. Sci.* **XXXII**, #1615. Lunar Planetary Institute, Houston. (CD-ROM)
EETA79001

Wang A., Kuebler K.E., Jolliff B.L. and Haskin L.A. (2003) Fe-Ti-Cr-oxides in Martian meteorite EETA79001 studied by point-counting procedure using Raman spectroscopy. (abs) *Lunar Planet. Sci.* **XXXIV**, #1742. Lunar Planetary Institute, Houston

Wang M.-S., Mokos J. and Lipschutz M. E. (1997) Volatile and other trace elements in Martian meteorites. (abs) *Lunar Planet. Sci*. **XXVIII**, 1493-1494.
ALHA77005, EETA79001, QUE94201, Shergotty, Zagami, Lafayette, Nakhla, Governador Valadares, Chassigny, ALH84001, LEW88516

Wang M-S., Mokos J. A. and Lipschutz M. E. (1999) Martian meteorites: Volatile trace elements and cluster analysis. *Meteoritics & Planet. Sci.* **33**, 671-675.
QUE94201, ALH84001, Nakhla, Lafayette, Governador Valadares, Chassigny

Wänke H. (1987) Chemistry and accretion of the Earth and Mars. *Bull. Soc. Geologique de France* **3**, 13-19.

Wänke H. (1991) Chemistry, accretion and evolution on Mars. *Space Sci. Rev.* **56**, 1-8.

Wänke H. (1988) Overview of Mars: SNC meteorite results. In *Workshop on Mars sample return science.* (*eds*. Drake *et al*.) *LPI Tech. Rpt.* **88-07**, 175-176. Lunar Planetary Institute, Houston

Wänke H. and Dreibus G. (1984) Chemistry and accretion of Earth and Mars. (abs) *Lunar Planet. Sci.* **XV**, 884-885.

Wänke H. and Dreibus G. (1985) The degree of oxidation and the abundance of volatile elements on Mars. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 28-29. Lunar Planetary Institute, Houston

Wänke H., Dreibus G., Jagoutz E., Palme H., Spettel B. and Weckwerth G. (1986) ALHA77005 and on the chemistry of the Shergotty parent body (Mars). (abs) *Lunar Planet. Sci.* **XVII**, 919-920.
ALHA77005

Wänke H. and Dreibus G. (1988) Chemical composition and accretion history of terrestrial planets. *Phil. Trans. Roy. Soc. London* **A325,** 545-557.

Wänke H., Dreibus G., Jagoutz E. and Mukhin L. M. (1992) Volatiles on Mars: The role of SO_2. (abs) *Lunar Planet. Sci.* **XXIII**, 1489-1490.

Wänke H. and Dreibus G. (1992) On the Martian volatiles as inferred from SNC-meteorites. (abs) *NIPR Sym. Antarctic Meteorites* **17th***,* 143-144. Nat. Inst. Polar Res., Tokyo.

Wänke H. and Dreibus G. (1996) The chemical composition of the Martian interior. (abs) *Lunar Planet. Sci.* **XXVII**, 1375-1376.

Wänke H. and Dreibus G. (1997a) New evidence for silicon as the major light element in the Earth's core. (abs) *Lunar Planet. Sci.* **XXVIII**, 1495-1496.

Wänke H. and Dreibus G. (1997b) Silicon in the Earth core, sulfur in the core of Mars. (abs) *7th Goldschmidt Conf.*, *LPI Contribution* **921**, 213. Tucson.

Warmflash D.M., Clemett S. J. and McKay D. S. (2001) Organic matter in SNC meteorites: Is it time to re-evaluate the Viking biology experimental data? (abs) *Lunar Planet. Sci.* **XXXII**, #2169. Lunar Planetary Institute, Houston. (CD-ROM)

Warmflash D.M., Clemett S.J., Gibson E.K., Fox G.F., Longazo T. and McKay D.S. (2002) Organic matter in the Nakhla meteorite: Implications for the Viking experiments and near-future missions to Mars. (abs) Meteoritcs 65th meeting at UCLA
Nakhla

Warren P. H. (1986) Compositional contrast between Martian regolith and SNC meteorites: Evidence for burried massive carbonates? (abs) *Lunar Planet. Sci.* **XVII**, 923-924.

Warren P. H. (1987) Mars regolith versus SNC meteorites: Possible evidence for abundant crustal carbonates. *Icarus* **70,** 153-161.

Warren P. H. (1994a) A carbonate-rich piece of Mars, disguised as a diogenite. *Meteoritics* **29**, 152-153. *(editorial)*
ALH84001

Warren P. H. (1994b) Lunar and Martian meteorite delivery services. *Icarus* **111**, 338-363.

Warren P. H. (1998a) Petrologic evidence for low-temperature, possible flood-evaporitic origin of carbonates in the ALH84001 meteorite. (abs) *Meteoritics & Planet. Sci.* **33**, A162-163.
ALH84001

Warren P. H. (1998b) Petrologic evidence for low-temperature, possibly flood-evaporitic origin of carbonates in the ALH84001 meteorite*. J. Geophys. Res.* **103**, 16,759-16,773.

Warren P. H. (1998c) The common ion effect in deposition of Martian (eg ALH84001) carbonates. (abs) *Workshop on the Issue Martian Meteorites: Where* - - - - #7040. Lunar Planetary Institute, Houston.

Warren P. H. (1999) Reply to dubious arguments put forward by Scott *et al.* *J. Geophys. Res.* **104**, 24,217-24,221.

Warren P. H. (2001) Martian meteorite mixology. *Meteoritics & Planet. Sci.* **36**, 191. (*an editorial*)

Warren P. H. and Kallemeyn G. W. (1987) A trio of meteoritic dunites, and new data for Shergotty. (abs) *Lunar Planet. Sci.* **XVIII,** 1056-1057.
Shergotty

Warren P. H. and Kallemeyn G. W. (1995) Siderophile trace elements in Allan Hills 84001 and other achondrites: A temporal increase of oxygen fugacity in the Martian mantle? (abs) *Meteoritics* **30**, 593-594.
ALH84001

Warren P. H. and Kallemeyn G. W. (1996) Siderophile trace elements in ALH84001, other SNC meteorites and eucrites: Evidence of heterogeneity, possibly, time-linked, in the mantle of Mars. *Meteoritics & Planet. Sci.* **31**, 97-105.
ALH84001

Warren P. H., Kallemeyn G. W., Arai T. and Kaneda K. (1996) Compositional-petrologic investigations of eucrites and the QUE94201 shergottite. (abs) *Proc. NIPR Sym. Antarctic Meteorites* **21st,** 195-197. Nat. Inst. Polar Res., Tokyo.
QUE94201

Warren P. H. and Kallemeyn G. W. (1997a) Yamato-793605 and other presumed Martian meteorites: Composition and petrogenesis. (abs) *NIPR Sym. Antarctic Meteorites* **22nd**, 197-199. Nat. Inst. Polar Res., Tokyo.
Y793605, ALH77005, EETA79001, QUE94201

Warren P. H. and Kallemeyn G. W. (1997b) Yamato-793605, EET79001 and other presumed Martian meteorites: Compositional clues to their origins. *Antarctic Meteorite Research* **10**, 61-81. Nat. Inst. Polar Res., Tokyo.
Y793605, ALH77005, EETA79001, QUE94201

Warren P. H. and Kallemeyn G. W. (1997c) Origin of the "A" lithology in presumed Martian meteorite Elephant Moraine 79001: Assimilation-mixing more likely than impact melting. (abs) *Meteoritics & Planet. Sci*. **32**, A135-136.
EETA79001

Warren P. H., Kallemeyn G. H. and Kyte F. T. (1998) Planetary core foramtion: Evidence from highly siderophile elements in Martian meteorites. (abs) *Workshop on the Issue Martian Meteorites: Where* - - #7037. Lunar Planetary Institute, Houston.

Warren P. H., Kallemeyn G. W. and Kyte F. T. (1999) Origin of planetary cores: Evidence from highly siderophile elements in martian meteorites. *Geochim. Cosmochim. Acta* **63**, 2105-2122.

Warren P. H., Greenwood J. P., Richardson J. W., Rubin A. E. and Verish R. S. (2000a) Geochemistry of Mars, a ferroan, La- and Th-rich basalt from Los Angeles. (abs) *Lunar Planet. Sci.* **XXXI,** #2001. Lunar Planetary Institute, Houston (CD-ROM).
Los Angeles

Warren P. H., Greenwood J. P. and Rubin A. E. (2000b) Los Angeles at Chicago. (abs) *Meteoritics & Planet. Sci.* **35**, A166.
Los Angeles

Wasch R. and Schade U. (1996) Infrared spectroscopy of lithologically different areas of a piece of the Zagami meteorite. (abs) *Meteoritics & Planet. Sci.* **31**, A146-A147.
Zagami

Wasserman A. A. and Berthka C. M. (2000) An experimental study of the formation of symplectite lamallae in the Nakhla Martian meteorites. (abs) *Lunar Planet. Sci.* **XXXI,** #1516. Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Wasson J. T. and Wetherill G. W. (1979) Dynamical, chemical and isotopic evidence regarding the formation locations of asteroids and meteorites. In *Asteroids* (*ed.* Gehrels), 926-974. Univ. Ariz. Press, Tucson.

Wasylenki L. E., Jones J. H., Le L. and Jurewicz A. J. G. (1993) Equilibrium and fractional crystallization of a primitive shergottite composition. (abs) *Lunar Planet. Sci.* **XXIV**, 1491-1492.

Watson L. L., Ihinger P. D., Epstein S. and Stolper E. M. (1991) Hydrogen, carbon and oxygen isotopic of volatiles in Nakhla. (abs) *Lunar Planet. Sci.* **XXII**, 1473-1474.
Nakhla

Watson L. L., Epstein S. and Stolper E. M. (1992) Hydrogen and carbon isotopic composition of volatiles in Nakhla: Implications for weathering on Mars. In *Workshop on the Martian surface through time* (*ed.* Haberle *et al.). LPI Tech. Rpt.* **92-02**, 165-166. Lunar Planetary Institute, Houston.
Nakhla

Watson L. L., Hutcheon I. D., Epstein S. and Stolper E. M. (1993a) High D/H ratios of water in magmatic amphiboles in Chassigny: Possible constraints on the isotopic composition of magmatic water on Mars. (abs) *Lunar Planet. Sci.* **XXIV**, 1493-1494.
Chassigny

Watson L. L., Hutcheon I. D., Epstein S. and Stolper E. M. (1993b) D/H ratios and water contents of amphiboles in magmatic inclusion in Chassigny and Shergotty. (abs) *Meteoritics* **28**, 456-457.
Chassigny, Shergotty

Watson L. L., Hutcheon I. D., Epstein S. and Stolper E. M. (1994a) Water on Mars: Clues from deuterium/hydrogen and water contents of hydrous phases in SNC meteorites. *Science* **265**, 86-90.
Chassigny, Shergotty, Zagami

Watson L. L., Epstein S. and Stolper E. M. (1994b) The abundance and stable isotopic composition of volatiles released from weathering products during stepped heating of Nakhla and Lafayette. (abs) *Lunar Planet. Sci.* **XXV**, 1471-1472.
Nakhla, Lafayette

Watson L. L., Epstein S. and Stolper E. M. (1994c) D/H of water released by stepped heating of Shergotty, Zagami, Chassigny, ALH84001 and Nakhla. (abs) *Meteoritics* **29**, 547.
Shergotty, **Zagami**, **Chassigny**, **ALH84001, Nakhla**

Weber I. and Bishoff A. (1999) Microstructures in pyroxenes from the Martian meteorite Zagami and the achondrites Bishopville (aubrite), Hammadah al Hamra 064, and Jalanash (urelites). (abs) *Meteoritics Planet. Sci.* **34**, A120-121.
Zagami

Weber I., Greshake A. and Bischoff A. (2000) Low-cristobalite in the Martian meteorite Zagami. (abs) *Lunar Planet. Sci.* **XXXI,** #1342. Lunar Planetary Institute, Houston (CD-ROM).

Zagami

Weckwerth G. (1983) Dipl. Thesis, Univ. Mainz, Mainz.

Weckwerth G. and Wänke H. (1984) Chemical relationships among shergottites, nakhlites, and Chassigny. (abs) *Meteoritics* **19**, 331-332.
Chassigny

Weinke H. H. (1978) Chemical and mineralogical examination of the Nakhla achondrite. *Meteoritics* **13**, 660-664.
Nakhla

Weiss B. P., Kirschvink J. L., Baudenbacher F. J., Vali H., Peters N. T., Macdonald F. A. and Wikswo J. P. (2000a) Reconciliation of magnetic and petrographic constraints on ALH84001? Panspermia lives on! (abs) *Lunar Planet. Sci.* **XXXI,** #2078. Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Weiss B. P., Kirschvink J. L., Baudenbacher F. J., Vali H., Peters N. T., Macdonald F. A. and Wikswo J. P. (2000b) A low temperature transfer of ALH84001 from Mars to Earth. *Science* **290**, 791-795.
ALH84001

Weiss B. P, Vali H., Baudenbacher F. J., Stewart S. T. and Kirschvink J. L. (2001) Records of an ancient Martian magnetic field in ALH84001. (abs) *Lunar Planet. Sci.* **XXXII**, #1244. Lunar Planetary Institute, Houston. (CD-ROM)
ALH84001

Weiss B.P, Vali H., Baudenbacher F.J., Kirschvink J.L., Stewart S.T. and Shuster D.L. (2002a) Records of an ancient Martian magnetic field in ALH84001. *Earth Planet. Sci. Lett.* **201**, 449-463.
ALH84001

Weiss B.P., Shuster D.L. and Stewart S.T. (2002b) Temperatures on Mars from 40Ar/39Ar thermochronology of ALH84001. *Earth Planet. Sci. Lett*. **201**, 465-472.
ALH84001

Weiss B.P, Vali H., Baudenbacher F.J., Shuster D.L., Stewart S.T. and Kirschvink J.L. (2002c) Records of an ancient Martian magnetic field and climate in ALH84001. (abs) 12th Goldschmidt Conf. *Geochim. Cosmochim. Acta* **66**, A827. Davos
ALH84001

Wentworth S. J. and Gooding J. L. (1986) Shergottite EETA79001: Petrologic heterogeneity and secondary alteration in Lithology C. (abs) *Meteoritics* **21**, 536-537.
EETA79001

Wentworth S. J. and Gooding J. L. (1988a) Calcium carbonate in Nakhla: Further evidence for pre-terrestrial secondary minerals in SNC meteorites. (abs) *Meteoritics* **23**, 310.
Nakhla

Wentworth S. J. and Gooding J. L. (1988b) Chloride and sulfate minerals in the Nakhla meteorite. (abs) *Lunar Planet. Sci.* **XIX**, 1261-1262.
Nakhla

Wentworth S. J. and Gooding J. L. (1989) Calcium carbonate and silicate "rust" in the Nakhla meteorite. (abs) *Lunar Planet. Sci.* **XX**, 1193-1194.
Nakhla

Wentworth S. J. and Gooding J. L. (1990) Pre-terrestrial origin of "rust" in the Nakhla meteorite. (abs) *Lunar Planet. Sci.* **XXI**, 1321-1322.
Nakhla

Wentworth S. J. and Gooding J. L. (1991a) Carbonate and sulfate minerals in the Chassigny meteorite. (abs) *Lunar Planet. Sci.* **XXII**, 1489-1490.
Chassigny

Wentworth S. J. and Gooding J. L. (1991b) Carbonate and sulfate minerals in the Chassigny meteorite. (abs) *Meteoritics* **26**, 408.
Chassigny

Wentworth S. J. and Gooding J. L. (1993) Weathering features and secondary minerals in Antarctic shergottites ALHA77005 and LEW88516**.** (abs) *Lunar Planet. Sci.* **XXIV**, 1507-1508.
ALHA77005, LEW88516

Wentworth S. J. and Gooding J. L. (1994) Carbonates and sulfates in the Chassigny meteorite: Further evidence for aqueous chemistry on the SNC parent planet. *Meteoritics* **29**, 860-863.
Chassigny

Wentworth S. J. and Gooding J. L. (1995) Carbonates in the Martian meteorite, ALH84001: Water-borne but not like the SNCs. (abs) *Lunar Planet. Sci.* **XXVI**, 1489-1490.
ALH84001

Wentworth S. J. and Gooding J. L. (1996) Water-based alteration of the Martian meteorite, QUE94201, by sulfate-dominated solutions. (abs) *Lunar Planet. Sci.* **XXVII**, 1421-1422.
QUE94201

Wentworth S. J., Thomas-Keprta K. L, Taunton A. E., Vebel M. A. and McKay D. S. (1998a) Possible weathering features in ALH84001. (abs) *Lunar Planet. Sci.* **XXIX** #1793, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Wentworth S. J., Thomas-Keprta K. L. and McKay D. S. (1998b) Alteration products and secondary minerals in Martian meteorite ALH84001. (abs) *Workshop on the Issue Martian Meteorites: Where - - - -* #7034. Lunar Planetary Institute, Houston.

Wentworth S. J. and McKay D. S. (1999) Weathering and secondary minerals in the Nakhla meteorite. (abs) *Lunar Planet. Sci.* **XXX**, #1946, Lunar Planetary Institute, Houston (CD-ROM)
Nakhla

Wentworth S. J., Thomas-Kerpta K. L. and McKay D. S. (2000) Weathering and secondary minerals in the Martian meteorite Shergotty. (abs) *Lunar Planet. Sci.* **XXXI** #1888. Lunar Planetary Institute, Houston (CD-ROM).
Shergotty

Wentworth S. J., Velbel M. A., Thomas-Keprta K. L., Longazo G. and McKay D. S. (2001) Weathering of Martian evaporites. (abs) *Lunar Planet. Sci.* **XXXII** #2108. Lunar Planetary Institute, Houston. (CD-ROM)

Wentworth S.J., Thomas-Keprta K.L. and McKay D.S. (2002) Water on Mars: Petrographic evidence. (abs) *Lunar Planet. Sci.* **XXXIII** #1932. Lunar Planetary Institute, Houston. (CD-ROM)
Nakhla

Westfall F. (1999) The nature of fossil bacteria: A guide to the search for extraterrestrial life. *J. Geophys.*

Res. **104**, 16437-16451.

Westall F., deWit M. J. and Dann J. (1997) What do fossil bacteria look like? Examples of 3.5 billion-year old mineral bacteria and the search for the evidence of life in extraterrestrial rocks. (abs) *Lunar Planet. Sci.* **XXVIII** 1543-1544.
ALH84001

Westall F., Gobbi P., Gerneke D. and Mazzotti G. (1998a) Microstructures in the carboante globules of Martian meteorite ALH84001: Preliminary results of a high resolution SEM study. (abs) *Lunar Planet. Sci.* **XXIX** #1362, Lunar Planetary Institute, Houston (CD-ROM).
ALH84001

Westall F., Gobbi P., Gerneke D. and Mazzotti G. (1998b) Ultrastructure in the carbonate globules of Martian meteorite ALH84001. *In* Exobiology: Matter, energy, and information in the origin and evolution of life in the Universe 245-250. (*eds*. Chela-Flores and Raulin) Kluwer Academic Pub. Dordrecht.

Westall F., Gobbi P., Mazzotti G., Gerneke D. Stark R. W., Drobek T., Heckl W. M., Gibson E., McKay D., Allen C., Steele A., and Thomas-Keprta K. (1998c) Combined SEM (secondary electrons, backscatter, cathodoluminescence) and atomic force microscope investigation of fracture surfaces in Martian meteorite ALH84001: Preliminary results. *Proc. SPIE Conf. On Inst. Methods and Missions in Astrobiology,* **3441**, 225-233. San Diego.

Wetherill G. W. *and many authors* (1981) Radiogenic and stable isotopes, radiometric chronology, and basaltic volcanism. In *Basaltic Volcanism on the Terrestrial Planets* 901-1047. Pergamon Press. *(review paper)*
Nakhla, Lafayette, Governador Valadares, Shergotty, Chassigny

Wetherill G. W. (1984) Orbital evolution of impact ejecta from Mars. *Meteoritics* **19**, 1-13.

Weyland M., Midgley P.A., Dunin-Borkowski R.E., Frankel R.B. and Buseck P.R. (2002) Advanced TEM techniques for assessing the possible biogenic origin of meteoritic magnetite crystals. (abs) *Lunar Planet. Sci.* **XXXIII** #1592. Lunar Planetary Institute, Houston. (CD-ROM)

Wiechert U., Halliday A. N., Lee D-C. and Rumble D. (2001) Oxygen isotopes and the origin of tungsten isotope variations in Martian meteorites. (abs) *Meteoritics & Planet. Sci.* **36**, A224-225.
ALH84001, Lafayette, Zagami, Shergotty, Chassigny, Nakhla, ALH77005

Wiens R. C. (1987) $C0_2$ and noble gas emplacement into basalt by artificial shock; Relevance to EETA79001 trapped gas. (abs) *Lunar Planet. Sci.* **XVIII,** 1082-1083.
EETA79001

Wiens R. C. (1988a) What we think we know from noble gases in shergottite EETA79001. (abs) *Meteoritics* **23**, 311.
EETA79001

Wiens R. C. (1988b) Noble gases released by vacuum crushing of EETA79001 glass. *Earth Planet. Sci. Lett.* **91**, 55-65.
EETA79001

Wiens R. C. (1988c) *Laboratory shock emplacement of gases into basalt, and comparison with trapped gases in shergottite EETA79001*. PhD Dissertation, University of Minnesota 175 pp.
EETA79001

Wiens R. C., Becker R. H. and Pepin R. O. (1984) Remeasurement of nitrogen in EETA79001 glass. (abs)

Meteoritics **19**, 336-337.
EETA79001

Wiens R. C. and Pepin R. O. (1986) Laboratory shock emplacement of low ambient pressure gases into basalt: Relation to EETA79001 trapped gas. (abs) *Meteoritics* **21**, 540.
EETA79001

Wiens R. C., Becker R. H. and Pepin R. O. (1986) The case for a Martian origin of the shergottites. II. Trapped and indigenous gas components in EETA79001 glass. *Earth Planet. Sci. Lett.* **77**, 149-158.
EETA79001

Wiens R. C. and Pepin R. O. (1987) Where in the glass is the gas? Siting studies on shergottite EETA79001 and laboratory shocked analogues. (abs) *Meteoritics* **22**, 527-528.
EETA79001

Wiens R. C. and Pepin R. O. (1988) Laboratory shock emplacement of noble gases, nitrogen, and carbon dioxide into basalt, and implications for trapped gases in shergottite EETA79001**.** *Geochim. Cosmochim. Acta* **52,** 295-307.
EETA79001

Wood C. A. and Ashwal L. D. (1981a) Meteorites from Mars: Prospects, problems and implications. (abs) *Lunar Planet. Sci.* **XII**, 1197-1199.

Wood C. A. and Ashwal L. D. (1981b) SNC meteorites: Igneous rocks from Mars? *Proc. Lunar Planet. Sci. Conf.* **12th**, 1359-1375. *(review paper)*

Wooden J. L., Nyquist L. E., Bogard D. D., Bansal B. M., Wiesmann H., Shih C.-Y. and McKay G. A. (1979) Radiometric ages for the achondrites Chervony Kut, Governador Valadares, and Allan Hills 77005. (abs) *Lunar Planet. Sci.* **X,** 1379-1381.
ALHA77005, Governador Valadares

Wooden J. L., Shih C.-Y., Nyquist L. E., Bansal B. M., Wiesmann H. and McKay G. A. (1982) Rb-Sr and Sm-Nd isotopic constraints on the origin of EETA79001: A second Antarctic shergottite. (abs) *Lunar Planet. Sci.* **XIII**, 879-880.
EETA79001

Wright I. P., Carr R. H. and Pillinger C. T. (1986) Carbon abundance and isotopic studies of Shergotty and other shergottite meteorites. *Geochim. Cosmochim. Acta* **50,** 983-991.
Shergotty, Zagami, ALHA77005, EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1987a) Carbon and nitrogen in Nakhla and EETA79001**.** (abs) *Meteoritics* **22**, 535-536.
EETA79001, Nakhla

Wright I. P., Grady M. M. and Pillinger C. T. (1987b) Carbonates in EETA79001: Terrestrial or Martian? (abs) *Lunar Planet. Sci.* **XVIII**, 1106-1107.
EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1988a) Carbon, oxygen and nitrogen isotopic compositions of possible Martian weathering products in EETA79001. *Geochim. Cosmochim. Acta* **52**, 917-924.
EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1988b) Stable isotopic studies of H, C, N, O and S in samples of Martian origin. In *Workshop on Mars sample return science.* (*ed*. Drake *et al.*) *LPI Tech. Rpt*. **88-07**, 179-180. Lunar Planetary Institute, Houston.

Wright I. P., Grady M. M. and Pillinger C. T. (1989) Organic materials in a Martian meteorite. *Nature* **340**, 220-222.
EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1990a) The evolution of atmospheric CO_2 on Mars: The perspective from carbon isotope measurements. *J. Geophys. Res.* **95**, 14,789-14,794.

Wright I. P., Grady M. M. and Pillinger C. T. (1990b) A search for carbonate minerals in Chassigny. (abs) *Lunar Planet. Sci.* **XXI**, 1353-1354.
Chassigny

Wright I. P., Grady M. M. and Pillinger C. T. (1992a) Chassigny and the nakhlites: Carbon-bearing components and their relationship to Martian environmental conditions. *Geochim. Cosmochim. Acta* **56**, 817-826.
Chassigny, Nakhla, Lafayette, Governador Valadares

Wright I. P., Pillinger C. T. and Grady M. M. (1992b) Nitrogen in Zagami. (abs) *Meteoritics* **27**, 309.
Zagami

Wright I. P., Pillinger C. T. and Grady M. M. (1992c) An investigation of the carbon in different lithologies of Zagami. (abs) *Lunar Planet. Sci.* **XXIII**, 1553-1554.
Zagami

Wright I. P., Grady M. M. and Pillinger C. T. (1992d) Determinations of stable isotopic compositions of H, C, N, O and S at the Martian surface using mass spectrometry and stepped combustion/pyrolysis. In *Workshop on innovative instrumentation for the in situ study of atmosphere-surface interactions on Mars*. (*eds.* Fegley and Wänke). *LPI Tech. Rpt.* **92-07,** 19. Lunar Planetary Institute, Houston.

Wright I. P., Hartmetz C. P. and Pillinger C. T. (1992e) Martian surficial carbon - constraints from isotopic measurements of shock-produced glass in EETA79001. In *Workshop on the evolution of the Martian atmosphere. LPI Contribution* **787**, 28-29. Lunar Planetary Institute, Houston.
EETA79001

Wright I. P., Pillinger C. T. and Grady M. M. (1992f) Attempts to comprehend Martian surface processes in SNC meteorites through interpretation of isotopic compositions of carbonates in SNC meteorites. In *Workshop on chemical weathering on Mars*. (*eds.* Burns and Banin) *LPI Tech. Rpt*. **92-04**. 39-41. Lunar Planetary Institute, Houston.

Wright I. P., Russell S. S., Boyd S. R., Meyer C. and Pillinger C. T. (1992g) Xylan, a potential contaminant for lunar samples and Antarctic meteorites. *Proc. Lunar Planet. Sci. Conf.* **22**, 449-458. Lunar Planetary Institute, Houston.
EETA79001

Wright I. P., Douglas C. and Pillinger C. T. (1993a) The carbon components in SNC meteorites of feldspathic harzburgite composition. (abs) *Lunar Planet. Sci.* **XXIV**, 1539-1540.
ALHA77005, LEW88516

Wright I. P., Douglas C. and Pillinger C. T. (1993b) Further carbon isotope measurements of LEW88516. (abs) *Lunar Planet. Sci.* **XXIV**, 1541-1542.
LEW88516

Wright I. P., Hartmetz C. P. and Pillinger C. T. (1993c) An assessment of the nature and origins of the carbon-bearing components in the fines collected during the sawing of EETA79001. *J. Geophys. Res.* **98**, 3477-3482.

EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1993d) Carbonates, sulfates, phosphates, nitrates and organic materials: their association in a Martian meteorite. In *Mars: past and future - results from the MSATT program* (*ed.* Haberle) *LPI Tech. Rpt*. **93-06**, 56-57. Lunar Planetary Institute, Houston.

Wright I. P. and Pillinger C. T. (1994) On the isotopic chemistry of carbon at the Martian surface. *Phil. Trans. Roy. Soc. London* A **349**, 309-321.

Wright I. P., Grady M. M. and Pillinger C. T. (1994) The acquisition of Martian sedimentary rocks: For the time being, collection of meteorites from terrestrial desert areas represents the best hope. In *Workshop on meteorites from cold and hot deserts*. (*eds*. Schultz *et al*.) *LPI Tech Rpt*. **95-02**, 77-78. Lunar Planetary Institute, Houston.

Wright I. P., Grady M. M. and Pillinger C. T. (1995) An interpretation of ^{14}C measurements of weathering products in SNC meteorites. (abs) *Lunar Planet. Sci.* **XXVI**, 1523-1524.
EETA79001, ALH84001

Wright I. P., Grady M. M. and Pillinger C. T. (1996a) Has Martian atmosphere CO_2 become depleted in ^{13}C with time? (abs) *Workshop on evolution of Martian volatiles.* (*eds*. Jakosky and Treiman) *LPI Tech. Rpt.* **96-01**, 47. Lunar Planetary Institute, Houston.

Wright I. P. *et al.* (1996b) *In Searching for life in the Solar System and beyond*. (*eds.* Pillinger and Penny) The Royal Society, London.

Wright I. P., Grady M. M. and Pillinger C. T. (1997a) Evidence relevant to the life on Mars debate. (I) ^{14}C results. (abs) *Lunar Planet. Sci.* **XXVIII**, 1585-1586.
EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1997b) Evidence relevant to the life on Mars debate. (II) Amino acids results. (abs) *Lunar Planet. Sci.* **XXVIII**, 1587-1588.
EETA79001

Wright I. P., Grady M. M. and Pillinger C. T. (1997c) An investigation into the association of organic compounds with carbonates in ALH84001. (abs) *Lunar Planet. Sci.* **XXVIII**, 1589-1590.
ALH84001

Wright I. P., Grady M. M. and Pillinger C. T. (1997d) Isotopically light carbon in ALH84001: Martian metabolism or Teflon contamination? (abs*) Lunar Planet. Sci*. **XXVIII**, 1591-1592.
ALH84001

Wright I. P., Assanov S., Verchovsky A. B., Franchi I. A., Grady M. M. and Pillinger C. T. (1997e) Further investigations of isotopically light carbon in ALH84001. (abs) In *Conference on Early Mars: Geologic and hydrologic evolution, physical and chemical environments, and the implications for life.* (*eds.* Clifford *et al.) LPI Contribution* **916,** 86. Lunar Planetary Institute, Houston.
ALH84001

Wright I. P., Grady M. M. and Pillinger C. T. (1998a) On the ^{14}C and amino acids in Martian meteorites. (abs) *Lunar Planet. Sci.* **XXIX** #1594, Lunar Planetary Institute, Houston (CD-ROM).

Wright I. P., Grady M. M., Gardner A. F. and Pillinger C. T. (1998b) The carbon isotopic composition of PAHs, hydrocarbons and other organic compounds in Nakhla. (abs) *Lunar Planet. Sci.* **XXIX** #1583, Lunar Planetary Institute, Houston (CD-ROM).
Nakhla

Wright I. P., Grady M. M. and Pillinger C. T. (1998c) Further carbon isotopic measurements of carbonates in ALH84001. (abs) *Meteoritics & Planet. Sci.* **33**, A169.
ALH84001

Wright I. P., Grady M. M. and Pillinger C. T. (1999) Dar al Gani - Lucky for some, unlucky for others. (abs) *Lunar Planet. Sci.* **XXX** #1594, Lunar Planetary Institute, Houston (CD-ROM).
DaG476

X TOP

Xirouchakis D. M. *et al*. (2000) EOS 81, 48, F782

Xirouchakis D. M., Draper D. S. and Schwandt C. S. (2001) A reappraisal of the mineralogy and crystallization features of Los Angeles, a basaltic Martian meteorite. (abs) *Lunar Planet. Sci.* **XXXII**, #1589. Lunar Planetary Institute, Houston. (CD-ROM)
Los Angeles

Xirouchakis D. M., Draper D. S., Schwandt C. S. and Lanzirotti A. (2002) Crystallization conditions of Los Angeles, a basaltic Martian meteorite. *Geochim. Cosmochim. Acta* **66**, 1867-1880.
Los Angeles

Y TOP

Yamada I., Mikouchi T. and Miyamoto M. (1997b) Symplectic exsolution in olivine from the Nakhla Martian meteorite. (abs) *Meteoritics & Planet. Sci*. **32**, A144.
Nakhla

Yamada I., Mikouchi T., Miyamoto M. and Murakami T. (1997a) Lamella inclusion in olivine from Nakhla (SNC) meteorite. (abs) *Lunar Planet. Sci*. **XXVIII**, 1597-1598.
Nakhla

Yamaguchi A. and Sekine T. (2000) Monomineralic mobilization of plagioclase by shock: an experimental study. *Earth Planet. Sci. Lett.* **175**, 289-296.

Yamashita K, Nakamura N., Imae N., Misawa K. and Kojima H. (2002) Pb isotopic signature of Martian meteorite Yamato 000593 (a preliminary report). (abs) *Antarctic Meteorites* **XXVII**, 180-182, NIPR, Tokyo
Y000593

Yanai K. (1984) Locality map series of Antarctic meteorites. Sheet 1 Allan Hills. Nat. Inst. Polar Res., Tokyo.

Yanai K. (1995) Re-searching for Martian rocks from diogenite-diogenitic achondrites. (abs) *Lunar Planet. Sci.* **XXVI**, 1533-1534.
Y793605

Yanai K. (1996) Martian meteorites: An attempt reclassification based on their compositions, lithologies and ages. (abs) *Meteoritics & Planet. Sci.* **31**, A157.
Y793605

Yanai K. (1977) First meteorites found in Victoria Land, Antarctica, December 1976 and January 1977. *Proceedings of the second symposium on Yamoto meteorties.* 51-69. Nat. Inst. Polar Res., Tokyo.

Yanai K. (1997a) General view of the Martian meteorites. (abs) *Lunar Planet. Sci*. **XXVIII**, 1603-1604.

Yanai K. (1997b) General view of twelve Martian meteorites. *Mineral. J.* **19**, 65-74

Yanai K. (2002) New Martian meteorite identified as a lherzolitic shergottite similar to ALH77005 meteorite. (abs) *Lunar Planet. Sci.* **XXXIII** #1248. Lunar Planetary Institute, Houston. (CD-ROM)
YA1075

Yanai K., Cassidy W. A., Funaki M. and Glass B. P. (1978) Meteorite recoveries in Antarctica during field season 1977-78. *Proc. Lunar Planet. Sci. Conf.* **9th**, 977-987.

Yanai K. and Iguchi M. (1981) *Photographic catalog of the selected Antarctic meteorites*. page 60 Nat. Inst. Polar Res., Tokyo.
ALHA77005

Yanai K. and Kojima H. (1987) *Photographic catalog of the Antarctic meteorites*. page 52 Nat. Inst. Polar Res., Tokyo.
ALHA77005

Yang J. and Epstein S. (1985) A study of stable isotopes in Shergotty meteorite. (abs) *Lunar Planet. Sci.* **XVI**, Suppl. A, 25-26. Lunar Planetary Institute, Houston.
Shergotty

Yarus M. (1997) A skeptical view. *The Planetary Report* **XVII**, 18-19.
ALH84001

Yoshida M., Ando H., Ohmoto K., Naruse R. and Ageta Y. (1971) Discovery of meteorites near Yamoto Mountains, East Antarctica. *Antarctic Record*, **39**, 62-65. Nat. Inst. Polar Res., Tokyo

Z TOP

Zahnle K.J. (1993) Xenological constraints on the impact erosion of the early Martain atmosphere. *J. Geophys. Res.,* **98**, 10899-10913.

Zbik M. and Gostin V.A. (1996a) Comparison between elemental ratios in fusion crusts of Stannern eucrite, lunar meteorite MAC 88105 and Martian meteorite Nakhla. (abs) *Lunar Planet. Sci.* **XXVII**, 1487-1488.
Nakhla

Zbik M. and Gostin V.A. (1996b) Comparison between elemental ratios in fusion crusts and minerals of lunar and Martain meteorites. (abs) *Meteoritics & Planet. Sci.* **31**, A158-A159.
Nakhla

Zent A.P. (2001) Use of SNC meteorites to constrain the role of oxidants in the Martian regolith. (abs) *Lunar Planet. Sci.* **XXXII**, #1770. Lunar Planetary Institute, Houston. (CD-ROM)

Zhang Y. (2003) Volatiles on Mars. (abs #1336) *Lunar Planet. Sci. Conf.* **34th**, Lunar Planetary Institute, Houston (CD-ROM).

Zipfel J. (1999) Pyroxene and olivine in basaltic shergottite Dar al Gani 476. (abs) *Meteoritics & Planet. Sci.* **34**, A123.
DaG476

Zipfel J. (2000) Sayh al Uhaymir 005/008 and its relationship to Dar al Gani 476/489. (abs) *Meteoritics & Planet. Sci.* **35**, A178.
SaU005, SaU008

Zipfel J. (2001) Lucky 13 and Martian meteorites. *Meteoritics & Planet. Sci.* **35**, 470. (editorial)

Zipfel J., Spettel B., Palme H. and Dreibus G. (1999) Petrology and chemistry of Dar al Gani 476, a new basaltic shergottite. (abs) *Lunar Planet. Sci.* **XXX** #1206, Lunar Planetary Institute, Houston (CD-ROM).
DaG476

Zipfel J., Scherer P., Spettel B., Dreibus G. and Schultz L. (2000) Petrology and chemistry of the new shergottite Dar al Gani 476. *Meteoritics & Planet. Sci.* **35**, 95-106.
DaG476

Zipfel J. and Goodrich C. A. (2001a) Rare earth element systematics of trapped melt inclusions and groundmass phases in Sayh al Uhaymir 005. (abs) *Lunar Planet. Sci.* **XXXII** #1292. Lunar Planetary Institute, Houston. (CD-ROM)
SaU005

Zipfel J. and Goodrich C. A. (2001b) REE in melt inclusions in olivine of ALH77005. (abs) *Meteoritics & Planet. Sci.* **36**, A232.
ALH77005

Zipfel J. and Goodrich C.A. (2002) The origin of megacrysts in SAU005 and EETA79001 (Lithology A): Evidence from a study of melt inclusions. (abs) *Lunar Planet. Sci.* **XXXIII** #1279. Lunar Planetary Institute, Houston. (CD-ROM)
SaU005, EETA79001

Ziemelis K. (1994) Meteorite made with a fizz. *Nature* **372**, 616.
ALH84001

Zolensky M. E., Schutt J. W., Reid A. M., Jâkes P., Martinez de los Rios E. and Miller R. M. (1994) Locating new meteorite recovery areas. In *Workshop on meteorites from cold and hot deserts.* (*eds.* Schultz *et al*.) *LPI Tech Rpt.* **95-02**, 78-80. Lunar Planetary Institute, Houston.

Zolensky M.E. (1998) The flux of meteorites to Antarctica. *In* Grady, Hutchison, McCall and Rothery (eds) "Meteorites: flux with time and impact effects". Geological Society Spec. Pub. No. 140, London

Zolotov M. Y. and Shock E. L. (2000) An abiotic origin for hydrocarbons in the Allan Hills 84001 Martian meteorite through cooling of magmatic and impact-generated gases. *Meteoritics & Planet. Sci.* **35**, 629-638.