

THOMAS GEORGE SHARP
CURRICULUM VITAE

PERSONAL DATA

Born: October 29, 1959, Minneapolis, Minnesota
Address: School of Earth and Space Exploration Phone: (480) 965-3071
Arizona State University Fax: (480) 965-8102
Tempe, AZ 85287-1404 E-mail tom.sharp@asu.edu

EDUCATION

Ph.D. in Geology, Arizona State University, 1990
M.S. in Geology, Arizona State University, 1986
B.S. in Geology, University of Minnesota, 1983
B.S. in Geophysics, University of Minnesota, 1983

PROFESSIONAL EXPERIENCE

2011-present Director, LeRoy-Eyring Center for Solid State Science, ASU
2007-2011 Associate Director, School of Earth and Space Exploration, ASU
2006-present Professor, School of Earth and Space Exploration, ASU, Tempe, AZ
2005-present Associate Director, NASA Arizona Space Grant Consortium
2000 - 2006 Associate Professor of Geology, Arizona State University, Tempe, AZ
2003 - 2004 Visiting Research Fellow, Research School of Earth Sciences,
The Australian National University, Canberra, ACT Australia
1997 - 2000 Assistant Professor of Geology, Arizona State University, Tempe, AZ
1993 - 1996 Research Faculty (Tenured), Bayerisches Geoinstitut, Bayreuth Germany
1991 - 1993 Research Associate, Bayerisches Geoinstitut, Bayreuth Germany
1991 Postdoctoral Research Associate, Dept. of Geology, A.S.U., Tempe AZ
1986 - 1990 Graduate Research Associate, Dept. of Geology, A.S.U., Tempe AZ
1983 - 1986 Graduate Research Assistant, Dept. of Geology, A.S.U., Tempe AZ

HONORS AND AWARDS

Mineralogical Society of America Distinguished Lecturer: 2005-2006
Fellow of the Mineralogical Society of America: 2004
Australian National University Visiting Research Fellow: 2003-2004
ASU Devil's Advocates Outstanding Contribution to the Community: 1998

PROFESSIONAL SERVICE AND AFFILIATIONS

Associate Director, School of Earth and Space Exploration 2007 - 2011
Associate Director of the Arizona Space Grant Consortium 2005 - present
COMPRES Infrastructure Development Committee Chair 2008 - 2011
COMPRES Infrastructure Development Committee 2006 - 2011
COMPRES ASU Elector 2003 - present
AGU Mineral and Rock Physics Focus Group 2000 - 2007
AGU Mineral and Rock Physics Focus Group Awards Committee 2005 - 2007
AGU Mineral and rock Physics Student Award subcommittee 2000 - 2003
Chair, AGU Mineral Rock Physics Student Award Subcommittee 2001 - 2003

Selection Panel, European Union, TMR Large Scale Facility Program	1997 - 2000
Member, Mineralogical Society of America	1983 - present
Member, American Geophysical Union	1987 - present
Member, American Association for the Advancement of Science	1998 – 2006
Member, Meteoritical Society	2000 - present

AREAS OF RESEARCH INTEREST

Mechanisms and kinetics of phase transitions in minerals
 High-pressure mineralogy: applications to mantle dynamics and geophysics
 Shock metamorphism: constraints from high-pressure minerals and transformations
 Mineralogy of weathering and alteration on Mars
 Mineralogy and microstructures as evidence for early life
 Element partitioning and the formation of Earth's core
 Transmission electron microscopy: applications to all of the above

THOMAS GEORGE SHARP - TEACHING EXPERIENCE

COURSES TAUGHT IN 2010-2012

I. COURSES

ASU 101 – Freshman Success (Fall 2007)
 LIA 194 – Freshman Success (Fall 2011)
 GLG 101 - Physical Geology 3 credits (Spr. 1997, Sr. II 1997, Spr.1998, 1999)
 GLG 101 - Physical Geology Honors 3 credits (Spr. 1998)
 GLG 103 - Physical Geology Laboratory 1 credit (Smr.II 1997)
 GLG 321 - Mineralogy Lecture - 3 credits (Fall 1997)
 GLG 322 - Mineralogy Laboratory - 2 credits (Fall 1997)
 GLG 321 - Mineralogy Lecture and Laboratory 3 credit hours
 (Fall 1998 - 2000, Spr. 2001 – 2003, 2005 – 2011, 2013-2015)
 GLG 400 - Geology Colloquium 1 credit (Fall 1999, 2006)
 GLG 400 - Geology Colloquium honors 1 credit (Fall 1999)
 GLG 450 - Geology Field Camp (Assisted) -6 credits (Smr.II 1998 - 2000)
 GLG 451 - Field Geology I - 3 credits (Assisted) (Spr. 2001)
 GLG 452 – Field Geology II - 3 credits (2001- 2003, 2005-2015)
 GLG 424 – Petrology 3 credits (with R. Hervig) (2008, 2010)

II. GRADUATE COURSES

GLG 490/590 - Advanced Mineralogy and Mineral Physics (Fall. 2009, 2011)
 GLG 490/590 - Advanced Mineralogy (Spr. 1999)
 GLG 490/590 – Analytical Methods in Geosciences (Spr. 2000)
 GLG 490/590 – Methods of Geoscience Teaching (Fall 2000, 2001, 2002)
 GLG 598 – Making of a Mars Scout Mission (with L. Leshin) (Fall 2001)
 GLG 598 - Reading and Conference: Weathering on Mars (Spr. 2001)
 GLG 490/598 - Reading and Conference: Shock metamorphism (Spr. 2003)
 GLG 598 – Making of a Planet (with L. Leshin) (Fall 2004)
 GLG 591 – Faculty Research Seminar (Fall 2005, 2006)

THESIS/DISSERTATION ADVISOR

I. FORMER GRADUATE STUDENTS AT THE UNIVERSITY OF BAYREUTH

- Stefan Heinemann (1996) Der Phasenübergang kubisch – tetragonal im System der Granate Majorit ($\text{Mg}_4\text{Si}_4\text{O}_{12}$) – Pyrop ($\text{Mg}_3\text{Al}_2\text{Si}_3\text{O}_{12}$). Ph.D, Universität Bayreuth,
- Ljuba Kerschhofer (1998) Mechanismen und Kinetik der Phasentransformationen des Olivin zu seinen Hochdruckpolymorphen Wadsleyit und Ringwoodit. Ph.D., Universität Wien,
- Elke Meissner, (2000) Entwicklung einer Methode zur Messung von Konzentrationsprofilen im sub-mikron-Bereich mittels ATEM, am Beispiel der Mg-Fe-Interdiffusion in Olivin. Ph.D., Universität Bayreuth,

II. Former Graduate Students at Arizona State University

- John Moreau: TEM study of microfossils in the Gunflint Formation. M.S. May 2001
- Carrie Aramovich: Shock-induced high-pressure minerals in chondrite RC106. M.S. Aug. 2003
- Lisa Danielson: HSE partitioning constraints on the formation of Earth's core. Ph.D, Dec. 2003
- Zhidong Xie: High-pressure minerals in Shock veins in Chondrites: Constraints on Shock pressure and Duration. Ph.D. Dec. 2003
- Joe Michalski: Mineralogy and TIR spectroscopy of clay minerals, alteration and weathering on Mars. Ph.D. Aug. 2005 (Co-advised with P. Christensen)
- Brad De Gregorio: Structure and chemistry of kerogen in Earth's earliest microfossils. Ph.D. Dec. 2006
- Heather Dalton: Experimental petrology constraints on the Martian mantle. M.S. May 2007
- Tamara Diedrich: The effect of H_2O on the mechanisms and kinetics of the olivine -ringwoodite phase transition. Ph.D. Aug. 2007
- Amy McAdam: PhD. Mineralogy and geochemistry of Antarctic soils; An analog for weathering on Mars, Aug 2008 (Co-advised with M. Zolotov)
- Karen Rieck: M.S. Li isotope studies of eucrite meteorites, May 2008 (Co-advised with R. Hervig)
- Michael Kraft: Ph.D. Mineralogy and TIR spectroscopy of silica-rich rock coatings and weathering on Mars, May 2009
- Wyatt Du Frane: Ph.D. The effect of H_2O on the transformation of enstatite under mantle transition-zone conditions, Dec. 2010
- Elizabeth Rampe: Ph.D. Mineralogy and spectroscopy of altered basalts with applications to chemical weathering on Mars, May 2011
- Karen Rieck: Ph.D. (Co-advised with R. Hervig) Mg isotopes in Genesis samples, Dec. 2015
- Jeff Lockridge: PhD Metastable phase transitions in enstatite at 18 and 20 GPa. Dec. 2015
- Jinping Hu: Ph.D. Shock metamorphism in meteorites, August 2016

III. CURRENT GRADUATE STUDENTS

Crystlynda Fudge: PhD. Shock metamorphism in meteorites

SERVICE ON STUDENT THESIS AND DISSERTATION COMMITTEES

PREVIOUS MS:

Scott Nowicki	(1997)
Eric Hargrave	(1999)
Katherine Geiger	(1999)
Kaatje van der Hoeven	(1999)
Mike Kraft	(1999)
Blair Linford	(2001)
Andrea Rogers	(2001)
Laural Cherednik	(2001)
Chis Eisinger	(2002)
Alice Baldrige	(2002)
Jill Best	(2002)
Joe Michalski	(2002)
Laura Aben	(2003)
Trevor Graff	(2003)
Wyatt DuFrane	(2005)
Jacob Spinsby	(2005)
Dan Toffelmeyer	(2006)
Melissa Bunte	(2008)

PREVIOUS PHD:

Robert Leighty	(1997)
Melissa Lane	(1997)
Victoria Hamilton	(1997)
Penny King	(1998)
David Lecinsky	(1999)
Josh Banfield	(1999)
Edward Bailey	(2000)
Steve Skotnicki	(2001)
Andre Potochnik	(2001)
Juliette Forneris	(2002)
Tim Glotch	(2004)
Andrea Rogers	(2005)
Paul Niles	(2005)
Scott Nowicki	(2006)
Robin Ferguson	(2006)
Amy Knudson	(2006)
Alice Baldrige	(2007)
Nick Schmerr	(2008)
Shawn Wright	(2008)
Silvain Piqueux	(2009)
James Ashley	(2010)
Pei-Ying Lin	(2011)
Chunpeng Zhao	(2012)
Christopher Edwards	(2012)
Allie Rutledge	(2015)
Nathaniel Borneman	(2015)
Rebecca Smith	(2016)
Andrew Darling	(2016)
Svetlana S	(2016)

INTERNATIONAL AND NATIONAL SERVICE

COMPRES Infrastructure Development Committee Chair	2008 – 2010
COMPRES Infrastructure Development Committee	2006 – 2011
AGU Special Session Organizer	2007 - 2009
Goldschmidt Conference session organizer	2005 -2006

AGU Mineral and rock Physics Award subcommittee	2005 – 2007
AGU Mineral and rock Physics Committee	2000 – 2007
AGU Mineral and rock Physics Student Award subcommittee	2000 – 2003
COMPRES ASU Elector	2003 - present
Bayerisches Geoinstitut Visitors Program Committee	1993 – 1996
European Union TMR Large Scale Facility Selection Panel	1996 – 2000
VI th EMPG-symposium Program Committee	1996

Reviewer –

Science
 Nature and Nature Geoscience
 PNAS
 American Mineralogist
 MSA Reviews in Mineralogy
 Earth and Planetary Science Letters
 European Journal of Mineralogy
 Meteoritics and Planetary Science
 Physics and Chemistry of Minerals
 Physics of Earth and Planetary Interiors
 Geology/GSA
 NASA Cosmochemistry grant proposals
 NASA Mars Fundamental Research proposals
 NSF grant proposals
 NSF Emerging Worlds Panel

ASU UNIVERSITY AND DEPARTMENTAL SERVICE

CLAS Curriculum Committee Chair	2014 - 2015
CLAS Curriculum Committee	2012 - 2015
SESE Associate Director for Undergraduate Studies	2007 - 2011
SESE Undergraduate Advisor	2007 - 2013
SESE Personnel and Budget Committee Chair	2006 - 2007
Associate Director of the Arizona Space Grant Consortium	2005 - present
Associate Chair, Department of Geological Sciences	2005 - 2006
Geological Sciences Graduate Advisor	2005 - 2006
Geological Sciences Personnel and Budget Committee	2001 - 2003
	2004 - 2006
Geological Sciences Curriculum Committee	2001 - 2003
Geological Sciences and SESE Undergraduate Advisor	2002 - 2003
Geological Sciences Graduate Committee	1998 - 2001
Geological Sciences Library Liaison	1997 - 2001
Sedimentary Geologist Search Committee	2004 - 2005
Geoscience Education Search Committee	2003
Volcanology Search Committee	2001

THOMAS GEORGE SHARP – PUBLICATIONS

RESEARCH ARTICLES

1. **Sharp, T.G.** and Buseck, P.R. (1988) Prograde versus retrograde intergrowths in a calc-silicate rock. *American Mineralogist* 73, 1292-1301.
2. **Sharp, T.G.**, Otten, M.T. and Buseck, P.R. (1990) Serpentinization of phlogopite phenocrysts from a micaceous kimberlite. *Contributions to Mineralogy and Petrology* 104, 530-539.
3. **Sharp, T.G.**, Zheng, N.J., Tsong, I.S.T. and Buseck, P.R. (1990) Scanning tunneling microscopy of defects in Ag- and Sb-bearing galena. *American Mineralogist Letters* 75, 1438-1442.
4. **Sharp, T.G.** and Buseck, P.R. (1993) The distribution of Ag and Sb in galena: Inclusions, defects, and solid solution. *American Mineralogist* 78, 85-95.
5. **Sharp, T.G.**, Oden, P.I. and Buseck, P.R. (1993) Lattice-scale imaging of mica and clay (001) surfaces by atomic force microscopy using net attractive forces. *Surface Science Letters* 284/1-2, L405-L410.
6. Högrefe, A., Rubie, D.C., **Sharp, T.G.** and Seifert, F. (1994) Metastability of enstatite in deep subducting lithosphere. *Nature* 372, 351-353.
7. **Sharp, T.G.**, Bussod, G.Y. and Katsura, T. (1994) Microstructures in β - $\text{Mg}_{1.8}\text{Fe}_{0.2}\text{SiO}_4$ experimentally deformed at transition zone conditions. *Physics of the Earth and Planetary Interiors* 86, 69-83.
8. **Sharp, T.G.** and Rubie, D.C. (1995) Catalysis of the olivine to spinel transformation by high-clinoenstatite. *Science* 269, 1095-1098.
9. McCammon, C.A., Pring, A., Keppler, H., **Sharp, T.G.** and Seifert, F. (1995) A study of bernalite, $\text{Fe}(\text{OH})_3$, using Mössbauer spectroscopy, optical spectroscopy and transmission electron microscopy. *Physics and Chemistry of Minerals* 22, 11-20.
10. **Sharp, T.G.**, Wu, Z., Seifert, F., Poe, B., Doerr, M. and Paris, E. (1996) Distinction between six- and four-fold coordinated silicon in SiO_2 polymorphs via electron energy loss near edge structure (ELNES) spectroscopy. *Physics and Chemistry of Minerals* 23, 17-24.
11. Wu, Z., Seifert, F., Poe, B. and **Sharp, T.** (1996) Multiple scattering calculations for SiO_2 polymorphs: Comparison to ELNES and XANES spectra. *Journal of Physics: Condensed Matter* 8, 1-14.
12. **Sharp, T.G.**, Stevenson, R.J. and Dingwell, D.B. (1996) Microlites and "nanolites" in rhyolitic glass: Microstructural and chemical characterization. *Bulletin of Volcanology* 57, 631-640.
13. Stevenson, R.J., Dingwell, D.B., Webb, S. and **Sharp, T.G.** (1996) Viscosity of microlite-bearing rhyolite obsidians: an experimental study. *Bulletin of Volcanology* 58, 298-309.

THOMAS GEORGE SHARP – PUBLICATIONS

RESEARCH ARTICLES (CONT.)

14. Romano, C., Mungall, J.E., **Sharp, T.**, Dingwell, D.B. and Bagdassarov, N. (1996) Tensile strengths of vesicular glasses: An experimental study. *American Mineralogist* 81, 1148-1154.
15. Chen, M., **Sharp, T.G.**, El Goresy, A., Wopenka, B. and Xie, X. (1996) The high-pressure assemblage majorite-pyrope solid solution + magnesiowüstite: A new constraint on the high pressure and temperature history of shock veins in chondrites. *Science* 271, 1570-1573.
16. Kerschhofer, L., **Sharp, T.G.** and Rubie D.C. (1996) Intracrystalline transformation of olivine to wadsleyite and ringwoodite under subduction zone conditions. *Science* 274, 79-81.
17. Ganguly, J., Chakraborty, S., **Sharp, T.G.** and Rumble, D. III (1996) Constraint on the time scale of biotite grade metamorphism during the Acadian Orogeny from a natural garnet-garnet diffusion couple. *American Mineralogist* 81, 1208-1216.
18. Hugh-Jones, D., **Sharp, T.**, Angel, R. and Woodland, A. (1996) The transition of orthoferrosilite to high-pressure C2/c clinoferrosilite at ambient temperature. *European Journal of Mineralogy* 8, 1337-1345.
19. **Sharp, T.G.**, Lingemann, C.M., Dupas, C. and Stöffler, D. (1997) Natural occurrence of MgSiO₃-ilmenite and amorphized MgSiO₃-perovskite in a shocked L chondrite. *Science* 277, 352-355.
20. Poe, B., Seifert, F., **Sharp, T.G.** and Wu, Z. (1997) ELNES spectroscopy of mixed Si coordination minerals. *Physics and Chemistry of Minerals* 24, 477-487.
21. Heinemann, S., **Sharp, T.G.**, Seifert, F. and Rubie D.C. (1997) The cubic-tetragonal phase transition in the system majorite (Mg₄Si₄O₁₂) - pyrope (Mg₃Al₂Si₃O₁₂), and garnet symmetry in the Earth's transition zone. *Physics and Chemistry of Minerals* 24, 206-221.
22. Hacker, B.R., **Sharp T.G.**, Zhang, R.Y., Liou, J.G. and Hervig, R.L (1997) Low-Ti olivines and dynamical diffraction contradict a transition-zone origin for ultrahigh-pressure lherzolites. *Science* 278, 702-704.
23. Klein, U., **Sharp, T.G.** and Schumacher, J.C. (1997) Analytical electron microscopy of nm-scale hornblende lamellae: Low-temperature exsolution in cummingtonite. *American Mineralogist* 82, 1079-1090.
24. van Aken, P.A. **Sharp T.G.** and Seifert, F. (1998) Electron-beam induced amorphization of stishovite: Silicon-coordination change observed using Si K-Edge extended electron energy-loss fine structure. *Physics and Chemistry of Minerals* 25, 83-93.

THOMAS GEORGE SHARP – PUBLICATIONS

RESEARCH ARTICLES (CONT.)

25. Meissner, E., **Sharp, T.G.** and Chakraborty, S. (1998) Quantitative measurement of short compositional profiles using analytical transmission electron microscopy (ATEM). *American Mineralogist* 83, 546-552.
26. Cordier, P. and **Sharp, T.G.** (1998) Large angle convergent beam electron diffraction determinations of dislocation Burgers vectors in synthetic stishovite. *Physics and Chemistry of Minerals* 25, 548-555.
27. Voegelé, V., Cordier, P., Sautter, V., **Sharp, T.G.**, Lardeaux, J.M. and Marques F. O. (1998) Plastic deformation of silicate garnets. II Deformation microstructures in natural samples. *Physics of the Earth and Planetary Interiors* 108,319-338.
28. Kerschhofer, L., Dupas, C., Liu, M., **Sharp, T.G.**, Durham, W.B. and Rubie, D.C. (1998) Polymorphic transformations between olivine, wadsleyite and ringwoodite: mechanisms of intracrystalline nucleation and the role of elastic strain. *Mineralogical Magazine* 62, 617-638.
29. Dupas, C., **Sharp, T.G.**, Rubie, D.C., Durham, W.B. (1998) Transformation and deformation mechanisms in $(\text{Mg,Fe})_2\text{SiO}_4$ olivine and β -phase under non-hydrostatic stress and subduction zone conditions. *Physics of the Earth and Planetary Interiors* 108, 33-48.
30. Chen M, El Goresy A, Wopenka B, **Sharp TG** (1998) Cooling rates in the shock veins of chondrites: constraints on the $(\text{Mg,Fe})_2\text{SiO}_4$ polymorph transformations. *Science in China series D-Earth sciences* 41 (5): 522-528.
31. **Sharp, T.G.**, El Goresy, A., Wopenka, B. and Chen, M. (1999) A post-stishovite SiO_2 polymorph in the meteorite Shergotty: Implications for impact events and the Earth's lower mantle. *Science* 284 1511-1513.
32. El Goresy, A., Dubrovinsky, L., **Sharp, T.G.** Saxena, S., and Chen,. (2000) A new monoclinic post-stishovite polymorph of silica in the SNC meteorite Shergotty. *Science* 288, 1632-1634.
33. Kerschhofer, L., Rubie, D.C., **Sharp, T. G.**, McConnell, J. D. C. and Dupas-Bruzek, C. (2000) Mechanisms and kinetics of intracrystalline olivine→ringwoodite transformation, *Physics of Earth and Planetary Interiors* 121, 59-76.
34. Pósfai, M., **Sharp, T.G.** and Kontny, A., (2000) Pyrrhotite varieties from the 9.1 km deep borehole of the KTB project. , *American Mineralogist* 85, 1406-1415.
35. Kontny, A., de Wall, H., **Sharp, T.G.** and Pósfai, M., (2000) Mineralogy and magnetic properties of natural pyrrhotite from a 260°C section at the KTB Drilling Site, Germany, *American Mineralogist* 85, 1416-1427.

THOMAS GEORGE SHARP – PUBLICATIONS

RESEARCH ARTICLES (CONT.)

36. DeCarli, P. S., Bowden, E., **Sharp, T. G.**, Jones, A. P. and Price, G.D. (2002) Evidence for kinetic effects on shock wave propagation in tectosilicates. *Shock Compression of Condensed Matter – 2001* edited by M. D. Furnish, N. N. Thadhani and Y. Horie 2002 American Institute of Physics.
37. N. Tomioka, K. Fujino, E. Ito, T. Katsura, T. **Sharp, T.** Kato (2002) Microstructures and structural phase transition in (Mg,Fe)SiO₃ majorite. *European Journal of Mineralogy*, 14, 7-14.
38. Xie, Z., Tomioka, N. and **Sharp T.** (2002) Natural occurrence of Fe₂SiO₄-spinel in the shocked Umbarger L6 chondrite. *American Mineralogist*, 87, 1257-1260.
39. Joseph R. Michalski, J.R., Kraft, M.D., Diedrich, T., **Sharp, T.G.** and Christensen, P. R. (2003) Thermal emission spectroscopy of the silica polymorphs and considerations for remote sensing of Mars. *Geophysical research Letters*, 30, 2008.
40. Kraft, M.D., Michalski, J.R. and **Sharp, T.G.** (2003) Effects of pure silica coatings on thermal emission spectra of basaltic rocks: Considerations for Martian surface mineralogy, *Geophysical Research Letters*, 30(24), 2288,
41. Hervig, R.L., Mazdab, F.K., Danielson, L., **Sharp, T.G.**, Hamed A. and Williams P. (2004) SIMS microanalysis for gold in silicates. *American Mineralogist*, 89, 498-504.
42. Michalski, J. R., Reynolds, S. J. Christensen, P.R. and **Sharp, T.G.** (2004) Thermal infrared compositional analysis of natural bedrock surfaces in the Sacaton Mountains, Arizona, *JGR Planets*, 109, E03007.
43. El Goresy, A., Dubrovinsky, L., **Sharp, T.G.** and Chen, M. (2004) Stishovite and post-stishovite polymorphs of silica in the Shergotty meteorite: their nature, petrographic settings versus theoretical predictions and relevance to the Earth's mantle. *Journal of Physics and Chemistry of Solids*, 65, 1597-1608.
44. Moreau, J. W. and **Sharp, T.G.** (2004) A Transmission Electron Microscopy Study of Silica and Kerogen Biosignatures in ~1.9 Ga Gunflint Microfossils. *Astrobiology*, 4, 196-210.
45. Glotch, T.D. Morris, R.V., Christensen, P.R. and **Sharp, T.G.** (2004) Effect of precursor mineralogy on the thermal infrared emission spectra of hematite: application to Martian hematite mineralization. *JGR-Planets*, 109, EO7003.
46. DeCarli, P. S., Aramovich Weaver, C., Xie, Z., and **Sharp, T.G.** (2004) Meteorite studies illuminate phase transition behavior of minerals under shock compression. In *Shock Compression of Condensed Matter – 2003*, American Institute of Physics, 0-7354-0181-0.

THOMAS GEORGE SHARP – PUBLICATIONS
RESEARCH ARTICLES (CONT.)

47. Xie, Z. and **Sharp T.G.** (2004) High-pressure phases in shock-induced melt veins of the Umbarger L6 chondrite: Constraints on shock pressure. *Meteoritics & Planetary Science*, 39, 2043-2054.
48. Hau, X., Huss, G.R. Tochibana, S. and **Sharp, T.G.** (2005) Oxygen, Si and Mn-Cr isotopic composition of fayolite in the oxidized Kaba CV3 carbonaceous chondrite. *Geochim. Cosmochim. Acta*, 69, 1333-1348.
49. Michalski, J.R., Kraft, M.D., **Sharp, T.G.**, Williams, L.B. and Christensen, P.R. (2005) Mineralogical constraints on the high-silica Martian surface component by TES: Clay-rich mineralogy cannot explain the Acidalia Planitia-type spectra. *Icarus*, 74. 161-177.
50. Xie, Z., **Sharp, T.G.** and De Carli, P.S. (2006). High pressure phases in a shock-induced melt vein of Tenham L6 Chondrite: Constraints on shock pressure and duration. *Geochimica et Cosmochimica Acta*. 70, 504-515
51. Michalski, J. R., Kraft, M.D., **Sharp T.G.**, Williams, L.B. and Christensen, P.R. (2006) Thermal emission spectroscopy of clay minerals and clay-bearing rocks: Application to Martian surface mineralogy. *JGR-Planets* 111, E03004, doi:10.1029/2005JE002438.
52. Hsu, W., Guan, Y. , Hua, X., Wang, Y. Leshin, L. A. and **Sharp, T. G.** (2006) Aqueous alteration of opaque assemblages in the Ningqiang carbonaceous chondrite: evidence from opaque assemblages in oxygen isotopes. *Earth and Planetary Science Letters*, 243 107–114.
53. Glotch, T.D, Christensen, P.R. and **Sharp, T.G.** (2006) Fresnel modeling of hematite crystal surfaces and application to Martian hematite spherules. *Icarus* 181, 408-418.
54. De Gregorio B. T. and **Sharp T.G.** (2006) The structure and distribution of carbon in the 3.5 Ga Apex chert: implications for the biogenicity of Earth's oldest putative microfossils. *American Mineralogist* 91, 784-789.
55. Leinenweber, K. Mosenfelder, J.L. Diedrich, T. Soignard, E. **Sharp, T.G.** Tyburczy, J. Wang, Y. (2006) High-pressure cells for *in-situ* multi-anvil experiments *High Pressure Research* 26, 283–292.
56. Michalski, J.R., Kraft, M.D., **Sharp, T.G.**, and Christensen, P.R. (2006) Effects of chemical weathering on infrared spectra of Columbia River Basalt and spectral interpretations of martian alteration. *Earth and Planetary Science Letters* 248, 822–829.
57. **Sharp T.G.** and De Carli, P.S. (2006) Shock effects in meteorites. In *Meteorites and the Early Solar System II*, Ed. D. Lauretta and H. McSween, University of Arizona Press, 653-677.

THOMAS GEORGE SHARP – PUBLICATIONS
RESEARCH ARTICLES (CONT.)

58. Mosenfelder, J.L., **Sharp, T.G.**, Asimow, P.D. and Rossman, G.R. (2006) Hydrogen incorporation in natural mantle olivines. In *Earth's Deep Water Cycle, Geophysical Monograph Series 168, American Geophysical Union p. 45-56.*
59. Xie, Z., **Sharp, T.G.** and De Carli, P.S. (2006) Estimating shock pressures based on high-pressure minerals in shock-induced melt veins of L chondrites. *Meteoritics & Planetary Science 41*, 1883-1898.
60. Xie, Z. and **Sharp T.G.** (2007) Host rock solid-state transformation in a shock-induced melt vein of Tenham L6 chondrite *Earth and Planetary Science Letters 254*, 433-445
61. De Carli, P.S., El Goresy, A., Xie, Z. and **Sharp T. G.** (2007) Ejection mechanisms for Martian meteorites. In *Shock Compression of Condensed Matter 2007*, Ed. M. Eler, M.D. Furnish, R. Cau, N. Holmes and J. Nguyen, American Institute of Physics 978-0-7354-0469-4/07.
62. Michalski, J.R., Reynolds, S.J., Niles, P., **Sharp, T.G.** and Christensen P.R. (2007), Alteration mineralogy in detachment zones: Insights from Swansea, Arizona. *Geosphere.*, 3 (4), 184-198
63. McAdam, A.C., Zolotov, M.Y., Mironenko, M.V., Leshin, L.A. and **Sharp T.G.** (2008) Preferential low-pH dissolution of pyroxene in plagioclase-pyroxene mixtures: Implications for Martian surface materials, *Icarus 196*, 90–96
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- Bowden, E., **Sharp, T.G.** and DeCarli, P.S. (2000) Observations of Possible Kinetic effects on the Shock metamorphism of Quartz. *MAPS 35, A31*.
- Moreau, J. and **Sharp, T.G.** (2000) The Submicron Structure and Composition of Ancient Terrestrial Microfossils: Taphonomy and the Effect of Diagenesis on Preservation. *EOS 81, F201*.
- Poland M.P, Robinson S.E. **Sharp T.G.** and Reynolds S. J. (2000) Improved Preparation of Graduate Students as Instructors at Arizona State University *EOS 81, F286*.
- Robinson S.E., Poland M.P., **Sharp T.G.** and Reynolds S. J. (2000) Strategies for preparing graduate students as instructors at Arizona State University. *GSA Abstracts with Programs 32, A-76*.
- Sharp, T.G.**, El Goresy, A. and Chen, M. (2000) Nanocrystalline maskelynite in the Sixiangkou and Tenham L-6 chondrites: Microstructures of shocked plagioclase with the hollandite structure. *LPSC XXXI CD-ROM*.
- Xie, Z. and **Sharp, T.G.** (2000) Mineralogy of shock-induced melt veins in chondrites as a function of shock grade. *LPSC XXXI CD-ROM*.
- Moreau, J. and **Sharp, T.G.** (2000) Optical and electron microscopic characterization of Precambrian Gunflint microfossils. *LPSC XXXI CD-ROM*.
- Sharp, T.G.**, (1999) Persistence of metastable minerals after shock: constraints on shock pressure. *Fall AGU, EOS 80, F1023*.
- Moreau, J. **Sharp, T.G.** Farmer, J. and Knauth, L.P (1999) Microstructures of Precambrian microfossils: criteria for biogenicity. *Fall AGU, EOS 80, F72*.
- Moreau, J. **Sharp, T.G.** Farmer, J. and Knauth, L.P (1999) Optical and electron microscopy of microfossils in the Precambrian Gunflint Chert, *GSA National Meeting*.
- Sharp, T.G.**, El Goresy, A ., Dubrovinsky, L. and Chen, M. (1999) Very dense silica minerals in the Shergotty SNC meteorite: evidence for extreme shock pressures. *LPSC XXX, 1827*.

THOMAS GEORGE SHARP – PUBLICATIONS

RECENT ABSTRACTS (CONT.)

- Sharp, T.G.**, Moreau, J. and Knauth, L.P. (1998) Searching for submicroscopic evidence of life in fossiliferous cherts. *National Astrobiology Institute Meeting, Ames, CA*.
- 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. *Meteoritics and Planetary Science 33, A144*
- Sharp, T.G.**, El Goresy, A. and Chen, M. (1998) Naturally occurring post-stishovite SiO₂ in a shocked Martian meteorite. *Spring AGU, EOS 79, S220*.
- Cordier, P. and **Sharp, T.G.** (1998) Large angle convergent beam electron diffraction characterization of dislocations in synthetic stishovite. *EMPG-VII, Terra Nova 10, Abstract Supplement No. 1, 9*.
- El Goresy, A., Dubrovinsky, L., Saxena, S. and **Sharp, T.G.** (1998) A new post-stishovite silicon dioxide polymorph with the baddelyite structure (zirconium oxide) in the SNC meteorite Shergotty: evidence for extreme shock pressure. *Meteoritics and Planetary Science 33, A45*
- El Goresy, A., **Sharp, T.G.**, Wopenka, B., and Chen, M. (1998) A new very-high-pressure silica mineral in the Shergotty SNC meteorite: implications for shock metamorphism and the Earth's lower mantle. *LPSC XXIX, 1707*.
- Kerschhofer, L., **Sharp, T.G.**, Dupas, C., McConnell, J.D.C., Rubie, D.C. (1998) TEM study of intracrystalline olivine → ringwoodite transformation. *EMPG-VII, Terra Nova 10, Abstract Supplement No. 1, 29*.
- Meissner, E., Chakraborty, S. and **Sharp, T.** (1998) Mg-Fe interdiffusion coefficients in olivine measured by analytical transmission electron microscopy (ATEM). *EMPG-VII, Terra Nova 10, Abstract Supplement No. 1, 40*.
- Rubie, D.C., Kerschhofer, L., Mosenfelder, J.L., Dupas, C., Liu, M. and Sharp, T.G. Effects of phase transformations on the mechanical evolution of subducting lithosphere. *Geoscience 98, Keele, UK., Abstracts, 124*.
- Voegelé, V., Cordier, P., Ando, J.I., Liebermann, R.C., **Sharp, T.G.** and Heinemann S. (1998) Plastic deformation mechanisms of silicate garnets under high pressure and high temperature. *EMPG-VII, Terra Nova 10, Abstract Supplement No. 1*.
- Vogelé, V., Cordier, P., Langenhorst, F., **Sharp, T.G.** and Heinemann, S. (1998) Characterization of dislocations in synthetic and natural MgSiO₃-majorite. *VIIth symposium for the Study of Earth's Interior, Vinci-Tours, France*.
- Wopenka, B., **Sharp, T.G.** and El Goresy A. (1998) Natural occurrences of mantle minerals in shocked chondrites: structural characterization via Raman spectroscopy and electron diffraction. *Spring AGU, EOS 79, S162*.

THOMAS GEORGE SHARP – PUBLICATIONS

RECENT ABSTRACTS (CONT.)

- Sharp, T.G.**, Lingemann, C.M., Dupas, C. and Stöffler D. (1997) Natural occurrence of MgSiO₃-ilmenite and amorphized (Mg,Fe)SiO₃-perovskite in a shocked L5-6 chondrite. *LPSC XXVIII, 1285-1286*.
- Sharp, T.G.**, Lingemann, C.M., and Dupas-Bruzek, C. (1997) Chemistry and microstructures of MgSiO₃-ilmenite and amorphized MgSiO₃-perovskite in a shocked chondrite. *Fall AGU, EOS F761*.
- Sharp, T.G.**, Chen, M. and El Goresy A. (1997) Mineralogy and microstructures of shock-induced melt veins in the Tenham (L6) chondrite. *LPSC XXVIII, 1283-1284*.
- Dupas, C., **Sharp, T.G.**, Rubie, D.C. and Durham W.B. (1997) Transformation and deformation mechanisms in (Mg,Fe)₂SiO₄ olivine and β-phase under non-hydrostatic stress and subduction zone conditions. *Gordon Conference on Rock Deformation*.
- Dupas, C., **Sharp, T.G.**, Rubie, D.C. and Durham W.B. (1997) Mechanisms of transformation and deformation in (Mg,Fe)₂SiO₄. *EUG Terra Nova 9, Abstracts Supplement No 1*.
- Dupas, C., **Sharp, T.G.**, Rubie, D.C. and Durham W.B. (1997) Mechanisms of transformation and deformation in (Mg,Fe)₂SiO₄ high-pressure polymorphs under non-hydrostatic stress. *EUG Terra Nova 9, Abstracts Supplement No 1, 92*.
- Dupas-Bruzek, C., Rubie, D.C., **Sharp, T.G.** and Durham W.B. (1997) Transformation and deformation of (Mg,Fe)₂SiO₄ olivine. *EOS, Fall AGU F743*.
- Dupas, C., Kerschhofer, L., **Sharp, T.G.**, Rubie, D.C. Durham W.B. (1997) Effects of non-hydrostatic stress on the mechanisms of (Mg,Fe)₂SiO₄ α-β-γ phase transformations. *IASPEI 97*.

THOMAS GEORGE SHARP - GRANTS

EXTERNAL RESEARCH GRANTS

A. Pending Grant Proposals

Co-investigator (P.I. D Smith) *NSF-MRI*: Acquisition of a Cryo FIB-SEM for Materials Science and Structural Biology at ASU

Total Award Amount: \$1,618,695.00

Total Award Period Covered: 8/1/2016 - 7/31/2019

Co-investigator (P.I. Julia Cartwright) *NASA Solar System Workings*, Constraining the Impact Flux in the Early Solar System through High-Precision Chronological Studies of Achondrite Melt Clasts

P.I. Julia Cartwright
Total Award Period Covered: 9/1/2017 - 8/31/2020

Co-investigator (P.I. J. Weirich) *NASA Solar System Workings*, Developing
Thermochronology of Ordinary Chondrites
Total Award Amount: \$104,720.00
Total Award Period Covered: 12/1/2017 - 11/30/2020

Co-investigator (P.I. K. Leinenweber) *NSF COMPRES Multi-Anvil Development Cell
Assembly Project (MADCAP)*
Total Award Amount: \$557,281.00
Total Award Period Covered: 6/1/2017 - 5/31/2022

B. Active Grants

Co-investigator (P.I. Judd Bowman) *NASA Space Grant*, Phoenix: Thermal Imaging to
Explore the Impact of Urban Heat Islands on the Environment
Total Award Amount: \$198,140.00
Total Award Period Covered: 5/9/2016 - 5/8/2018

Co-investigator (P.I. Ariel Anbar) *NSF-GEO FESD Type I: The Dynamics of Earth
System Oxygenation*
Total Award Amount: \$4,845,000.00
Total Award Period Covered: 9/1/2013 - 8/31/2018

Co-investigator (P.I. Trevor Thornton) *NSF-ECCS, NNCI: Nanotechnology
Collaborative Infrastructure Southwest (NCI-SW)*
Total Award Amount: \$4,000,000.00
Total Award Period Covered: 9/15/2015 - 8/31/2020

Co-investigator (P.I. Trevor Thornton) *NSF-ECCS, Wetmore: NNCI: Nanotechnology
Collaborative Infrastructure Southwest (NCI-SW)*
Total Award Amount: \$86,654.00
Total Award Period Covered: 9/15/2015 - 8/31/2020

Principal Investigator, *NASA Cosmochemistry Program*, Using shock metamorphism to
explore the impact history of the solar system. \$322,538, 4/1/2013-3/30/2017.

Co-Principal Investigator (T. Swindle P.I. UoA) *NASA Space Grant through the
University of Arizona, ASCENDING Further: Engaging More Students from Community
Colleges in STEM Activities Through Expansion of the Arizona Space Grant
Consortium ASCEND! Program* \$22,119.00 Total Award Period Covered: 8/15/2014 -
8/14/2016

Co-Investigator (K. Leinenweber P.I.) *Consortium for Material Properties Research in Earth Sciences (COMPRES) Univ. of Illinois Champaign Urbana*, Multi-Anvil Cell Development Project \$533,376.00, Total Award Period Covered: 6/1/2012 - 5/31/2017

Co-Investigator (A. Anbar P.I.) NSF Geo FESD Type I: The Dynamics of Earth System Oxygenation. \$4,845,000.00 Total Award Period Covered: 9/1/2013 - 8/31/2018

C. Previous Grants

Co-Principal Investigator (J. Michalski P.I.) *NASA Mars Fundamental Research Program through The Planetary Science Institute*, Effects of shock metamorphism on phyllosilicate spectroscopy \$452,904.00 total \$48,268, for Sharp 5/1/2010 – 4/30/2015

Co-Principal Investigator (T. Swindle P.I. UoA) *NASA Space Grant through the University of Arizona*, Arizona Space Grant Consortium (Annual - Yr 1) \$959,484.00 Total Award Period Covered: 4/9/2010 - 4/8/2015

Principal Investigator *NSF-Recovery Act Research Support*, The Effect of Trace Amounts of H₂O on the Rates and Mechanisms of Olivine and Enstatite Phase Transformations In Earth's Mantle Transition Zone. \$293,852, 7/1/2009 – 6/30/2013

Principal Investigator *NASA Cosmochemistry Program*, Constraining the Impact History of Meteorite Parent Bodies From Shock Metamorphism. Funded for \$283,566 4/1/2009 - 3/31/2012 No cost extension to 3/31/2013

Co-Investigator (R. Carpenter P.I.) Nsf-Mps-Dmr MRI: Acquisition of an Aberration Corrected High Resolution Analytical Transmission Electron Microscope for Advanced Materials. \$3,277,750 (Sharp recognition \$229,443) 10/1/2008 - 8/31/2014

Co.-Investigator, (K. Leinenweber P.I.) *COMPRES* Multi-anvil cell development \$168,690 6/1/10 – 5/31/2012

Co.-Investigator, *NSF NSF-Recovery Act Research Support*, Upgrade of the Multi-Anvil High-Pressure Facility at Arizona State University, \$125,913, 7/1/2009 – 6/30/2012

Principal Investigator *NASA Education* Arizona Space Grant Consortium \$242,104 4/9/2010 – 4/8/2015

Principal Investigator *NASA Education* Fellowship/Scholarship Acct: Arizona Space Grant Consortium \$157,549 4/9/2010 – 4/8/2015

Principal Investigator, *NASA Graduate Student Researchers Program*, Effects of secondary silicates on remote sensing measurements and interpretations: implications

for the composition and alteration of the Martian crust. \$30,000 08/01/2009 - 07/31/2010.

Principal Investigator, *NASA Space Grant Program*, Arizona Space Grant Consortium (Annual - Yr 1) \$164,745, 3/1/2010 – 2/28/2011

Co-Investigator, *COMPRES* Multi-anvil cell development, \$90,000, 6/1/10 – 5/31/2011

Co-Investigator *NASA*, A Modern Electron Microprobe for Cosmochemical Research at Arizona State University \$450,000, 4/1/2010 – 3/31/2011

Principal Investigator, *NASA NASA Graduate Student Researchers Program*, Effects of secondary silicates on remote sensing measurements and interpretations: implications for the composition and alteration of the Martian crust. \$30,000 08/01/2007 -07/31/2008.

Principal Investigator, *NASA Cosmochemistry Program*, Shock Metamorphism in Meteorites: Shock Conditions and Impact History. \$228,000, 04/01/06-03/31/09

Principal Investigator, *NASA Mars Fundamental Research Program*, Mineralogy and Microstructures of Basalt weathering Rinds and their Spectral Signatures in Thermal Infrared and Visible/Near Infrared spectra: Fundamental research for understanding the nature of the Martian Crust. \$248,563, 08/01/06-07/31/09

Principal Investigator, Arizona Space Grant Consortium Cycle 4, NASA Space Grant Program, Funding through University of Arizona
Total ~ \$ 550,056, 2/1/05 – 1/31/2010

Co-investigator, *COMPRES* Multi-Anvil Cell Development Project,
P.I K. Leinenweber, Co-I. J. Tyburczy,
COMPRES: Community Facilities and Infrastructure Development
Total \$100,000, 05/01/07 – 04/30/08

Co-investigator, Electronics and Instrumentation for Extreme Environments
P.I T. Thornton Co-Is H. Barnaby, and W. Burlison
EEE498/591: 019712-001
Total \$20,000, 2007

Co-Investigator, Redesign of the Course GLG 101 Intro to Geology I to ASU
P.I K. Hodges, Co-Is J. Johnson, S. Reynolds, S. Semken and J. Tyburczy
019528-001 Arizona Board of Regents
Total \$52911, 2007

Principal Investigator, Arizona Space Grant Consortium Cycle 4 Supplement to:
Arizona Space Grant Consortium (Space Grant augmentation -Geospatial) University
of Arizona

Total \$14,000, 11/1/05 - 10/31/06

Principal Investigator, Arizona Space Grant Consortium, Workforce Development: ASCEND NASA Space Grant Program, Funding through University of Arizona
Total \$18,950 1/1/05 - 12/31/06

Principal Investigator, Arizona Space Grant Consortium, Workforce Development: MIMIC NASA Space Grant Program, Funding through University of Arizona
Total \$4,250 1/1/05 - 12/31/06

Co-investigator, COMPRES Multi-Anvil Cell Development Project, P.I. K. Leinenweber, Co-I. J. Tyburczy,
Total \$269,716, 05/01/04 – 04/30/07

Principal Investigator, *NASA Mars Fundamental Research Program* Mineralogy, Chemistry, And Thermal Emission Spectroscopy Of Poorly Crystalline Alteration Products And Basalt Weathering Rinds: Fundamental Research
Total \$61,000, 7/1/05 – 6/30/06.

Principal Investigator, NSF, Effects of water on transformation and deformation mechanisms in the mantle transition zone.
Total \$203,720, 7/1/02 – 6/30/06

Principal Investigator, *NASA Cosmochemistry Program*, Shock-Vein Crystallization and Phase Transformations in Chondrites: Estimating Shock Pressure and Pressure Duration.
Total \$203,000, 04/01/03-03/31/06

Principal Investigator, *NASA Graduate Student Researchers Program*, The effects of amorphous silica coatings on remote sensing of Mars .
Total \$72,000, 7/1/03 – 6/30/06.

Principal Investigator, *NASA Graduate Student Researchers Program*, Resolving the biogenicity of Earth's oldest microfossils using electron energy loss spectroscopy and X-ray absorption spectroscopy.
Total \$72,000 7/1/04 – 6/30/07.

Co-investigator with Tyburczy and Holloway, NSF Facilities program, Technician Support for the Arizona State University Multiple anvil High Pressure Laboratory.
\$201,000 9/1/01 – 7/15/05.

Co. Investigator , Ronald Greeley Co.-I. and Laurie Leshin P.I. *NASA Scout Missions SCIM* – Sample Collection for Investigation of Mars \$75,000 01/02/03-12/31/03

Principal Investigator, *NASA Graduate Student Researchers Program*, Partitioning of highly siderophile elements at elevated pressure and temperature: constraints on core formation of the Earth. \$68,000 7/1/00 – 6/30/03.

Principal Investigator, *NASA Cosmochemistry Program*, High-pressure minerals in shocked chondrites: Constraints on shock conditions and duration. \$196,800, 5/1/00-4/30/03.

Module Leader (co-I. L. P. Knauth, overall proposal P.I. is Jack Farmer), *NASA Astrobiology Program*, Module 3B, Exploring the Living Universe: Origin, Evolution and Distribution of Life in the Solar System. \$ 310,478, 7/1/98-6/30/03

Principal Investigator, *NASA Cosmochemistry Program*, Mineralogy and microstructures of shock-induced melt veins in chondrites. \$81,000, 5/1/98 – 4/30/00.

Principal Investigator, NSF, Partitioning of highly siderophile elements at elevated pressure and temperature constrains on core formation and accretion of the Earth. \$157,000 1/1/01 – 12/31/03.

Co-investigator (P.I.s J. Holloway and S. Sacks) National Science Foundation, Measurement of P and S velocities in mantle wedge peridotite at high pressure and temperature. \$140,806, 5/1/97-4/30/99.

Principal Investigator (co-P.I. S. Chakraborty), *Deutsche Forschungsgemeinschaft* (German Science Foundation), Development of a method to measure concentration profiles on a sub- μm scale with ATEM, application to Mg-Fe interdiffusion in olivine. 78,000 DM, 8/1/96-7/31/98.

Co-Investigator (P.I. D.C. Rubie; co-P.I. F. Seifert) *Deutsche Forschungsgemeinschaft* (German Science Foundation), Mechanisms and kinetics of phase transformations between MgSiO_3 -polymorphs at high pressure and temperature. 71,000 DM, 8/1/94-7/31/96.

INVITED RESEARCH TALKS

University of Melbourne,

Lunar Planetary Laboratory, University of Arizona 2011

AGU Annual Fall Meeting, Volatiles in Earth's Mantle Session. Fall 2007.

Kobe International School on Planetary Materials, Kobe Japan, two lectures on shock physics and metamorphism, July 2007

University of Milan, two lectures to the Department of Earth Science, Milan, Italy, April 28, 2006

Eberhard-Karls-University Tübingen, Institute for Geosciences, Tübingen, Germany, April 26, 2006.

Free University of Amsterdam, Faculty of Earth and Life Sciences, Amsterdam, The Netherlands, April 24, 2006.
 University of Munich, Department of Geology, Munich Germany, April 21, 2006.
 California State University-Chico, Department of Geology, Chico CA. Nov. 17, 2005.
 Humbolt State University, Department of Geology, Arcata CA, Nov. 16, 2005.
 Oregon State University, Department of Geosciences, Corvallis Oregon, Nov. 14, 2005.
 University of Michigan, Department of Geology, Ann Arbor Michigan, Oct. 28, 2005.
 Lawrence University, Department of Geology, Appleton Wisconsin, Oct. 26, 2005.
 Iowa State University, Department of Geology, Ames Iowa, Oct. 24, 2005.
 Arizona State University, Department of Geological Sciences Colloquium, Aug. 31, 2005.
 Study of Materials at Extreme Conditions Conference, Miami Beach FL. April 19, 2005.
 The Australian National University, Planetary Science Institute Public Lecture, Canberra, ACT Australia, Feb. 16, 2004.
 The Australian National University, RSES Earth Materials Group, Canberra, ACT Australia, Sept. 2003.
 American Geophysical Union Annual Fall Meeting, 2001, San Francisco CA.
 University of California Santa Barbara, Department of Geological Sciences Seminar, Santa Barbara CA Feb. 21, 2001.
 New Mexico Tech, Department of Earth and Environmental Science Seminar, Socorro, NM Nov. 30, 2000.
 Arizona State University, Department of Geological Sciences Colloquium, Oct. 25, 2000.
 California Institute of Technology, Geology Club, Pasadena California Jan 26, 2000
 California Institute of Technology, Shock Physics Group, Jan 26, 2000
 Geophysical Laboratory, Carnegie Institution, Washington D.C. Jan. 10, 2000
 University of Minnesota, Oct. 21 and 22, 1999
 Universität Muenster, TEM workshop, Germany – Feb. 23, 1999
 University of Arizona – Oct. 9, 1998
 Museum für Naturkunde, Humboldt Universität Berlin, Germany – Nov. 22, 1996
 Universität Heidelberg, Germany – Nov. 11, 1996
 Technische Hochschule Darmstadt, Germany– May 16, 1996
 Arizona State University – March 5, 1996, Dec. 19, 1995, Dec. 15, 1993
 Universität Frankfurt am Main, Germany – Nov. 15, 1995
 Cambridge University, UK – Nov. 22, 1995
 University of Minnesota – Dec. 1994
 Bayerisches Geoinstitut, Germany – April 1991, Aug. 13, 1992, April 22, 1993 March 5, 1996

PAPERS PRESENTED AT SCIENTIFIC CONFERENCES

American Chemical Society Meeting April 1991
 American Geophysical Union - May 1986, Dec. 1989, 1992, - 1997, May 1998, Dec. 1999 - 2011

Arbeitskreis für Mineralogie und Petrologie: Gerolstein Germany - 1993; Plön,
Germany - 1994; Hannover, Germany 1996
European Union of Geosciences April 1995
Experimental Mineralogy, Petrology and Geochemistry International Symposium -
April 1994,
Geological Society of America – Oct. 1987, 1990, 1991, 1999
Goldschmidt Conference Aug. 2006-2007
International Mineralogical Association - Sept. 1994
Lunar and Planetary Science Conference –March 1996 - 2003, 2005-2010
Meteoritical Society Meeting –1996, 1998, 2000 - 2002, 2005, 2008, 2010
Mineralogie Jahrestagung – 1995
Symposium on Materials at Extreme Conditions – April 2005