

CURRICULUM VITAE

MELINDA DARBY DYAR

Department of Astronomy
Mount Holyoke College
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Education:

Ph.D., Geochemistry, Massachusetts Institute of Technology, Cambridge, Mass. Thesis topic: Crystal chemistry and statistical analysis of iron in mineral standards, micas, and glasses.

Advisor: Roger G. Burns.

B.A., Geology and Art History¹, Wellesley College, Wellesley, Mass. Thesis topic: Geology of the Broadmoor Wildlife Sanctuary, South Natick, MA: Structural and petrographic analysis.

Advisor: Margaret Thompson. Summer Field Camp, Indiana University, Cardwell, Montana.

Employment:

Senior Scientist, Planetary Science Institute, 2015-present.

Kennedy-Schelkunoff Professor and Chair, Department of Astronomy, Mount Holyoke College and Five College Astronomy Department, 2011-present.

Associate Professor and Chair, Department of Astronomy, Mount Holyoke College and Five College Astronomy Department, 2002-2011.

Associate Professor Department of Earth and Environment, Mount Holyoke College and Five College Astronomy Department, 2002-2008.

Five College Graduate Faculty in Astronomy, University of Massachusetts, 2002-present.

Visiting Associate Professor, Department of Astronomy and Department of Earth and Environment, Mount Holyoke College and Five College Astronomy Department, 2001-2002.

Visiting Associate Professor, Department of Astronomy, University of Massachusetts (Amherst), 2001-2002.

Affiliated Staff, Department of Geological Sciences, University of Idaho, 2000-2018.

Visiting Assistant Professor, Department of Astronomy and Department of Earth and Environment, Mount Holyoke, 1998-2001.

Assistant Professor, Department of Geology and Astronomy, West Chester University, 1993-1998.

Visiting Assistant Professor, Department of Geology, Smith College, 1995-1996.

Assistant Professor, Department of Geological Sciences, University of Oregon, 1986-1993.
Member, Materials Science Institute, 1987-1993.

Research Fellow, Division of Geological and Planetary Sciences, California Institute of Technology, 1985-1986 (G.R. Rossman, supervisor).

Post-Doctoral Fellow, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, 1985 (R.G. Burns, supervisor).

Research Assistant, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, 1980-1985.

Research Staff, Chevron Oil Field Research Company, La Habra, CA, summer, 1982.

Assistant Instructor, Indiana University Geologic Field Station, Cardwell, MO, summer, 1980.

Professional Societies:

Association for Women Geoscientists

Geological Society of America (Fellow)

Mineralogical Society of America (Fellow)

American Geophysical Union

North American Society for LIBS

Geochemical Society

¹ Course requirements for the art history major were completed while a graduate student at MIT.

Honors:

Sigma Xi, 1980
1984 Mineralogical Society of America (M.S.A.) Grant for Research in Crystallography
1990-1991 National Lecturer, Mineralogical Society of America
Outstanding Service Award, Mineralogical Society of America, 1991
Fellow, Mineralogical Society of America, 1995
Girls' Incorporated, Holyoke, Massachusetts, Honoree, 1 April, 2004
Meribeth E. Cameron Faculty Award for Scholarship, Mount Holyoke College, 2010
Participating Scientist, Mars Science Laboratory Science Team, 2012-2014
G.K. Gilbert Award for outstanding contributions to planetary science, Geological Society of America, 2016
Fellow, Geological Society of America, 2017
Hawley Medal, 2017, Mineralogical Association of Canada
Eugene Shoemaker Distinguished Scientist Medal, NASA Solar System Exploration Research Virtual Institutes, 2018
Helmholtz International Fellow, 2018-2021
Fellow, Geochemical Society, 2019

Professional Service:

M.S.A. Research Grants Committee, 1991
M.S.A. Science Grants Committee, 1991
The Geochemical Society Program Committee, 1991-1994
National Science Foundation Instrumentation and Laboratory Instruction Panel, 1988 and 1992
National Science Foundation Undergraduate Curriculum and Course Development Panel, 1991
National Science Foundation Workshop: The Role of Faculty in the Disciplines in the Undergraduate Education of Future Teachers, invited participant, contributor to working paper, 1992
Program Committee, Geological Society of America National Meetings, 1992-1994
American Geophysical Union Workshop: Shaping the Future of Undergraduate Earth Science Education, invited participant and contributor to working paper, 1996
M.S.A. Lecture Program Committee, 1998-2000; Chair 1999-2000
M.S.A. Crystallography Research Grant Committee 1998-1999
Council for Undergraduate Research (C.U.R.), Councillor, 1999-2000
American Geological Institute (A.G.I.) Outreach Committee, 2000-2003
Associate Editor, *American Mineralogist*, 2000-present
Review Panel, NASA Cosmochemistry Program, 2001
Review Panel, NSF/NATO Postdoctoral Fellowship Program, 2002-2003
Judges Panel, Name the Rovers contest, 2003
Review Panel, NSF, CCLI Program, 2003
Instrument Selection Review Panel, Mars Science Lander 2009, NASA, 2004
Review Panel, NSF, CCLI Program, 2004
International Program Committee, Goldschmidt Conference, 2005
Executive Committee, AWIS National Meeting, 2005
Review Panel, NASA, 2006
Review Panel, NASA, 2007
Review Panel, NASA, 2008
Review Panel, NASA, 2008
Review Panel, NSF, 2008
Review Panel, NASA, 2009
Review Panel, NSF, 2009
Review Panel, NASA, 2009

Review Panel, NASA, 2010
Review Panel, NASA, 2011
Review Panel, NASA, 2012
Review Panel, NASA, 2013
Review Panel, NASA, 2015
Review Panel, NASA, 2016
Review Panel, NSF, 2017 (×2)
Review Panel, NASA, 2018

Invited Talks and Professional Presentations:

University of California at Riverside, 1986 and 1991²
University of Maine at Orono, 1987 and 1991¹
Oregon State University, 1986 and 1991
Massachusetts Institute of Technology, 1987
Wellesley College, 1987
Smith College, 1988
State University of New York at Albany, 1989
Southern Methodist University, 1989
University of Washington, 1990
University of Saskatchewan, 1991¹
San Diego State University, 1991¹
University of California at Davis, 1991¹
Sonoma State University, 1991¹
University of Calgary, 1991¹
University of New Mexico, 1991¹
University of Houston, 1991¹
Louisiana State University, 1991¹
Texas Tech, 1991¹
University of Chicago, 1992
Penn State University, 1992
University of Kentucky, 1992
University of Colorado at Boulder, 1993
European Research Conference, Hydrogen-Containing Defects in Minerals and Ceramics, 1993
Deep Continental Studies Workshop, Microknowledge and Megathinking, 1993
Portland State University, 1993
Hopi Buttes Workshop, invited participant, 1993
Rutgers University, 1994
University of North Carolina, 1994
Southern Methodist University, 1994
University of Massachusetts at Amherst, 1996
Mount Holyoke College, 1997
University of Western Ontario, 2000
University of Idaho, 2001
Eastern Washington University, 2001
Wellesley College, 2001
State University of New York at Stony Brook, 2003
Lunar and Planetary Institute, 2003
Brearley School, 2004

²talk sponsored by Mineralogical Society of America Lecture Program.

Massachusetts Institute of Technology, 2004
University of Massachusetts, 2004
Wellesley College, 2004
Rhode Island College, 2006
SUNY Binghamton, 2007
University of New Mexico, 2007
Colby College, 2008
Rutgers University, 2009
NASA Summer Science Institute, Goddard Space Flight Center, 2009
Hartwick College, 2010
M.I.T., 2011
Wellesley College, 2011
Brown University, 2011
Indiana University, 2011
TED talk, 2012
Texas Tech University, 2013
Skidmore College, 2014
University of Massachusetts Amherst, 2014
Rutgers University, 2014
Planetary Science Institute, 2015
TED-X, Springfield, MA 2015
University of Massachusetts, Amherst, 2015
Brown University, 2015
Amherst College, 2016
Rensselaer Polytechnical Institute, 2017
M.I.T., 2017
Williams College, 2018
Keynote Plenary Speaker, AAAS, January 2018
Colby College, 2018
University of Vermont (Burlington), 2018

College and University Service:

Structural Geologist Search Committee, University of Oregon (UO) 1987-1988
Chair, Affirmative Action Search Committee, UO, 1988
Chair, X-ray and Thin Section Committee, Dept. of Geological Sciences, UO, 1986-1987
Faculty Advisor, Condon Undergraduate Society, UO, 1986-1988
Affirmative Action Liaison, Dept. of Geological Sciences, UO, 1986-1989
Materials Science Institute Budget Committee, UO, 1987-1992
Treasurer, Materials Science Institute, UO, 1988-1992
Director, Materials Science Institute Research for Undergraduates Program, UO, 1988 & 1989
Physics Department Condensed Matter Search Committee, UO, 1988 and 1989
Graduate Teaching Fellow Coordinator, Dept. of Geological Sciences, UO, 1988-1989
Seismology Search Committee, Dept. of Geological Sciences, UO, 1988-1989
Volcanologist Search Committee, Dept. of Geological Sciences, UO, 1989-1990, 1990-1991
Telephone Counselor, Dept. of Geological Sciences, UO, 1990-1991
Chair, Displays Committee for Cascade Hall, UO, 1990-1993
Computer Coordinator, Dept. of Geological Sciences, UO, 1989-1993
Member, President's Task Force on Campus Infrastructure and Technology, UO, 1990-1992
Member, Committee on Campus Hazardous Waste Remediation, UO, 1988-1993
Member, University Library Committee, UO, 1987-1989
Member, Faculty Advisory to the Museum of Art, UO, 1989-1993

Chair, Faculty Advisory to the Museum of Art, UO, 1990-1993
 Member, Departmental Computer Lab Managers, UO, 1989-1993
 Board Member, Faculty Club of the University of Oregon, 1988-1993
 Secretary-Treasurer, Faculty Club of the University of Oregon, 1989-1990
 Member, Docent Council, University of Oregon Museum of Art, 1988-1993
 Member, Board of Governors, University of Oregon Museum of Art, 1988-1993
 Member, Curriculum Committee, Dept. of Geology and Astronomy, WCU, 1993-1996
 Member, College of Arts and Sciences Recruitment Committee, WCU, 1994-1995
 Internship Coordinator, Dept. of Geology & Astronomy, WCU, 1993-1997³
 Member, Undergraduate Review Committee, Dept. of Geology & Astronomy, WCU, 1993-1998²
 Member, Graduate Review Committee, Dept. of Geology & Astronomy, WCU, 1994-1998²
 Member, Fellowship Committee, Mount Holyoke College, 2002-2006
 Member, Planning and Budget Committee, 2003-2004
 Chair, Fellowship Committee, Mount Holyoke College, 2003-2006
 Coordinator of Universal Application Funding, 2003-2012
 Member, Search Committee for Fellowships and Pre-Graduate Advising, 2009-2010
 Task Force on Curriculum to Career, 2011
 Member, Curriculum Committee, Five College Astronomy Department, 1999-present
 Member, Radiation Safety Committee, Mount Holyoke College, 1999-present
 Chair, Astronomy Department, 1999-present
 Senate member, Five College Astronomy Department, 1999-present
 Advisory Committee, 2017-2018

Miscellaneous Presentations to the College Community and Beyond:

Mathematics Department, MHC, 2000
 Five College Geology Symposium, February 2001
 Mount Holyoke Club of Bridgeport, CT, 2003
 Lyon Lecture series, Denver, 25 Oct. 2003
 Family Weekend, 31 Oct. 2003
 Mathematics Department, MHC, February 2004
 Five College Geology Symposium, February 2004
 Mars lecture, AST 11, Amherst College, 5 March 2004
 Fascinating Professor program, Francis Perkins scholars, 9 March, 2004
 South Hadley Lions Club, 6 April 2004
 East Longmeadow Library, 1 May, 2004
 Dedication of Kendade Hall, 8 May, 2004
 Class of 1959 reunion dinner, 28 May 2004
 Mount Holyoke Club of South Hadley, 9 June, 2004
 NOVA/WGBY fundraiser, Mount Holyoke College, 14 June, 2004
 Summer math for high school students, summer Mars project, July, 2004
 MHC Office of Admissions, summer staff training seminar, August, 2004
 Family Weekend, 30 Oct. 2004
 Hughes Symposium on Integrating Undergraduates into Research Programs, January 2005
 Mount Holyoke Club of Houston, March, 2005
 Springfield Star Club, April, 2005
 Mount Holyoke Reunion, June 2005
 Century Club, Springfield, MA, March 2006

³Maternity leave from West Chester University was taken during the academic years 1995-1996 and 1997-1998.

Mount Holyoke Reunion, June 2006
Mid-Coast Maine Mount Holyoke Club, June, 2006
MacDuffie School, January 2007
Mount Holyoke Club of New York City, March, 2007
Stargazers Club, North Scituate, RI, April 2007
Mount Holyoke Gala, Washington D.C., April 2009
Mount Holyoke Club of Bridgeport, December 2011
Development Office function in New York City, May 2012
Development Office function in San Francisco, October 2012
Development Office function in Los Angeles, October 2012
Development Office function in Boston, November 2012
Mount Holyoke Club of Cape Cod, May 2013
Mount Holyoke Club of New Hampshire, June 2013
Albany Area Amateur Astromers, October, 2014
New England Society of Economic Geologists, January, 2015
Mount Holyoke Club of New Hampshire, October, 2015
Mount Holyoke Club of Fairfield County, October, 2015
Talk for 6th grade class at Common School, Amherst MA, May, 2017
Talk for the Development Office, October 2017
Reunion talk, class of 1967, May 2018

Courses Taught:

Mineralogy I and II (advanced undergraduate)
Igneous and Metamorphic Petrology (advanced undergraduate)
Introduction to Earth History (introductory historical geology)
Introduction to Geology (introductory physical geology)
Planet Earth (introductory geology/planetary science)
Geochemistry (graduate and undergraduate)
Spectroscopy (graduate and undergraduate)
Geometrics (applications of statistical methods) (graduate and undergraduate)
Planetary Science (introductory and advanced undergraduate)
Planetary Science seminar on Mars (advanced undergraduate)
Spectroscopy of the Planets (advanced undergraduate)
Meteorites (advanced undergraduate)

Books and Electronic Media:

Dyar, M.D., and Gunter, M.E. (2013) *Mineral Database*. App for I-pad, Mac, I-Phone.
McKillop, S. and Dyar, M.D. (2010) *Geostatistics Explained, An Introductory Guide for Earth Scientists*.
Textbook. Cambridge University Press.
Dyar, M.D., and Gunter, M.E. (2008) *Mineralogy and Optical Mineralogy: A Three-Dimensional
Approach*. Textbook. Mineralogical Society of America.
Dyar, M.D. (1999) *Hands-On Mineral Identification*. CD-ROM. Tasa Graphic Arts, Inc., Albuquerque,
N.M.
Dyar, M.D., Busch, R.M., and Wiswall, G. (1997, 1998) *The Study of Minerals*. CD-ROM. Tasa Graphic
Arts, Inc., Albuquerque, N.M.
Dyar, M.D., McCammon, C.A., and Schaefer, M.W., Eds. (1996) *Mineral Spectroscopy: A Tribute to
Roger G. Burns*. Special Publication #5, The Geochemical Society, Washington, D.C., 400 pp.

Papers:

1. Dyar, M.D., and Burns, R.G. (1981) Coordination chemistry of iron in glasses contributing to remote-sensed spectra of the moon. *Proc. Lunar and Planet. Sci. Conf.*, **12B**, 695-702.

2. Burns, R.G., and Dyar, M.D. (1983) Spectral chemistry of green glass-bearing 15426 regolith. Proc. Lunar and Planet. Sci. Conf., 14, *J. Geophys. Res.*, **88**, B221-B228.
3. Dyar, M.D., and Birnie, D.P. (1984) The effects of quench media on iron partitioning and ordering in a lunar glass. Proc. 1st Intl. Conf. on Glass in Planet. and Geolog. Phenomena, *J. Non-Cryst. Sol.*, **67**, 397-412.
4. Stone, A.J., Parkin, K.M., and Dyar, M.D. (1984) STONE: a program for resolving Mössbauer spectra. DEC Users Soc. 11-720, Marlboro, Mass.
5. Dyar, M.D. (1984) Precision and interlaboratory reproducibility of measurements of the Mössbauer effect in minerals. *Amer. Mineral.*, **69**, 1127-1144.
6. Dyar, M.D. (1984) Experimental methods for quenching structures in lunar-analog silicate melts: variations as a function of quench media and composition. Proc. Lunar and Planet. Sci. Conf., 15, *J. Geophys. Res.*, **84**, supplement, C233-C239.
7. Dyar, M.D. (1985) A review of Mössbauer data on inorganic glasses: the effects of composition on iron valency and coordination. *Amer. Mineral.*, **70**, 304-316.
8. Birnie, D.P., and Dyar, M.D. (1986) Cooling rate calculations for silicate glasses. Proc. Lunar and Planet. Sci. Conf., 16, *J. Geophys. Res.*, **91(B4)**, D509-D513.
9. DeGuire, M.R., Dyar, M.D., O'Handley, R.C., and Kalongi, G. (1986) Magnetic ordering in splat-quenched ferrite-silica compositions. *J. Magn. Magn. Mater.*, **54-57**, 1337-1338.
10. Dyar, M.D., and Burns, R.G. (1986) Mössbauer spectral study of ferruginous one-layer trioctahedral micas. *Amer. Mineral.*, **71**, 955-964.
11. Dyar, M.D. (1986) Practical application of Mössbauer goodness-of-fit parameters for evaluation of real experimental results: a reply. *Amer. Mineral.*, **71**, 1266-1267.
12. DeGuire, M.R., O'Handley, R.C., Kalongi, G., and Dyar, M.D. (1986) Spinel ferrite-silica glass obtained by splat quenching. *J. Non-Cryst. Sol.*, **81**, 351-364.
13. Dyar, M.D. (1986) Comment on ferrous/ferric Mössbauer analysis of simulated nuclear waste glass with and without computer fitting. *Commun., Am. Cer. Soc.*, **69(7)**, C-160-C-162.
14. Dyar, M.D. (1987) A review of Mössbauer data on trioctahedral micas: evidence for tetrahedral Fe³⁺ and cation ordering. *Amer. Mineral.*, **72**, 102-112.
15. Dyar, M.D., Naney, M.T., and Swanson, S.E. (1987) Effects of quench methods on Fe³⁺/Fe²⁺ ratios: a Mössbauer and wet chemical study. *Amer. Mineral.*, **72**, 792-800.
16. Fudali, R.F., Dyar, M.D., Griscom, D.L., and Schreiber, H.D. (1987) The oxidation state of iron in tektite glass. *Geochim. Cosmochim. Acta.*, **51(10)**, 2749-2756.
17. Dyar, M.D., and Naney, M.T. (1988) Effects of quench methods on Fe³⁺/Fe²⁺ ratios: Reply. *Amer. Mineral.*, **73**, 1479.
18. Dyar, M.D. (1989) Application of Mössbauer goodness-of-fit parameters to experimental spectra: Further discussion. *Amer. Mineral.*, **74**, 688.
19. McGuire, A.V., Dyar, M.D., and Ward, K.W.⁴ (1989) Neglected Fe³⁺/Fe²⁺ ratios: a study of Fe³⁺ contents of megacrysts from alkali basalts. *Geology*, **17**, 687-689.
20. Dyar, M.D., McGuire, A.V., and Ziegler, R.D. (1989) Redox equilibria and crystal chemistry of coexisting minerals from spinel lherzolite mantle xenoliths. *Amer. Mineral.*, **74**, 969-980.
21. Dyar, M.D. (1990) Mössbauer spectra of biotite from metapelites. *Amer. Mineral.*, **75**, 656-666.
22. Guidotti, C.V., and Dyar, M.D. (1991) Ferric iron in metamorphic biotite and its petrologic and crystallochemical implications. *Amer. Mineral.*, **76**, 161-175.
23. Dyar, M.D., Perry, C.P., Rebbert, C.R., Dutrow, B., Holdaway, M.J., and Lang, H. (1991) Mössbauer spectroscopy of synthetic and naturally occurring staurolites. *Amer. Mineral.*, **76**, 27-41.
24. Burns, R.G., and Dyar, M.D. (1991) Crystal chemistry and Mössbauer spectra of babingtonite. *Amer. Mineral.*, **76**, 892-899.
25. Dyar, M.D., Colucci, M.T., and Guidotti, C.V. (1991) Forgotten major elements: Hydrogen and oxygen variation in biotite from metapelite. *Geology*, **19**, 1029-1032.
26. Holdaway, M.J., Mukhopadhyay, B., Dyar, M.D., Dutrow, B.L., Rumble, D. III., and Grambling, J. (1991) A new perspective on staurolite crystal chemistry: Use of stoichiometric and chemical end-members for a mole fraction model. *Amer. Mineral.*, **76**, 1910-1919.
27. McGuire, A.V., Dyar, M.D., and Nielson, J.E. (1991) Metasomatic oxidation of upper mantle peridotite. *Contrib. Min. Petrol.*, **109**, 252-264.

⁴Names of undergraduate coauthors are underlined.

28. Dyar, M.D., McGuire, A.V., and Mackwell, S.M. (1992) Fe³⁺/H⁺ and D/H in mantle kaersutites - Misleading indicators of mantle source fugacities. *Geology*, **20**, 565-568.
29. Dyar, M.D., McGuire, A.V., and Harrell, M.D. (1992) Crystal chemistry of iron in two styles of metasomatism in the upper mantle. *Geochim. Cosmochim. Acta*, **56**, 2579-2586.
30. Banfield, J.M., Dyar, M.D., and McGuire, A.V. (1992) The defect microstructure of oxidized mantle olivine from Dish Hill, California. *Amer. Mineral.*, **77**, 959-975.
31. McGuire, A.V., Francis, C.A., and Dyar, M.D. (1992) Mineral standards for electron microprobe analysis of oxygen. *Amer. Mineral.*, **77**, 1087-1091.
32. Holdaway, M.J., Gunst, R.F., Mukhopadhyay, B., and Dyar, M.D. (1993) Staurolite end member molar volumes determined from unit-cell measurements of natural specimens. *Amer. Mineral.*, **78**, 56-67.
33. O'Hanley, D.S., and Dyar, M.D. (1993) The crystal chemistry of lizardite 1T and the formation of magnetite in serpentines. *Amer. Mineral.*, **78**, 391-404.
34. Dyar, M.D. (1993) Mössbauer spectroscopy of tetrahedral Fe³⁺ in trioctahedral micas - Discussion. *Amer. Mineral.*, **78**, 665-668.
35. Dyar, M.D., Guidotti, C.V., Holdaway, M.J., and Colucci, M. (1993) Nonstoichiometric hydrogen contents in common rock-forming hydroxyl silicates. *Geochim. Cosmochim. Acta.*, **57**, 2913-2918.
36. Dyar, M.D., Mackwell, S.M., McGuire, A.V., Cross, L.R., and Robertson, J.D. (1993) Crystal chemistry of Fe³⁺ and H⁺ in mantle kaersutites: Implications for mantle metasomatism. *Amer. Mineral.*, **78**, 968-979.
37. Dyar, M.D. (1993) Instructional innovation. In *The role of geosciences faculty in the undergraduate education of science and mathematics teachers*. In *Proceedings, National Science Foundation Workshop, Role of Faculty from the Science Disciplines in the Undergraduate Education of Future Sciences and Mathematics Teachers*, 208-210.
38. Guidotti, C.V., Yates, M.G., Dyar, M.D., and Taylor, M. (1994) Petrogenetic implications of Fe³⁺ content of muscovite in pelitic schists. *Amer. Mineral.*, **79**, 793-795.
39. Earley, D., Dyar, M.D., Ilton, E.S., and Grantham, A.A. (1995) The influence of structural fluorine on biotite oxidation in copper-bearing, aqueous solutions at low temperatures and pressures. *Geochim. Cosmochim. Acta.*, **59**, 2423-2433.
40. Hower, J.C., Graham, U.M., Dyar, M. D., Taylor, M.E., and Rathbone, R.F. (1995) Approaches to the study of iron distribution among phases in high- and low-sulfur coal fly ash. In *Coal - Energy and the Environment*, S.-H. Chiang, ed., Proceedings 12th Ann. Pittsburg Coal Conference, 1138-1143.
41. Dyar, M.D., Treiman, A.H., Beauchamp, P.M., Blaney, D.L., Kim, S.S., Klingelhoefer, G., Mehall, G., Morris, R.V., Ninkov, Z., Sprague, A.L., Zolensky, M., and Pieters, C. (1995) Mineralogy. In Morris, C. and Treiman, A. H., eds., *Planetary Surface Instrumentation Workshop, Lunar and Planetary Institute, Tech. Rep.* 95-05, 65-84.
42. Dyar, M.D., Martin, S.V., Mackwell, S.J., Carpenter, S., Grant, C.A., and McGuire, A.V. (1996) Crystal chemistry of Fe³⁺, H⁺, and D/H in mantle-derived augite from Dish Hill: Implications for alteration during transport. In: M.D. Dyar, C.A. McCammon, and M. Schaefer, eds., *Mineral Spectroscopy: A Tribute to Roger G. Burns*, Special Publication #5, The Geochemical Society, 273-289.
43. Delaney, J.S., Bajt, S., Sutton, S.R., and Dyar, M.D. (1996) *In situ* microanalysis of Fe³⁺/ΣFe ratios in amphibole by X-ray Absorption Near Edge Structure (XANES) spectroscopy. In: M.D. Dyar, C.A. McCammon, and M. Schaefer, eds., *Mineral Spectroscopy: A Tribute to Roger G. Burns*, Special Publication #5, The Geochemical Society, 170-177.
44. Robertson, J.D., and Dyar, M.D. (1996) Nuclear methods for analysis of boron in minerals. In: E.S. Grew and L.M. Anovitz, eds., *Boron: Mineralogy, Petrology, and Geochemistry in the Earth's Crust. Reviews in Mineralogy*, vol. 32, Mineralogical Society of America, 805-820.
45. Holdaway, M.J., Mukhopadhyay, B., Dyar, M.D., Guidotti, C.V., and Dutrow, B.L. (1997) Garnet-biotite geothermometry revised: New Margules parameters and a natural specimen data set from Maine. *Amer. Mineral.*, **82**, 582-595.
46. Bettison-Varga, L., Burger, R., Creasy, J., Dyar, D., Knight, P., Shapiro Ledley, T., and McManus, D. (1996) How should we integrate research and education? In: M.F.W. Ireton, C.A. Manduca, and D.A. Mogk, Eds., *Shaping the Future of Undergraduate Earth Science Education*, American Geophysical Union, 29-32.
47. Dyar, M.D. (1997) Color in minerals. In: J.B. Brady, Mogk, D.W., and Perkins, D., eds., *Teaching Mineralogy*, Mineralogical Society of America, 323-348.
48. Smyth, J.R., Dyar, M.D., May, H.M., Bricker, O.P., and Acker, J.G. (1997) Crystal structure refinement and Mössbauer spectroscopy of an ordered, triclinic clinocllore. *Clays Clay Mins.*, **45**, 544-550.

49. Delaney, J.S., Dyar, M.D., Sutton, S.R., and Bajt, S. (1998) Redox ratios with relevant resolution: Solving an old problem using the Synchrotron microXANES probe. *Geology*, **26**, 139-142.
50. Dyar, M.D., Taylor, M.E., Lutz, T.M., Francis, C.A., Robertson, J.D., Cross, L.M., Guidotti, C.V., and Wise, M. (1998) Inclusive chemical characterization of tourmaline: Mössbauer study of Fe valence and site occupancy. *Amer. Mineral.*, **83**, 848-864.
51. O'Hanley, D.S., and Dyar, M.D. (1998) The composition of chrysotile: integration of Mössbauer and electron microprobe data and the relationship between chrysotile and lizardite. *Canad. Mineral.*, **36**, 727-739.
52. Dyar, M.D., Delaney, J.S., Sutton, S.R., and Schaefer, M.W. (1998) Fe³⁺ distribution in oxidized olivine: A synchrotron micro-XANES study. *Amer. Mineral.*, **83**, 1361-1365.
53. Dyar, M.D., Guidotti, C.V., Core, D.P., Wearn, K.M., Wise, M.A., Francis, C.A., Johnson, K., and Brady, J.B. (1999) Stable isotope and crystal chemistry of tourmaline across pegmatite - country rock boundaries at Black Mountain and Mount Mica, southwestern Maine, U.S.A. *Euro. J. Mineral.*, **11**, 281-294.
54. Bloodaxe, E.S., Hughes, J.M., Dyar, M.D., Grew, E.S., and Guidotti, C.V. (1999) Linking structure and chemistry in the schorl-dravite series. *Amer. Mineral.*, **84**, 922-928.
55. Tagg, S.L., Cho, H., Dyar, M.D., and Grew, E.S. (1999) Tetrahedral boron in naturally-occurring tourmaline. *Amer. Mineral.*, **84**, 1451-1455.
56. Francis, C.A., Dyar, M.D., Williams, M., and Hughes, J.M. (1999) The occurrence and crystal structure of foitite from a tungsten-bearing vein at Copper Mountain, Taos County, New Mexico. *Canad. Mineral.*, **37**(6), 1431-1438.
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Howenstine, J. (B.A., University of Massachusetts, 2006) Analysis of depth-diameter relationship of martian craters.

Bendersky, C. (B.A., Mount Holyoke College, 2007) The onset of thermal metamorphism in enstatite chondrites.

Walker, C.A. (B.A., Mount Holyoke College, 2007) Variations of solar wind parameters over a solar cycle: Expectations for NASA's Solar Terrestrial Relations Observatory (STEREO) Mission.

Graham, S. (B.A., Mount Holyoke College, 2007) GPS geodetic constraints on the November 21, 2004 Mw 6.3 earthquake off the northwest coast of Dominica: implications for in situ volatile solubilities and eruptions dynamics.

Barkley, M. (B.A., Mount Holyoke College, 2007) The effects of F-OH⁻ substitution on the crystal structure of pegmatitic topaz.

Cadieux, Sarah Beth (B.A., Mount Holyoke College, 2008) Carbon-isotope stratigraphy of Upper Cretaceous deposits of the Dalmatian Island of Brač, Croatia.

Langford, Amy (B.A., Mount Holyoke College, 2008) Unbiased search for molecular outflows in the Taurus Molecular Cloud.

Emerson, Erica (B.A., Mount Holyoke College, 2008) Analysis of iron oxidation in garnets.

Tucker, Jonathan (B.A., Amherst College, 2009) Calibrating ChemCam: Preparing to Probe the Red Planet.

Knutson, J.K. (B.A., Mount Holyoke College, 2010) Exploring biotite iron transformation by the hyperthermophilic archaeon *Pyrobaculum Islandicum*.

Barbieri, Lindsay (B.A., Hampshire College, 2010) Deciphering Late-Amazonian climate change on Mars using evidence preserved in gully fan stratigraphy.

Bell, S. (B.A., Amherst College, 2011) Fresh lunar crater ejecta as revealed by the Miniature radio Frequency (Mini-RF) instrument on the Lunar Reconnaissance Orbiter.

Ozanne, M.V. (B.A. Mount Holyoke College, 2012) Comparison of shrunken regression methods for major elemental analysis of rocks using laser-induced breakdown spectroscopy (LIBS).

DeVeaux, M.L. (B.A. Mount Holyoke College, 2012) Evaluation of statistical methods for classification of laser-induced breakdown spectroscopy (LIBS) data.

Williams, Molly (B.A., Mount Holyoke College, 2012) Characterizing Fe(III) transformation in a deep-sea hyperthermophilic archaeon.

Kashyap, Srishti (B.A., Mount Holyoke College, 2013) Isolating and characterizing an Fe(III) transforming deep sea thermophilic archaeon.

Breitenfeld, Laura (B.A., Mount Holyoke College, 2017) Predicting olivine composition using Raman spectroscopy through band shift and multivariate analyses.

Ytsma, Caroline (B.A. Smith College, 2018) Univariate and multivariate quantification of hydrogen, lithium, boron, carbon, and sulfur under vacuum and in Earth and Mars atmospheres using laser-induced breakdown spectroscopy.

Carey, CJ (Ph.D., University of Massachusetts, 2018) Graph construction for manifold discovery.

Boucher, Thomas (Ph.D., University of Massachusetts, 2018) Transfer learning with mixtures of manifolds.

Graduate Committees:

McCanta, Molly (Ph.D., Brown University, 2004)
Buczowski, Debra (Ph.D., University of Massachusetts, 2006)
Keskula-Snyder, Anna (Ph.D., University of Massachusetts, 2006)
Klima, Rachel (Ph.D., Brown University, 2007)
Amy Stander (MS, URI, 2013)
Tommy Boucher (Ph.D., UMass, 2018 Computer Science)
C.J. Carey (Ph.D., UMass, 2017, Computer Science)
S. Giguere (Ph.D., UMass, current student, Computer Science)
S. Kashyap (Ph.D., UMass, current student, Microbiology)

EXTERNAL GRANT:**PREVIOUS FUNDING:****American Chemical Society, Petroleum Research Fund:**

"Cation Ordering in Synthetic Trioctahedral Micas"
\$18,000 funded, 7/1/87-8/31/89
\$4,500 supplement, 5/1/88-9/30/88
\$2,500 supplement, 5/1/89-7/1/89
"Detailed Crystal Chemistry of Iron-Bearing Phyllosilicates"
\$40,000 funded, 5/1/91-8/31/93
\$3,000 supplement, 6/1/91-9/30/91

National Science Foundation, Earth Sciences Division:

"Crystal Chemistry and Petrogenesis of Biotites from Pelitic Schists"
\$60,000 funded, 7/1/87-6/30/90
"Crystal Chemistry of Metapelitic Minerals in a Petrologic Context"
\$50,226 funded, 1/1/89-12/31/90
"Crystal Chemistry of Hydrogen and Oxygen in Common Phyllosilicate Minerals"
\$61,774 funded, 1/1/92-12/31/93
"Development of Standards for Light Element Analysis in Geological Materials: Collaborative Research"
\$ 21,639 funded, 6/1/93-12/31/95
"The Boron Budget in High-Grade Pelitic Metamorphic Rocks: How, When, and Where does the Boron Go?" (Joint with C.V. Guidotti and E.S. Grew)
\$56,333 funded for period 1/1/96-12/31/97
"Hydrogen Partitioning and Fe³⁺ Exchange in Mantle Minerals: Effects on Mechanical Behavior - Collaborative Research" (Joint with S.J. Mackwell)
\$142,997 funded for period 11/1/93 to 5/31/98
\$5,000 supplement funded for 5/1/94 to 9/1/94
"Redox Processes in Rio Grande Rift and Colorado Plateau Xenoliths: Collaborative Research" (Joint with A.V. McGuire)
\$55,598 funded for period 6/1/94-5/31/98
\$7,000 supplement funded for 5/1/95 to 9/1/95
"Synchrotron MicroXANES Study of Iron Redox in Mantle Phases"
\$60,000 funded for period 8/15/98 - 2/28/01
"R.U.I.: Acquisition of a New Mössbauer spectrometer"
\$49,840 funded for period from 3/1/99 - 2/28/01
"R.U.I.: Collaborative Research: Chemical Equilibria Involving Iron and Hydrogen in Metapelites from Western Maine"
\$27,468 funded for period from 8/1/99 - 7/31/01

- “RUI: Acquisition of a Scanning Electron Microscope at Mount Holyoke College”
\$226,560 funded for period from 6/1/02-5/30/03
- “RUI: Collaborative Research: Hydrogen and Ferric Iron in Felsic Melts”
(collaborative with Sheila Seaman, University of Massachusetts)
\$86,000 funded for period from 1/1/03-12/31/06
- “RUI: Collaborative Research: Improvements in the Application of the Mössbauer Effect to Studies of Minerals”
(collaborative with Martha Schaefer, LSU)
\$76,939 funded for period from 1/1/05-12/31/08
- “Redox Ratios by Fe-XANES”
(collaborative with M. Gunter and A. Lanzirotti)
\$104,897 funded for period from 6/1/08-5/31/11
- “Effects of Composition and Cooling Rate on Fe XANES Glass Calibrations”
(Collaborative with Molly McCanta at Tufts University)
\$115,363 funded to MHC for period from 8/1/12 – 7/31/15

National Science Foundation, Division of Computation and Data-Enabled Science and Engineering:

- “Transfer Learning for Chemical Analyses from Laser-Induced Breakdown Spectroscopy”
(Sridhar Mahadevan, UMass, Co-I)
\$141,129 to MHC for period from 9/1/13 – 8/31/15

National Science Foundation, Division of Undergraduate Education:

- "Undergraduate Research Program in Materials Science"
\$14,500 funded, 5/1/88-9/30/88
- "Undergraduate Research Program in Materials Science"
\$36,600 funded, 5/1/89-12/31/89
- "Equipment for Program Improvement in Mineralogy/Petrology"
\$45,000 funded, 1/1/89-12/31/89
\$40,000 match from University of Oregon
\$7,500 match from I.B.M. and Novell
- “Support for Development of Minerals and Mineralogy: A Three-Dimensional Approach”
\$75,000 funded for period from 3/1/00 - 2/28/02
- “A Modular, Inquiry-Based Regional Approach to Introductory Laboratories”
(S. Good, C.G. Fisher, R.M. Busch, T.M. Lutz, L. Srogi, and C.G. Wiswall, Co-I’s) NSF grant DUE-9850923, \$40,800 funded, 6/1/98-5/31/2000.
- “An Integrative Curriculum in Earth, Human, and Environmental Sciences
(Joint with L. Savoy, M.J. Markley, A. Werner, M.A. McMenamin, S. Dunn, and T. Millete)
\$170,000 funded for period from 1/1/00 - 6/30/05
- “Support for Development of Minerals and Mineralogy: A Three-Dimensional Approach”
\$417,244 funded for period from 3/1/02 – 2/28/08
- “An Integrative Curriculum in Planetary Science”
(C.M. Hamilton, T. Burbine, co-Is)
\$91,900 funded for period from 9/1/05 – 8/31/07
- “Scaffolding Effective Practice for Use of Animations in Teaching Mineralogy and Physical Geology”
(M. Gunter and L. Wenk, Co-I’s)
\$150,000 funded for period from 1/1/09 -12/31/10
- “Building Analytical Competence for Geoscience Students through use of Spectroscopic Tools”
(Collaborative with John B. Brady and Eileen McGowan)
\$73,375 funded to MHC for period 8/15/12-7/31/15

National Science Foundation Scholarships in Science, Technology, Engineering, and Mathematics

“Improving Recruitment and Retention of Transfer Students to STEM Majors at Mount Holyoke College”
(Sarah Bacon and Becky Packard, Co-Is)
\$600,000 for period from 1/1/12-12/31/16

Packard Foundation

“Earth and Environmental Sciences in California and the Southwest” (Joint with A. Ellison, L. Savoy, and T. Millette)
\$200,000 funded for period from 1/1/00 - 12/31/02

Tektronix Foundation:

"Request for Upgrade to Mössbauer Spectroscopy Laboratory"
\$4,000, 1987; \$6,000, 1988; \$10,000, 1989

NASA, Cosmochemistry Division:

“Synchrotron microFTIR characterization of hydrogen in nominally anhydrous minerals in martian materials.”

\$68,000 funded for period from 1/1/01 - 12/31/02

“Ferric Iron and Hydrogen in Mars Minerals”

\$45,000 funded for period from 1/1/03 - 12/31/03

“Acquisition of a 4.5K Mössbauer Spectrometer”

\$35,345 funded for period from 1/1/05 to 12/31/06

NASA, Exobiology Program:

"Biogenic iron oxide transformations by thermophilic and mesophilic iron-reducing microbes"

James Holden, University of Massachusetts, PI

\$208,316 to MHC for period from 4/1/14-3/31/18

NASA, Mars Fundamental Research Program:

“Temperature Dependence and Resolution of Fundamental Mössbauer Parameters in Mars-Analog Minerals”

\$150,000 funded for period from 10/1/02 – 9/30/06

“Taking Apart the Rocks of Mars” (C. Pieters, P.I., J. Bishop, J. Sunshine, T. Hiroi, Co-Is)

NNG04GB53G

\$60,000 funded for period from 12/31/03 – 11/30/06

“Analysis and Characterization of Sulfates and Sulfides Using Multiple Spectral Techniques (M. Lane, P.I., J.L. Bishop, Co-I)

\$31,000 funded for period from 1/1/05-12/31/06

“Temperature Dependence and Resolution of Fundamental Mössbauer Parameters in Mars-Analog Minerals”

(collaborative with M. Schaefer, LSU)

\$90,000 funded for period from 3/1/06-2/28/09

“Mineral Standards and Technique Development for Laser-Induced Breakdown Spectroscopy”

\$375,000 funded for period from 3/1/06-2/28/09

“Formation of Magnetic Minerals on Mars by Alteration of Nanophase Ferric Oxides/Oxyhydroxides”

(Janice Bishop, SETI/Ames, PI)

\$30,000 funded for period from 3/1/06-2/28/09

“Further Analysis and Characterization of Sulfates and Sulfides Using Multiple Spectral Techniques”

(collaborative with Melissa Lane, Planetary Science Institute (PI), and Janice Bishop, SETI)

\$32,000 funded for period from 3/1/06-2/28/09

“Characterizing the Rocks of Mars through Integrated Spectroscopy”

(collaborative with C. Pieters (PI), J. Bishop, M. Lane, T. Hiroi, J. Sunshine)

- \$60,000 to MHC for period from 3/1/07 – 2/28/11
 “Analysis and Characterization of Phosphates Using Multiple Spectral Techniques”
 (collaborative with Melissa Lane (PI), Planetary Science Institute, and Janice Bishop, SETI)
 \$45,947 funded for period from 3/1/08-2/28/12
- “The State of Sulfur on Mars: Understanding the Interrelationships Among the Crystal Structure, Chemistry, and Spectroscopy of Sulfates and Sulfides “
 (collaborative with Melissa Lane (PI), Planetary Science Institute, and Janice Bishop, SETI)
 \$97,754 funded to MHC for period from 6/1/10-5/31/13
- “Technique Development for Laser-Induced Breakdown Spectroscopy: Calibration, Classification, and Light Element Analysis”
 (collaborative with Sam Clegg and Roger Wiens, LANL, and Martha Schaefer)
 \$719,000 funded for period from 3/1/09 – 5/30/14
- “Effects of Shock Metamorphism on Phyllosilicate Spectroscopy”
 (Joseph Michalski, P.I.)
 \$67,941 funded to MHC for period from 6/1/10-5/31/14
- “Impact History and Meteoritic Contributions to the Martian Upper Crust”
 (collaborative with Caleb Fassett, PI)
 \$261,888 funded to MHC for period 6/1/14-5/31/18
- “Transfer learning for chemical analyses from laser-induced breakdown spectroscopy on the surface of Mars”
 (collaborative with Sridhar Mahadavean)
 \$445,093 funded to MHC for period 11/29-14-11/30/17

NASA, Lunar Advanced Science and Exploration Research Program:

- “Thermodynamics, VIS-IR Spectroscopy, and Mapping of Adsorbed Water on the Moon”
 (K. Hibbitts, PI)
 \$33,920 to MHC for period from 6/1/08 – 5/31/09
- “Pyroxene Spectroscopy as a Tool to Probe the Composition and Thermal History of the Lunar Surface”
 (Rachel Klima, PI)
 \$104,914 to MHC for period from 1/1/10 – 5/31/13
- “The Stability and Transport of Water on the Moon”
 (Karl Hibbitts, P.I.)
 \$106,614 funded to MHC for period from 9/1/11-6/30/15
- “Solar Wind Induced Production of Hydroxyl and Water on the Moon”
 (Thomas Orlando, PI)
 \$9,313 to MHC for period from 9/1/11-6/30/15

NASA, Mars Science Laboratory Participating Scientist Program:

- “Enhancing Science Return from ChemCam through Laboratory and Statistical Analyses and Integration with APXS”
 \$476,885 for period from 2/15/12-12/31/16

NASA, Lunar Science Institute Program:

- “The Moon as Cornerstone to the Terrestrial Planets: The Formative Years”
 C.M. Pieters, PI, Brown University
 \$135,000 funded to MHC for period from 4/9/09 – 4/8/14

NASA Planetary Geology and Geophysics Program:

- “Integrated Spectroscopy of Pyroxenes: Composition, Structure, and Thermal History”
 (Rachel Klima, PI)
 \$32,711 to MHC for period from 8/5/11-8/4/14

“Pyroxene Spectroscopy, Composition, Structure, and Thermal History”
(Rachel Klima, PI)
\$91,313 to MHC for period from 6/1/13 – 5/31/16

NASA Solar System Workings Program:

“SuperCam-Analog Laser-induced Breakdown Spectrometer at Mount Holyoke College”
\$445,095 for period 10/1/16-9/30/18

NASA, Solar System Exploration and Research Virtual Institute Program:

“Volatiles, Regolith and Thermal Investigations Consortium for Exploration and Science (VORTICES)”
Ben Bussey, APL, PI
\$51,998 to PSI for period from 1/1/14-12/31/18

NASA Emerging Worlds Program:

“Volatile Adsorption onto Primitive Grains for Understanding the Formation of the Early Solar System”
Karl Hibbitts, PI
\$13,858 to PSI for period from 3/1/15-2/28/18

CURRENT FUNDING:

NASA, Solar System Exploration and Research Virtual Institute Program:

“Remote, In Situ, and Synchrotron Studies for Science and Exploration”

Tim Glotch, Stony Brook Univ., PI (**Dyar is Deputy PI**)

\$777,256 to MHC for period from 1/1/14-12/31/18

“Environment and Evolution of Exploration Destinations: Science and Engineering Synergism”

Carle Pieters, Brown Univ., PI

\$135,600 to MHC for period from 1/1/14-12/31/18

“TREX: Toolbox for Research and Exploration”

Amanda Hendrix, PSI, PI

\$5,483,517 to PSI 6/1/17 – 5/31/22

NASA, Apollo Next Generation Sample Analysis Programy Program:

“Spectroscopy Consortium Addressing Redox Acquired by Beads (SCARAB)”

M. Darby Dyar, P.I.

\$658,034 to PSI for period from 4/1/19-3/30/22

NASA, Exobiology Program:

“ICE-MAMBA Ice-covered Chemosynthetic Ecosystems: Mineral Availability and MicroBiological Accessibility”

Jill Mikuchi, Univ. of Tennessee, PI

\$208,316 to PSI for period from 1/22/17-1/21/20

“Fe(III) Oxide Reduction by a Hyperthermophilic Crenarceon: Novel Mechanisms and Detection”

James Holden, Univ. of Massachusetts, Amherst, PI

\$230,236 to PSI for period from 10/1/18 – 9/30/21

NASA Solar System Workings Program:

“Oxidation State of Lunar Glasses: Implications for Surface and Eruptive Processes on the Moon”

Molly McCanta, PI

\$136,530 to PSI for period from 10/1/16-3/30/19

“Towards Quantifying Oxygen Fugacity in Solar System Materials: In Situ Multivalent Element Analyses in Pyroxene”

Molly McCanta, PI

\$267,184 to Dyar for period from 10/1/18 – 9/30/21

NASA Planetary Data Archiving, Restoration, and Tools:

“Advanced XAS Calibration Tools for In Situ Analysis of Redox States of Fe, Ti, Mn, Cr, V, and Eu in Extraterrestrial Glasses”

M. Darby Dyar, P.I. with Molly McCanta, Univ. of Tennessee

\$208,997 to PSI for period from 1/15/17-1/14/20

NSF Information Integration and Informatics

“Collaborative Research: Deep Learning for Spectroscopy”

Collaborative with Sridhar Mahadevan and Mario Parente

\$373,793 to MHC for period from 4/1/16-3/31/20

NSF Petrology and Geochemistry:

“Refining Geothermobarometry in Pyroxenes using In Situ Measurements of Fe³⁺”

M. Darby Dyar, P.I. with Molly McCanta, Univ. of Tennessee

\$172,000 to MHC for period from 7/1/18 – 6/30/2101

NSF Planetary Astronomy:

“Formation, Stability, and Detection of Amorphous Ferric Sulfate Salts on Mars”

Elizabeth Sklute, PI

\$232,273 to MHC for period from 10/1/18 – 9/30/21