

Curriculum Vitae

Glenn Alfred Waychunas

Senior Staff Scientist, Earth Sciences Division, Lawrence Berkeley National Laboratory
Group leader for Molecular Geochemistry and Nanogeoscience
Principal Investigator: ESD Experimental and Theoretical Geochemistry Program

Personal Information: Married to Linda A. Kuhli
Citizenship: United States

Education: B.A. Temple University, Philadelphia, Pennsylvania
Major: Chemistry, Minors: Geology, Mathematics

Honors: Dean's List four years; Magna cum Laude; Chemistry dept.highest honors

Ph.D. University of California, Los Angeles
Major: Geochemistry, Minors: Materials Science, Physical Chemistry
Honors: Neumann Fellowship; University Fellowship
Thesis Advisor: Prof. Wayne A. Dollase
Thesis: Detailed atomic structure of oxide solid solutions

Research Interests:

Application of synchrotron radiation-based spectroscopy and scattering methods to problems in geochemistry, environmental chemistry and mineral-water interface chemistry;
X-ray scattering studies of atomic arrangements in amorphous materials, nanoparticles, surfaces, and wet interfaces;
Non-linear optical spectroscopy of interface molecular, electronic and water structure;
Computer modeling of crystal structures, solid solutions, crystal surfaces and surface water structure; calculation of x-ray and related spectra of materials
Nucleation phenomena and topology; kinetics of precipitation processes at mineral surfaces;
Luminescence and electronic properties of solids and interfaces.

Professional Experience:

2007-present: Senior Staff Scientist, ESD Geochemistry Dept., LBNL
11/3/97-3/2007: Staff Scientist, ESD, Geochemistry Dept., LBNL
2007-12, member Scientific Advisory Committee, Advanced Photon Source, Argonne National Laboratory
2008-2012, chair, Scientific Advisory Committee, Stanford Synchrotron Radiation Laboratory, Stanford University
2011-present, PI BES Theoretical and Experimental Geochemistry Program, LBNL ESD
2008-present, PI Nanogeoscience program, LBNL ESD
2000-present, Molecular Geochemistry and Nanogeoscience group leader
2009-2012 Proposal Review Board, Canadian Light Source; Chair 2010-2012

2003-04 Co-chair Stanford Synchrotron Radiation Laboratory Users Organization Executive Committee (SSRLUOEC); 2004-05 Chair of SSRLUOEC
2005-2009 Proposal review panel Advanced Light Source
2005; 2009-2010 Search Committee for SSRL director, SLAC ALD
2008-present Professional Staffing Committee, ESD, LBNL
2007 Lytle award; Spicer award committees, Stanford University SSRL
2005-6, Organization committee for XAFS XV International Meeting
2001 DOE NABIR Proposal evaluation panel
2007 DOE ERSP Proposal evaluation panel
2001-04, Committee on Short Courses, MSA; Chair 2003-2004
2002-present, Editorial Board, International Journal of Nanotechnology
2002, Short Course Lecturer Mineralogical Society of America (Luminescence of Apatite; Grazing incidence methods in synchrotron x-ray spectroscopy)
2000, Award for Excellence in Editing, American Mineralogist, MSA
1989-93; 1997-2001, Associate Editor, American Mineralogist, MSA
1990-present, Fellow, Mineralogical Society of America
1999-present, member, G.T. Seaborg Transuranic Institute, Chemical Sciences Division, LBNL
2001, Short Course Lecturer Mineralogical Society of America (Structural characterization of Nanomaterials)
1998, Kraus Crystallographic Award Committee, MSA
1994-98, Member of CARS (Consortium for advanced radiation sources, University of Chicago) Board of Governors
1998-present, GSECARS steering committee member
1999 Organization Committee for ALS Users meeting
1998-present, charter member, Envirosync organization
1982-97: Director of X-ray diffraction/spectroscopy laboratory, Center for Materials Research (CMR), Stanford University, Stanford, California.
1982-97, Senior Research Scientist, School of Engineering, Stanford University
1994-96, Chair of Geosync organization, AGU; Charter member Geosync
1996-99, At-large representative, Geosync organization
1980-92, Center for Materials Research, Stanford University, Central Facilities Committee
1994-2000, Design team leader, x-ray spectroscopy, GSECARS, APS
1984-98, Lecturer, Stanford University
1991, Short Course Lecturer Mineralogical Society of America (Spectroscopic/Mathematical methods)
1988, Short Course Lecturer Mineralogical Society of America (X-ray Spectroscopy)
1989-1990, Committee on Committees, MSA
1983, 1987, Review Committee for GSA/MSA abstracts, GSA National Meeting
4/89-7/89 Guest Professor at the Bayerisches Geoinstitut (Universität Bayreuth, Federal Republic of Germany.
1984;1993, Ph.D. Orals Examination Committee, Materials Science and Engineering Dept. Stanford University; Acting Prof. Stanford University School of Engineering.

Submitted, Published Invited Abstracts and Extended Abstracts

- (203) Fernandez-Martinez A, Cuello G, Bourg I, Johnson M, Waychunas G, Sposito G and Charlet L “Water structure and hydration properties of Imogolite nanotubes. Goldschmidt meeting Prague, Czech Republic Aug 18, 2011
- (202) Waychunas G, Sung J and Shen Y R “Sum frequency vibrational spectroscopy of water and hydroxyls on the corundum (1-102) surface: Acid-base properties from direct observation of protonation states. Goldschmidt meeting Prague, Czech Republic Aug 18, 2011 (invited)
- (201) Gilbert B, Katz J, Zhang X, Attenkofer K, Frandsen C, Zarzycki P, Rosso K, Waychunas G “origin of the differences in redox reactivity of iron oxyhydroxides revealed by time-resolved spectroscopy. Goldschmidt meeting Prague, Czech Republic Aug 18, 2011
- (200) Jun Y-S, Lee B, Hu Y, Ray J, Waychunas G and Fernandez-Martinez A “Nucleation and growth mechanisms and kinetics of environmentally important oxides and carbonates” Goldschmidt meeting Prague, Czech Republic Aug 17, 2011 (keynote)
- (199) G A Waychunas Princeton talk March 23 “What do we understand about natural nanoparticles?” (invited)
- (198) G A Waychunas “Low dimensional mineralogy: surfaces, bound interfacial water and nanoparticles” Geophysical Laboratory (Carnegie Institution Washington) talk March 21, 2011 Washington DC (invited)
- (197) A Fernandez-Martinez, Y Hu, Y-S Jun, G A Waychunas “New insights into the structure of Amorphous Calcium Carbonate from neutron and X-ray scattering investigations.” ACA meeting June 1, 2011 New Orleans
- (196) B Gilbert, P Eng, J F Banfield and G A Waychunas “Crystal truncation rod studies of the Pyrite (001) surface.” International Mineralogical Association General Meeting Budapest, Hungary August 26, 2010 (invited)
- (195) G A Waychunas “Mineralogy and geochemistry at lower dimensionality: Mineral-water interfaces and nanoparticles.” International Mineralogical Association General Meeting Budapest, Hungary August 27, 2010 (invited-plenary)
- (194) S K Ghose, G A Waychunas, P J Eng, T P Trainor “Structure and Reactivity of Hydrated Goethite (100) Interface and Arsenic Sorption: CTR and RAXR Study.” Goldschmidt meeting, Knoxville TN June 13-18, 2010 (invited)
- (193) D M Singer, J F Banfield, G A Waychunas “Identification of U(VI) Sorption Products and Precipitates on magnetite by GI-SAXS, GI-XAS, and Microscopy.” Goldschmidt meeting, Knoxville TN June 13-18, 2010 (submitted)
- (192) J F Banfield, H Zhang, B Gilbert, K H Williams, S Singer, G Waychunas “A Perspective on nanominerals and their Roles in Microbial Ecosystems.” Goldschmidt meeting, Knoxville TN June 13-18, 2010 (invited)
- (191) J E Stubbs, P J Eng, G A Waychunas, M T Paffett, J R Bargar “Structure of hydrated UO₂ surfaces.” Goldschmidt meeting, Knoxville TN June 13-18, 2010
- (190) Y-S Jun, G A Waychunas, B Lee “Surface-Mediated Nucleation and Growth of Iron Oxides.” Goldschmidt meeting, Knoxville TN June 13-18, 2010 (invited)
- (189) G A Waychunas, J Sung and Y R Shen “Nanoparticle surface properties deduced from single crystal mineral/water interface studies.” Goldschmidt meeting Knoxville, TN June 13-18, 2010 (invited)
- (188) B Gilbert, J Katz, J Banfield, H Zhang, R Falcone, G A Waychunas “Observing Iron Redox Dynamics at the Nanosecond Scale with Time-Resolved X-ray Spectroscopy.” Goldschmidt meeting Knoxville, TN June 13-18, 2010 (invited)

- (187) J A Davis, G A Waychunas “Past, present, and future of surface complexation modeling.” ACS annual Meeting, March 21, 2010, San Francisco, CA (invited)
- (186) J E Katz, B Gilbert, X Zhang, K Attenkofer, R Falcone, G A Waychunas “ Ultrafast time-resolved X-ray absorption measurements of the reductive dissolution of iron oxide nanoparticles.” ACS annual Meeting, March 24, 2010, San Francisco, CA
- (185) D M Singer, J F Banfield, G A Waychunas “Identification of U(VI) sorption products on magnetite by grazing incidence X-ray scattering and X-ray absorption spectroscopy.” ACS annual Meeting, March 24, 2010, San Francisco, CA
- (184) H Zhang, G A Waychunas, and J F Banfield “Study of formation of iron-hydroxyl molecular clusters using molecular dynamics simulations.” ACS annual Meeting, March 22, 2010, San Francisco, CA
- (183) G A Waychunas “Molecular scale mineral-water interface studies using crystal truncation rod surface diffraction and sum frequency vibrational spectroscopy.” Special seminar, Princeton University, Geology Dept., Jan 22, 2010 (invited).
- (182) G A Waychunas “Cutting-edge Investigations in Synchrotron-based Environmental Sciences.” Eastern Forum of Science and Technology, Chinese Academy of Sciences, Shanghai, China, November 6, 2009 (invited)
- (181) J E Katz, B Gilbert, X Zhang, K Attenkofer, J Banfield, R Falcone, G Waychunas “Ultrafast Time-resolved X-ray absorption measurements of the reductive dissolution of iron-oxide nanoparticles.” GSA/MSA symposium in honor of 2009 MSA and Roebling awardees. Oct 2009, Denver (invited)
- (180) G A Waychunas “Mineralogy and geochemistry in 2 dimensions: Mineral surface and interface structure, and connection to nanomineralogy.” UC Berkeley EPS Dept. Seminar Sept. 10, 2009 (invited)
- (179) G A Waychunas “Ordered water structure at mineral-water interfaces: Consequences for sorption, precipitation and pore solution transport.” Goldschmidt International Conference Abstracts volume, Davos Switzerland, June 2009 (invited)
- (178) B Gilbert, G A Waychunas, D Spagnoli, J F Banfield and R L Penn, “The Crystal Chemistry of Ferrihydrite.” Materials Research Society Spring Meeting, April 15, 2009 (invited)
- (177) G A Waychunas et al. “Sulfate sorption and incorporation into iron oxyhydroxide minerals.” ACS annual meeting, Salt Lake City, Utah March 2009 (invited)
- (176) G A Waychunas et al. “The crystal chemistry of iron-oxyhydroxide-silica interfacial reactions.” ACS annual meeting, Salt Lake City, Utah March 2009 (invited)
- (175) D Spagnoli et al. “Predicting the effect of ordered water on the adsorption of ions on nanoparticle surfaces and aggregation of hematite nanoparticles.” ACS annual meeting, Salt Lake City, Utah March 2009
- (174) G A Waychunas “Complementary nanoparticle structural analysis using EXAFS, XANES, PDF and simulations.” SSRL Annual meeting Workshop on EXAFS analysis Oct 2008 (invited)
- (173) G A Waychunas "Natural nanoparticle shape, structure, properties and reactivity from x-ray studies" Denver X-ray Conference Aug 2008 (plenary-invited)
- (172) YS Jun, G A Waychunas, B Lee “Nature of environmental nanoparticle development at mineral-water interfaces.” Goldschmidt International Conference abstracts , Vancouver BC Canada July, 2008 (invited).
- (171) Young-Shin Jun, Glenn A. Waychunas, and Byeongdu Lee, “Nucleation and Growth of Environmental Oxide Nanoparticles at Water-Mineral Interfaces” , Gordon Research Conference on Environmental Sciences: Water, Future Challenges and Advances in Aquatic Sciences, Holderness School, Holderness, NH, June 22-27, 2008. (invited)

- (170) G Waychunas, S Ghose, L Zhang, C Tian and YR Shen “Water structure on mineral surfaces: Comparisons between quartz, corundum and goethite.” Goldschmidt International Conference abstracts, Vancouver BC Canada July, 2008
- (169) GA Waychunas, B Gilbert, J Banfield and K Attenkofer “Time-resolved and Ultrafast imaging of redox processes on mineral surfaces.” 2008 Analysis, Imaging, and Separations Research Meeting. DOE BES Program and Abstracts. Annapolis, MD May 4-7, 2008. (invited)
- (168) D Spagnoli, JF Banfield, GA Waychunas, B Gilbert “The Structure of water around iron oxide mineral nanoparticles.” Goldschmidt International Conference abstracts, Vancouver BC Canada July, 2008
- (167) YS Jun, GA Waychunas “Molecular-investigation of silicate passivation of iron oxide surfaces.” Abstracts and program. ACS National Meeting, New Orleans LA April 7, 2008
- (166) GA Waychunas, P Eng, SK Ghose, YR Shen, D Spagnoli, TP Trainor, L Zhang “Ordering of water near mineral surfaces: recent observations, simulations, and consequences.” Abstracts and Program. ACS National Meeting New Orleans LA April 7, 2008 (invited)
- (165) YS Jun, GA Waychunas, B Lee “Kinetics of early nucleation and growth of iron oxide nanoparticles at mineral-water interfaces.” Abstracts and Program. ACS National Meeting, New Orleans LA April 7, 2008.
- (164) L Zhang, YR Shen, C Tian, GA Waychunas “Vibrational spectroscopy on alumina/water interfaces with surface charges.” Abstracts and Program. ACS National Meeting, New Orleans LA April 7, 2008.
- (163) D Spagnoli, JF Banfield, GA Waychunas and B Gilbert “The Structure of water around hematite nanoparticles” December AGU National Meeting, SF CA 2007
- (162) YS Jun, GA Waychunas and B Lee “Nucleation and Growth of Environmental Nanomaterials at Water-Mineral Interfaces”, Special Session on “Environmental, Ecological and Biogeochemical Impacts of Natural and Synthetic Nanomaterials,” 2007 AGU Fall Meeting, San Francisco, CA, USA, December 10-14, 2007.
- (161) GA Waychunas “There’s plenty of time at the beginning: time-resolved and ultrafast measurements of geochemical reactions.” GSA National meeting Nov 2007 (invited)
- (160) GA Waychunas “Synchrotron scattering and spectroscopy methods applied to interface kinetics.” CEKA EMSI meeting Penn State Univ Oct 19, 2007 (invited)
- (159) YS Jun, GA Waychunas, B Lee “Nucleation and Growth of Iron Oxide Nanoparticles at Water-Mineral Interfaces Using *In Situ* Time-Resolved GISAXS” CEKA EMSI meeting Penn State Univ Oct 18, 2007 (invited)
- (158) YS Jun, GA Waychunas, B Lee “Kinetic Study of Nucleation and Growth of Environmental Nanoparticles at Water-Mineral Interfaces Using *In Situ* Time-Resolved GISAXS” ACA Annual Meeting, Salt Lake City UT July 2007
- (157) YS Jun, GA Waychunas “Molecular-level investigations of nucleation mechanisms and kinetics of formation of environmental nanoparticles: Results from silicate on hematite and iron oxides on quartz.” 2nd Annual Environmental Sciences Remediation program PI Meeting, Lansdowne VA April, 2007
- (156) C Tian, N Ji, V Ostroverkhov, G Waychunas, YR Shen “Interfacial structures of acidic and basic aqueous solutions” ACS National meeting Chicago IL March 2007
- (155) L Zhang, YR Shen, GA Waychunas “Water interaction with nanostructured silicon oxide surfaces” ACS National meeting Chicago IL March 2007
- (154) N Ji, V Ostroverkhov, G Waychunas, YR Shen “Interfacial water/vapor structure of NaI aqueous solutions” ACS National Meeting Chicago IL March 2007

- (153) GA Waychunas, B Gilbert, CS Kim “Strengths and weaknesses of structure probes for poorly crystalline and nanocrystalline minerals.” ACS National Meeting, Chicago March 2007 (keynote-invited)
- (152) YS Jun, GA Waychunas, MF Toney “Morphological characterization of environmental oxide nanoparticles on mineral surfaces using grazing incidence small angle X-ray scattering.” ACS National Meeting, Chicago March 2007
- (151) V Ostroverkhov, J Na, C.Y. Chen, G. A. Waychunas, Y-R. Shen “Phase-sensitive sum-frequency vibrational spectroscopy on water/vapor interfaces.” CLEO/QELS Laser conference, Long Beach, CA May 2006
- (150) GA Waychunas, PJ Eng, S Ghose, T Trainor, J Bargar “Structure and chemistry of the mineral-water interface: A molecular view” Washington Univ. St. Louis, February, 2007 (invited)
- (149) GA Waychunas “Crystal truncation rod surface diffraction studies of hydrated oxide surfaces: Equilibrium structure, sorption effects, and time-resolved experiments.” Glenn T. Seaborg Center Presentation, LBNL November 10, 2006 (invited).
- (148) PJ Heaney, JD Kubicki, CE Martinez, R Mathur, K Osseo-Asare, GA Waychunas, CF Conrad, YS Jun, K Basilevskaya, DR Hummer, C Lopano, AJ Wall “From Atom to Crystal: A Multidisciplinary Effort to understand the precipitation of soil-forming minerals in aqueous systems.” GSA Annual Meeting, Philadelphia PA October 2006
- (147) SK Ghose, G Waychunas, P Eng, T Trainor, J Catalano “Surface structure and reactivity of hydrated goethite (α -FeOOH) (100) surface. ACS National meeting, San Francisco CA September 2006 LBNL-61142
- (146) GA Waychunas, C S Kim, B Gilbert, H Zhang, J F Banfield “Nanoparticle structure, surface structure and crystal chemistry.” Goldschmidt International Meeting, Melbourne Australia September 2006. LBNL-61140 (invited)
- (145) GA Waychunas, V Ostroverkhov, N Ji, L Zhang, Y R Shen “Probing water structure at mineral-water and water-vapor interfaces: New possibilities for molecular geochemistry.” ACS National Meeting, San Francisco CA September 2006 LBNL-61141
- (144) YS Jun, G A Waychunas, M F Toney “Nucleation and growth of nanoparticles on mineral surfaces: First environmental applications of grazing incidence small angle x-ray scattering.” ACS National Meeting, San Francisco CA September, 2006
- (143) YS Jun, G A Waychunas, P J Eng, T P Trainor, S K Ghose “Silicate adsorption on the r-plane (1-102) surface: A crystal truncation rod study.” ACS National Meeting, San Francisco CA September 2006 LBNL-61144
- (142) T Trainor, P Eng, A. Chaka, G. Brown, K Tanwar, S Petitto, C Lo, S Ghose, G Waychunas “Structure of the iron-oxide aqueous solution interface via coupled surface x-ray diffraction and density functional theory.” ACS National Meeting, San Francisco CA September 2006 LBNL-61145
- (141) R Chandrasekharan, V Ostroverkhov, S Prakash, L Zhang, G Waychunas, YR Shen and M Shannon “High-Temperature Hydroxylation of Alumina Crystalline Surfaces: An FTIR-ATR and SFG Spectroscopic Study.” MRS Spring Meeting April 19, 2006 San Francisco LBNL-61146
- (140) S K Ghose, G Waychunas, P Eng, T Trainor and J Catalano “Surface structure determination of an elusive oxide: Goethite (FeOOH).” ACS National Meeting, Atlanta GA March 29, 2006. LBNL-61147
- (139) Y R Shen, V Ostroverkhov, E C Chen, J Na, G Waychunas “Phase-sensitive sum-frequency vibrational spectroscopic studies of water interfaces.” ACS National Meeting, Atlanta GA March 27, 2006 (Invited). LBNL-61148

- (138) G A Waychunas, V Ostroverkhov, YR Shen “A New Method for studying water at mineral-water interfaces: Phase Sensitive-Sum Frequency Vibrational Spectroscopy (PS-SFVS)” Geochemistry Dept. Director’s review. April 12, 2006.
- (137) G A Waychunas, Y.-S. Jun, M. Toney, P. J. Eng, S. Ghose and T.P. Trainor “Kinetics and morphology of nanoparticle nucleation and growth on mineral surfaces.” DOE BER ERSF meeting, Airlie House VA April 4, 2006. LBNL-61149
- (136) G A Waychunas, Y.-S. Jun, P. J. Eng, S. Ghose and T. P. Trainor “Anion sorption topology on hematite: Comparison of arsenate and silicate.” ACS National Meeting, Atlanta GA March 27, 2006. (invited) LBNL-61150
- (135) C S Kim, L E DeGreeff, C J Lentini, M A McKee and G A Waychunas “Spectroscopic and macroscopic studies of heavy metal interactions with iron oxyhydroxide nanoparticles. NIRT NSF nanoparticle symposium 17 Jan 2006 Albuquerque, NM LBNL-61151
- (134) G A Waychunas “Nanoparticles, surface structure, and crystal chemistry” NIRT NSF nanoparticle symposium 17 Jan 2006 Albuquerque, NM (invited) LBNL-61152
- (133) G A Waychunas et al. “Combining crystal truncation rod diffraction and Grazing-incidence XAS information to determine surface complexation geometry.” Stanford SSRL Users Meeting 17 Oct 2005. (invited) LBNL-61153
- (132) K Bazilevskaya, G Waychunas, C E Martinez “What surface analyses/techniques tell us about mixed Al-Fe coatings formed on quartz surfaces.” ACS National Meeting, Washington DC Aug 28, 2005. LBNL-61154
- (131) C S Kim and G A Waychunas. “Reaction of iron oxyhydroxide nanoparticles with heavy metals as a function of particle size.” Goldschmidt Conference Moscow, Idaho. May 25, 2005.
- (130) T P Trainor, P Eng, A M Chaka, C Lo, K Tanwar, S Ghose, J G Catalano, G A Waychunas, G E Brown, A Templeton. “Structure and reactivity of hydroxylated hematite surfaces: Application of surface x-ray diffraction and spectroscopy. Goldschmidt Conference, Moscow, Idaho. May 24, 2005.
- (129) V Ostroverkhov, G.A. Waychunas, Y.R. Shen “Phase sensitive sum-frequency vibrational spectroscopy of water on hydrophilic and hydrophobic interfaces.” APS National Meeting, Los Angeles, CA March 21, 2005.
- (128) T P Trainor, A M Chaka, P Eng, J G Catalano, G A Waychunas, G E Brown, M Newville “Structure of the hydroxylated α -Fe₂O₃ (0001) surface: Surface X-ray diffraction and density functional theory results.” ACS National Meeting San Diego, CA March 16, 2005.
- (127) J G Catalano, T P Trainor, P Eng, G A Waychunas, G E Brown “Surface X-ray scattering and spectroscopy studies of U(VI) adsorption on corundum and hematite single-crystal surfaces.” ACS National Meeting San Diego, CA March 17, 2005.
- (126) C S Kim, M F Toney, G A Waychunas, J F Banfield “Small- and wide-angle x-ray scattering studies of aggregation-based growth in goethite (α -FeOOH) nanoparticles. ACS National Meeting San Diego, CA March 16, 2005.
- (125) G.A. Waychunas “Surface complexation geometry obtained from in-situ surface x-ray diffraction.” NIRT workshop on nanotechnology, Tempe AZ December 5-7, 2004 (invited)
- (124) G.A. Waychunas “Complementary Grazing incidence EXAFS and Crystal Truncation rod surface diffraction studies of arsenate sorption on hematite surfaces.” Actinide-XAS-2004 LBNL Sept 14, 2004 (invited).
- (123) Gaft M, Nagli L and Waychunas G “Nature of benitoite BaTiSi₃O₉ Luminescence” Vienna Workshop/European Mineralogical Spectroscopy Conference Vienna, Austria Sept, 2004

- (122) V. Ostroverkhov, G.A. Waychunas and Y.R. Shen “Sum-frequency vibrational spectroscopy of water/ α -quartz interfaces.” CLEO National Meeting, San Francisco, CA May 18, 2004.
- (121) V. Ostroverkhov, G.A. Waychunas, and Y.R. Shen “Sum-frequency surface vibrational spectroscopy with amplitude and phase.” APS National meeting, Montreal, CA March 22, 2004.
- (120) Huang F, Gilbert B, Zhang H, Finnegan M, Rustad J, Kim C, Waychunas G, Banfield J “Interface interactions in nanoparticle aggregates.” Goldschmidt meeting June, 2004 Copenhagen, Denmark
- (119) Kim CS, Toney MF, Waychunas GA, Rustad JR Banfield JF “Synchrotron-based studies of nanoparticulate iron oxyhydroxide growth and metal uptake.” Goldschmidt meeting June, 2004 Copenhagen, Denmark
- (118) T.P. Trainor, P.J. Eng, J.G. Catalano, G.E. Brown and G.A. Waychunas “Crystal truncation rod diffraction study of the hydrated hematite (1-102) surface.” 227th National ACS meeting, Anaheim CA. March 30, 2004.
- (117) S.C.B. Myneni, G.A. Waychunas, S.J. Traina and G.E. Brown “Predicting oxoanion complexation in aqueous solutions and at mineral-water interfaces.” 227th National ACS meeting, Anaheim CA April 1, 2004.
- (116) Y.R. Shen, V. Ostroverkhov, and G.A. Waychunas “Sum-frequency vibrational spectroscopy of water/quartz interfaces: Crystalline vs. fused quartz.” 227th National ACS meeting, Anaheim CA April 1, 2004.
- (115) G.A. Waychunas, T.P. Trainor, P.J. Eng, M. Newville, J.G. Catalano and G.E. Brown “Surface EXAFS and diffraction study of arsenate sorption on hematite single crystals.” 227th National ACS meeting, Anaheim CA March 30, 2004.
- (114) C.S. Kim, J.F. Banfield and G.A. Waychunas “Unique reactivity and speciation of heavy metals on goethite nanoparticles.” 227th National ACS meeting. Anaheim, CA March 30, 2004.
- (113) G. DeStasio, G.A. Waychunas, C. Chan and J.F. Banfield "Iron at the L-edge: spectromicroscopy of Fe minerals and Fe oxidizing bacteria" AGU National Meeting, San Francisco, 12/2003
- (112) C.S. Kim, J.F. Banfield and G.A. Waychunas “Reactivity and speciation of heavy metals with nanoparticulate goethite.” AGU National Meeting, San Francisco, 12/2003.
- (111) G. E. Brown, J. R. Bargar, T. P. Trainor, P. J. Eng, J. P. Fitts and G.A. Waychunas “Applications of Crystal Chemistry to Mineral Surface Geochemistry” GSA National Meeting, Seattle, WA 11/2003.
- (110) D. A. Shaughnessy, C. H. Booth, H. Nitsche, D. K. Shuh, G. A. Waychunas, R. E. Wilson, H. Gill, K. J. Cantrell, R. J. Serne “Molecular interfacial reactions between Pu(VI) and Manganese Oxide minerals manganite (MnOOH) and hausmannite (Mn₃O₄)” Migration 2003 Conference, Gyeongju, Korea, September 21-26, 2003.
- (109) G.A. Waychunas, T.P. Trainor and P.J. Eng “Crystal Truncation Rod (CTR) diffraction and Grazing-incidence EXAFS (GIXAFS) studies of Molecular Structure at the Mineral-Water Interface.” IUPAC meeting Qttawa Canada August 10-15, 2003
- (108) J.F. Banfield, F. Huang, B. Gilbert, H. Zhang, J. Moreau and G.A. Waychunas “Nanoparticles: size-structure-reactivity interrelationships.” Goldschmidt meeting, Japan.
- (107) B. Gilbert, H. Zhang, F. Huang, M. Finnegan, G.A. Waychunas and J.F. Banfield. “Special phase transformation and crystal growth pathways observed in nanoparticles.” ACS national meeting. New Orleans, LA March 23-27, 2003.

- (106) G. A. Waychunas, J.A. Davis and R. Reitmeyer. "Iron hydroxide nanoprecipitate formation and suppression on quartz surfaces." ACS national meeting. New Orleans, LA March 23-27, 2003.
- (105) G.A. Waychunas, C.C. Fuller, J.A. Davis and J.J. Rehr. "Comparison of Multiple scattering XANES and EXAFS analysis of Zn sorption on ferrihydrite." DOE PI Geochemistry Symposium. ANL March 7, 2003
- (104) V. Ostroverkhov, G.A. Waychunas and Y.R. Shen. "Sum-frequency vibrational spectroscopic studies of the mineral-water interface. APS National Meeting March, 2003.
- (103) C.S. Kim, J.F. Banfield and G.A. Waychunas. "Characterization and reactivity of nanoparticulate goethite." ACS national meeting. New Orleans, LA March 23-27, 2003.
- (102) P.J. Lam, J.K. Bishop, G.A. Waychunas, S.R. Sutton and M. Newville. "Characterization of Fe in marine particulates via micro-XAS: Possibilities and limitations. LBNL-50849, 2002.
- (101) P.J. Lam, J.K. Bishop, and G.A. Waychunas "Characterization of Fe in marine aggregates via micro-XAS: preliminary results." JGOFS (Joint Global Ocean Flux Study) Iron Workshop. Monterey Bay Aquarium Research Institute. Moss landing, CA June, 2002.
- (100) T. P. Trainor, P. J. Eng, G.A. Waychunas, J.C. Catalano and G.E. Brown. "Structure of the hydrated hematite (0001) surface." AGU National Meeting, San Francisco CA December 8, 2002.
- (99) G.A. Waychunas "Grazing incidence x-ray absorption and emission spectroscopy." MSA/Geochemical society shortcourse on synchrotron radiation. Carmel, CA December 4, 2002 (Invited).
- (98) G.A. Waychunas "X-ray spectroscopy applications in the Environmental sciences", Users meeting of Canadian Light Source. Saskatoon, CA November 16, 2002 (invited).
- (97) G.A. Waychunas "Apatite Luminescence". GSA meeting symposium on phosphates. Denver, CO October 29, 2002 (Invited).
- (96) G.A. Waychunas "Report on the NanoGeoscience workshop at Berkeley, June 14-16, 2002." NSF headquarters Washington, D.C. October 21, 2002. (Invited).
- (95) G.A. Waychunas "Applications in sulfur geochemistry at the ALS." ALS Users meeting, October 10-12, 2002 (Invited).
- (94) G.A. Waychunas "Importance of water structure in defining complexation on mineral surfaces." Physics dept. UC Berkeley July 12, 2002 (Invited).
- (93) G. A. Waychunas "How do bulk crystal surfaces differ from nanocrystal surfaces?" NSF-NRC NanoGeoscience workshop. LBNL June 14, 2002 (Invited).
- (92) G. A. Waychunas "Sulfate binding in nanocrystalline Fe oxyhydroxides." (Invited) PNNL/EMSL May 23, 2002
- (91) Shaughnessey, D., Nitsche, H., Serne, R., Shuh, D., Waychunas, G., Booth, C., and Cantrell, K. "Transuranic Interfacial Reaction Studies on manganese Oxide Mineral Surfaces." (Invited) EMSP FY 2002 Vadose Zone Workshop, Richland, WA. 5-6 November, 2001.
- (90) Shaughnessey, D., Nitsche, H., Serne, R., Shuh, D., Waychunas, G., Booth, C., Cantrell, K. and Wilson, R. "Complexation and Redox Interactions between Aqueous Plutonium and manganese Oxide Interfaces." Actinides 2001 International Conference, Hayama, Japan. 4-9 November, 2001.
- (89) G. A. Waychunas. "Applications of Grazing Incidence x-ray spectroscopy for Mineralogical and Geochemical analysis." (Invited) European Mineralogical Spectroscopy Congress abstract, Sept., 2001, Paris, France. Bull. Soc. Franc. Mineral. Crist. 13, 113.
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- (6) Waychunas, G.A. "Mossbauer, X-ray and EXAFS study of Fe³⁺ clustering in MgO and MgO-Fe_{1-x}O: Evidence for specific cluster geometries", *J. Materials Science*, 18, 195-207 (1983).
- (5) Waychunas, G.A. "Mathematical Techniques in Crystallography and Materials Science, E. Prince, Springer-Verlag, 1982", *Amer. Assn. Cryst. Growth Newsletter*, 12, 4 (Book Review) (1982).
- (4) Waychunas, G.A. "Advances in X-ray Analysis, Vol. 24, Plenum Press, New York", *Am. Mineral.*, 67, 1083 (Book Review) (1982).
- (3) Apted, M.J., Waychunas, G.A. and Brown, G.E., Jr. "EXAFS study of iron and zinc complexes in hydrothermal solutions", 8th Annual SSRL Users Group Mtg., *SSRL Report* 81-03, 21-22 (1981).
- (2) Waychunas, G.A. "Mossbauer, X-ray, optical and chemical study of cation arrangements and defect association in Fm3m solid solutions in the system periclase-wustite-lithium ferrite", Ph.D. Thesis, Geochemistry, UCLA, University Microfilms, Ann Arbor, Michigan, 456 p. (1979).
- (1) Finnerty, T.A., Waychunas, G.A. and Thomas, W.M. "The preparation of starting mixes for mineral synthesis by a freeze-dry technique", *Am. Mineral.*, 63, 415-18 (1978).

Book Chapters

- Kim, C.S., Lentini, C.J. and Waychunas, G.A. "Associations between iron oxyhydroxide nanoparticle growth and metal adsorption/structural incorporation." Absorption of Metals by Geomedia II, pp 153-185 eds. M O Barnett and Doug Kent Elsevier
- GA Waychunas, Y.-S. Jun, P. J. Eng, S. Ghose and T. P. Trainor Anion sorption topology on hematite: Comparison of arsenate and silicate. Absorption of Metals by Geomedia II, pp 31-66 eds. M O Barnett and Doug Kent Elsevier LBNL-61150
- Benning, L. G. and Waychunas, G.A. Nucleation, growth, and aggregation of mineral phases: mechanisms and kinetic controls. In: *Kinetics of Water-Rock Interaction* 88 pp Springer (2007)
- Waychunas, G.A. Luminescence of Natural and Synthetic Apatites. *Reviews in Mineralogy and Geochemistry* 48, 701-742. (2002)
- Waychunas, G.A. Grazing Incidence x-ray spectroscopy of Mineral surfaces. *Reviews in Mineralogy and Geochemistry* 49, 267-315. (2002)
- Waychunas, G.A. "Structure, Aggregation and Characterization of Nanoparticles". *Reviews in Mineralogy and Geochemistry* 44: 105-166 (2001)
- Waychunas, G.A. and Tarashchan, A. "Luminescence of Minerals. Interpretation of the luminescence spectra in terms of Band theory, Crystal Field theory, Sensitization and Quenching." *Advanced Mineralogy* 2, 124-135, Springer Verlag (1995).
- Manceau, A. and Waychunas, G.A. "Mineralogical and Geochemical Information from X-ray Absorption Spectroscopy." *Advanced Mineralogy* 2, 91-108, Springer Verlag (1995).
- Emmanuel Fritsch and Glenn Waychunas. "The Fluorescence of gemstones", Chapter 15 in: Manual Robbins, ed., *Fluorescence, Gems and Minerals under Ultraviolet light*, Geoscience Press, Phoenix, AZ, 149-174, (1993).
- Waychunas, G.A. "Crystal Chemistry of Oxides and Oxyhydroxides", *Reviews in Mineralogy*, Volume 24, Oxide Minerals, Mineralogical Society of America, 11-68 (1991).
- Waychunas, G.A., Brown, G.E., Jr. and Finger, L.W. "Synchrotron X-ray scattering studies of earth materials", in *Synchrotron X-ray sources and New Opportunities in the Earth Sciences*, Argonne National Laboratory Workshop Jan. 18-20, 1988, ANL Report ANL/APS-TM-3, 25-44 (1988).
- Brown, G.E., Jr. and Waychunas, G.A. "Synchrotron-based spectroscopic and anomalous scattering studies of earth materials", in *Synchrotron X-ray sources and New Opportunities in the Earth Sciences*, Argonne National Laboratory Workshop Jan. 18-20, 1988, ANL Report ANL/APS-TM-3, 69-92 (1988).
- Waychunas, G.A. "Luminescence, X-ray emission and new spectroscopies", in *Reviews in Mineralogy*, Ed. Paul H. Ribbe, 18, 639-698 (1988).
- Brown, G.E., Jr., Calas, G., Waychunas, G.A. and Petiau, J. "X-ray absorption spectroscopy applications in Mineralogy and Geochemistry", in *Reviews in Mineralogy*, Ed. Paul H. Ribbe, 18, 431-512 (1988).
- Hawthorne, F.C. and Waychunas, G.A. "Spectrum fitting methods", in *Reviews in Mineralogy*, Ed. Paul H. Ribbe, 18, 63-98 (1988).
- Odin, G.S., Bailey, S.W., Amouric, M., Frohlich, F. and Waychunas, G.A. "Mineralogy of the verdine facies", in: G.S. Odin, ed., *Green Marine Clays, Developments in Sedimentology*, Elsevier Science Publ., Amsterdam, 159-204 (1988).

Invited Presentations (since 2000, inclusive of those abstracted)

IMA talk August 2010
 Goldschmidt talk June 2010
 Div Review talk March 24, 2010
 ACS talk March 21, 2010
 Princeton Talk Jan 21, 2010
 Shanghai talk Nov 2009
 Earth and Planetary Sciences Dept. UC Berkeley, Sept. 10 2009 “Mineralogy and geochemistry in 2 dimensions: Mineral surface and interface structure, and connection to nanomineralogy.”
 Goldschmidt International Conference Davos Switzerland, June 2009 “Ordered water structure at mineral-water interfaces: Consequences for sorption, precipitation and pore solution transport.”
 ACS annual meeting, Salt Lake City, Utah March 24 2009 “Sulfate sorption and incorporation into iron oxyhydroxide minerals.”
 ACS annual meeting, Salt Lake City, Utah March 22 2009 “The crystal chemistry of iron-oxyhydroxide-silica interfacial reactions.”
 ACS annual meeting, Salt Lake City, Utah March 24 2009 “Predicting the effect of ordered water
 On the adsorption of ions on nanoparticle surfaces and aggregation of hematite nanoparticles.”
 Surface and Catalysis Science Seminar MSD LBNL Nov 20, 2008 “The structure of water near mineral oxide surfaces: A holistic approach including CTR, PS-SFVS, simulations, and other constructs.”
 SSRL Annual meeting Workshop on EXAFS analysis Oct 2008 “Complementary nanoparticle structural analysis using EXAFS, XANES, PDF and simulations.”
 Denver X-ray Conference August 5, 2008 "Natural nanoparticle shape, structure, properties and reactivity from x-ray studies" (invited-plenary)
 DOE BES Program 2008 Analysis, Imaging, and Separations Research Meeting. Annapolis, MD May 4-7, 2008 “Time-resolved and Ultrafast imaging of redox processes on mineral surfaces.”
 SSRL XAS Workshop May 20, 2008 “Grazing Incidence and polarized XAS measurements: theory, utility and experimental considerations.”
 ACS National Meeting, Chicago March 2007 “Strengths and weaknesses of structure probes for poorly crystalline and nanocrystalline minerals.” (invited-keynote)
 Washington University in St. Louis, March 2007 “Structure and chemistry of the mineral-water interface: A molecular view.”
 NSLS Feb 2007 “Silicate passivation of Fe oxide surfaces studied via a new technique: soft x-ray grazing-incidence x-ray spectroscopy”
 CEKA EMSI meeting Penn State Univ Oct 19, 2007 “Synchrotron scattering and spectroscopy Methods applied to interface kinetics.”
 GSA National Meeting Oct 29, 2007 “There’s plenty of time at the beginning: time-resolved and ultrafast measurements of geochemical reactions.”
 NIRT NSF nanoparticle symposium 17 Jan 2006 “Nanoparticles, Surface structure, and crystal chemistry” Albuquerque, NM (invited-keynote)
 ACS National Meeting, March 27, 2006 “Anion sorption topology on hematite: Comparison of arsenate and silicate.” Atlanta GA
 Goldschmidt Conference August 29, 2006 Melbourne Australia “Nanoparticle Structure, Surface

Structure, and Crystal Chemistry” (invited-keynote)
 ACS National Meeting, San Francisco CA September 2006 LBNL-61141 “Probing water structure at mineral-water and water-vapor interfaces: New possibilities for molecular geochemistry.” (invited-keynote)
 Glenn T. Seaborg Center Presentation, LBNL November 10, 2006 “Crystal truncation rod surface diffraction studies of hydrated oxide surfaces: Equilibrium structure, sorption effects, and time-resolved experiments.”
 SSRL PRP Panel Meeting “SSRL User Organization functions and activities.” Feb 16, 2005
 DOE PI Geochemistry Symposium “Water at Mineral Surfaces: New Information from Phase-Sensitive Sum Frequency Vibrational Spectroscopy (PS-SFVS)” June 6, 2005
 CEKA All-hands workshop Sept 15-16, 2005 “Synchrotron techniques for characterizing precipitation” Penn State University, University Park PA
 SSRL User Meeting symposium 17 Oct 2005 “SSRL Users’ Organization Highlights” Stanford
 SSRL User Meeting symposium 17 Oct 2005 “Combining crystal truncation rod diffraction and grazing-incidence XAS information to determine surface complexation geometry” Stanford
 SLAC Users meeting 10 Sept. 2005 “SSRL 2005 Update for SLAC Users” Stanford
 Actinide XAS 2004, LBNL 14-16 Sept. 2004 “Combined Surface EXAFS and Surface Diffraction analysis of arsenate complexation on hematite single crystals.”
 NIRT workshop on nanotechnology, Tempe AZ December 5-7, 2004 “Surface complexation geometry obtained from in-situ surface x-ray diffraction.”
 CEKA EMSI Workshop Penn State Univ. October 21, 2004. “Synchrotron applications in mineral reaction kinetics.”
 DOE PI Geochemistry Symposium Argonne National Laboratory March 7, 2003. “Comparison of multiple scattering XANES and EXAFS analysis of Zn sorption on ferrihydrite.”
 IUPAC meeting Ottawa Canada August 10-15, 2003 “Crystal Truncation Rod (CTR) diffraction and Grazing-incidence EXAFS (GIXAFS) studies of Molecular Structure at the Mineral-Water Interface.”
 PNNL Symposium on nanogeochemistry. May 21, 2002. “Structural studies on sulfate bonding in schwertmannite and iron oxides.”
 Mineralogical Society of America/Geochemical Society Short Course. Golden, CO. October 28, 2001. “Luminescence of natural and synthetic apatites.”
 Mineralogical Society of America/Geochemical Society Short Course. Monterey, CA. December 3-5, 2002. “Grazing-incidence x-ray studies of sorption process on mineral surfaces.”
 NSF-NRC NanoGeoscience workshop. LBNL June 14, 2002 “How do bulk crystal surfaces differ from nanocrystal surfaces?”
 Physics dept. UC Berkeley July 12, 2002 “Importance of water structure in defining complexation on mineral surfaces.”
 ALS Users meeting, October 10-12, 2002 “Applications in sulfur geochemistry at the Advanced Light Source.”
 NSF headquarters Washington, D.C. October 21, 2002. “Report on the NanoGeoscience workshop at Berkeley, June 14-16, 2002.”
 GSA National meeting, Symposium on phosphates. Denver, CO October 29, 2002 “Apatite Luminescence”.
 Canadian Light Source Users meeting, Saskatoon, Canada November 15, 2002 “Applications of x-ray spectroscopy to the Environmental sciences.”
 MSA/Geochemical society shortcourse on synchrotron radiation. Carmel, CA December 4,

2002 “Grazing incidence x-ray absorption and emission spectroscopy.”
 Molecular Environmental Science Workshop, Advanced Light Source, April 30, 2001
 “Complementary spectroscopic measurements at the mineral-water interface.”
 University of California, Davis Geology Department, May 9, 2001. “Mineralogical Structural
 problems addressible with synchrotron x-ray methods”.
 Goldschmidt Conference. Hot Springs, Virginia, May 21, 2001. “Reanalysis of the
 schwertmannite structure and the incorporation of SO_4^{2-} groups: an IR, XAS, WAXS and
 simulation study”.
 European Conference on Mineralogy and Crystallography. September 13, 2001. Paris, France.
 “Applications of Grazing Incidence x-ray spectroscopy for Mineralocical and
 Geochemical analysis”.
 ALS Workshop on Molecular Environmental Science and Theory, Computation and Synchrotron
 Experiments. Berkeley, October 16, 2001. “X-ray Spectroscopy of Environmental
 Nanomaterials”.
 Mineralogical Society of America/Geochemical Society Short Course. Davis, CA December 7,
 2000. “Growth, structure and aggregation of nanoparticles.”
 University of Western Ontario, London, Ontario, Canada. March 16, 2000. “New
 Developments in MES at the ALS and APS”.
 Stanford University Geological and Environmental Sciences Dept. April 29, 2000. "The
 structure of water near mineral interfaces: effects on sorption and surface precipitation
 reactions."
 Workshop 5, 10th APS Users meeting, May 4, 2000. “XANES and EXAFS studies of aqueous
 Zn precipitation on hydrous ferric oxide.”
 Santa Fe V Conference on Rock Magnetism, July 21, 2000. “Synchrotron-based micro
 techniques for the characterization of minor phases.” (invited-keynote)
 ALS Synchrotron Science Group Meeting, September, 21, 2000. “Mineral surface reactions and
 structure: GIXAS and CTR studies.”
 ALS Users Meeting, Workshop on Superbend Hard X-ray applications, October, 18, 2000.
 “Grazing incidence surface geochemistry studies with hard x-rays”.

Professional Society Membership

Mineralogical Society of America (MSA)
 Member since 1970; Fellow 1990-present; Associate Editor of American Mineralogist,
 1989-1993; 1997-2001; Review committee for GSA/MSA abstracts GSA fall meeting,
 1987, 1983; Member committee on committees, 1989-1990; Kraus Crystallographic
 Award committee, 1998-99; Short course committee, 2001-2004 (Chair 2004).
 American Chemical Society (ACS) 1999-present
 Geochemical Society (GS) 2007-present
 American Geophysical Union (AGU)
 Geosync Organization (chair 1994-1996; At-large Rep. 1996-1999)
 Envirosync Organization, 1998-present

Referee/reviewer for articles in the following scholarly publications:

American Mineralogist	Journal of Physical Chemistry
Chemical Geology	Journal of Solid State Chemistry
Elements	Langmuir
Environmental Science and Technology	Nature
European Journal of Mineralogy	Nature Materials
Geochemical Transactions	Physica B
Geochimica et Cosmochimica Acta	Physical Chemistry Chemical Physics
Geology	Physical Review B
Inorganic Chemistry	Physical Review Letters
International Journal of Nanotechnology	Physics and Chemistry of Minerals
Journal de Physique	Physics and Chemistry of Solids
Journal of the American Chemical Society	Reviews in Mineralogy and Geochemistry
Journal of Chemical Physics	Science
Journal of Colloid and Interface Science	Spectrochimica Acta
Journal of Geophysical Research	Springer Proceedings in Physics
Journal of Luminescence	Water Resources Research
Journal of Materials Research	
Journal of Nanoparticle Research	Book Chapters for Springer, Elsevier,

Referee/reviewer for Grant proposals and Awards from the following agencies:

American Chemical Society, Petroleum Research Fund
American Geophysical Union
Department of Energy, Basic Energy Sciences
Department of Energy, NABIR program
Department of Energy, EMSP; ERSP program
Geochemical Society
Guggenheim Foundation
Hertz Foundation
Macarthur Foundation
Mineralogical Society of America
National Science Foundation (several programs)
National Sciences and Engineering Research Council of Canada
Penrose Foundation, Geological Society of America
Research Corporation Science Advancement Programs
National Environmental Research Council (UK)
Engineering and Physical Sciences Research Council (UK)
Soros Foundation
L'Oreal-Unesco Award program
National Aeronautics and Space Administration

Reviewer of tenure appointment and promotion packages for faculty at:

Arizona State University
Miami University of Ohio
Stanford University
Washington University in St. Louis
University of California, Davis
University of California, Merced
University of Oregon
University of Ottawa
University of Michigan
Princeton University

Technical expertise:

Equipment: Computer interfacing of multiaxis x-ray diffractometers to minicomputer systems; Reconfiguration of 2 axis diffractometer into 4 axis geometry for single crystal and texture measurements; Design and development of a new special focusing diffractometer (GFD) for textured thin films on substrates; Addition of position sensitive linear detector system for use with GFD; Development of unique focusing optics for GFD; Design and development of energy-dispersive, theta-theta high temperature diffractometer system for the study of molten materials and phase transitions; Development of laboratory Mössbauer spectrometer system with laser interferometric calibration for mineral and silicate glass ^{57}Fe site partitioning studies; Design and development of a high X-ray flux laboratory scattering facility (rotating anode); Design and construction of a ultra-high vacuum (UHV) system for single crystal characterization and surface preparation including LEED, quadrupole mass spect. analysis, TDS analysis, Plasma ablation sources with subsidiary chamber for X-ray diffraction and spectroscopy; Design and construction of instrumentation for grazing-incidence small angle scattering (GISAXS) at synchrotron sources including He beam paths.

Software (written in Fortran, basic, C, assembly code):

Complete computer analysis package for Mössbauer spectroscopy including non-linear full-matrix least squares spectrum fitting program; Spectral subtraction and rescaling programs; Fourier deconvolution programs for source lineshape extraction; Program package for pole figure texture analysis including contoured maps of stereo-projection of pole density; orientation distribution function (ODF) program; Program package for quantitative analysis of X-ray powder diffraction patterns including data plotting programs, peak deconvolution codes, powder structure refinement program with texture analysis; various powder data manipulation programs
EXAFS program package including: background fitting program (non-linear full matrix least squares with multi-region n-order spline functions and interactive graphics); Fourier transform programs (both forward and backward with windowing and interactive graphics); CHIFIT6 program for modeling of EXAFS functions with up to 8 shells of atoms and fitting of Fourier filtered EXAFS data sets; Programs for manipulation of near-edge spectral data (XANES); generation of pair distribution functions for materials of known structure using atomic, EXAFS or X-ray scattering amplitudes;

Program to calculate effects of polarization of incident X-ray synchrotron beam on RDF obtained from single crystal EXAFS experiment; Fourier deconvolution program for noise filtering, Program package for analysis of diffuse x-ray scattering from melts, amorphous solids with generation of radial distribution functions (RDFs) including: Calibration, Data scaling, Fourier transformation, Scattering factor generation, Compton approximation, Multiple scattering corrections;

Adaptation of DBWiles Rietveld analysis program to include interactive graphics; Implementation of SPEC package for 4-circle diffractometer control with custom in-house system.

Software packages or programs used (high familiarity):

CERIUS² (Biosym/MSI Corporation): Crystal builder, Amorphous builder, Surface builder, Interface builder, Molecular builder, Electron and x-ray diffraction, Non-crystalline x-ray diffraction, LEED/RHEED, Energy minimization, Molecular Dynamics, Rietveld; DLS76 (Baerlocher); SHADOW; Feff 6.0/7.0/8.0 (Rehr); DBWS; SPEC; SUPER; Philips APD software; MRD software, Reciprocal lattice simulation software; GSAS; popLA (texture analysis software); EXAFSPAK (George and Pickering/ SSRL); JCPDS/IDD analysis package; TTMultiplets (DeGroot); Feff3- Feff8 (J.J. Rehr and associates); SIXPACK (Sam Webb, SSRL);

Grants, Proposals, Thrust (EFRC/IRG/MRSEC) Programs

2011-2014 PI Experimental and Theoretical Geochemistry program LBNL Earth Sciences Division Fundind: DOE BES Chemical Sciences, Geosciences and Biosciences Program. Request: \$ 6,700,000

2010-2015 Lead Investigator, Thrust one, ESD EFRC on Carbon Sequestration (NCGC) allocation: \$1,400,000

2008-2011 PI Nanogeoscience Program LBNL Earth Sciences Division Funding: DOE BES Chemical Sciences, Geosciences and Biosciences Program. \$ 2,850,000.

2007-2010 PI Imaging electronic and atomic redistribution during redox reactions at surfaces. Funding: DOE BES Chemical Sciences. Requested funding: \$1,495,000. Funded at full request

2005-2009 Institute collaborator. Center for Environmental Kinetic Synthesis (CEKS). Lead PI: Susan Brantley. Funding: NSF EMSI program and DOE-BES. Requested amount: \$7,500,000 NSF; \$4,000,000 DOE. Funded at \$6,000,000 NSF; \$2,500,000 DOE.

2005-2007 co-PI Toward an Understanding of Biogeochemical Reaction rates and Pathways of Fe and Tc at the pore scale. Funding: DOE BER (NABIR) PI: Carl Steefel, co-PIs: James Fredrikson, John Zachara, Allen Christian. Requested amount: \$1,071,500. Not funded.

2005-2007 co-PI How do interfacial phenomena control nanoparticle structure? Funding: DOE BES Chemical Sciences (nanotechnology). Co-PIs: Jillian Banfield and James Rustad. Requested amount: \$1,100,000. Funded at \$900,000.

2005-2007 PI Molecular structure and processes at mineral-water interfaces. Funding: DOE BES Geosciences. Co-PIs: J.A. Davis and Y.R. Shen. Requested amount: \$780,000. Funded at \$600,000.

2002-2007 Institute Collaborator. Institute for Actinide Interactions at Complex Environmental Interfaces. Lead PI: Heino Nitsche. Other PIs: Russel Pitzer, Jillian Banfield, Jay Keasling, Kenneth Raymond and Garrison Sposito. Funding: NSF EMSI program and DOE-BES. Requested amount: \$7,500,000 NSF; \$5,000,000 DOE. Not funded.

2003-2005 co-PI Transuranic Interfacial Reaction Studies on Manganese Oxide-Hydroxide Mineral Surfaces. PI: Heino Nitsche (LBNL, UCB). Funding: DOE-BES. Requested amount: \$776,044. Not funded.

2002-2004 PI LDRD Environmental Nanoscience. Funding: LDRD/LBNL co-PI's: Jillian Banfield (UCB), Hoi-Ying Holman (LBNL), and Paul Alivisatos (LBNL). Requested amount: \$900,000. Funded at \$600,000.

2002-2004 PI Complexation and Precipitation Processes on Mineral Surfaces. Funding: DOE BES Geosciences. Co-PI's: James Rustad (PNNL), James Davis (USGS) and Ron Shen (UCB). Requested amount: \$775,000. Funded at \$650,000.

2002-2004 co-PI Experimental, theoretical, and model-based studies of crystallographically controlled self-assembly during growth of nanophase materials. Funding: DOE nanoscale science program. PI: Jillian Banfield (UCB). Other co-PI: James Rustad (PNNL). Requested amount: \$1,050,000. Funded at requested level.

2001-2003 co-PI: GeoSoilEnviroCARS: A National Resource for Earth, Planetary, Soil and Environmental Science Research at the Advanced Photon Source. Funding: DOE OER. PI: Stephen Sutton (U. Chicago). Other co-PI's: Gordon Brown (Stanford), Peter Eng (U. Chicago), John Parise (SUNY Stonybrook), Joseph Pluth (U. Chicago) and Mark Rivers (U. Chicago). Requested amount: \$2,602,005. Funded.

2000-2001 PI: Development of an integrated experimental program for the complete structural determination of the mineral-water interface. Funding: LDRD/LBNL co-PI's: Ping Liu (CSD), Peter Eng (APS CARS/U. Chicago), James Rustad (PNNL) and David Shuh (CSD). Requested amount \$87,000. Not funded.

2000-2002 PI: Sources and sinks of iron in marine productivity: Characterization of iron speciation with Synchrotron X-ray and IR spectromicroscopy. Funding: DOE, Carbon Sequestration Research Program. Co-PI's Inez Fung (UCB), Jim Bishop (LBNL) and Hoi-Ying Holman (LBNL). Requested amount: \$900,000. Not Funded

1999-2002 Co-PI: "Transuranic Interfacial Reaction Studies on Manganese Oxide-Hydroxide Mineral Surfaces."
Funding: DOE/EMSP PI: Heino Nitsche (CSD) other co-PI's: David Shuh (CSD), R. Jeff Serne (PNNL) Requested amount: \$ 900,000 Funded at \$ 600,000.

1999-2003 Co-PI: "VUV/Soft X-ray Molecular Environmental Science Facility at the Advanced Light Source." Funding: DOE/Chemical Sciences

PI: David K. Shuh, CSD, LBNL Other PI's: Scott Chambers (PNNL), David Clark (LANL), John Gland (U. Michigan), Satish Myneni (Princeton), Anders Nilsson (Uppsala), Neville Smith (LBNL), Louis Terminello (LLNL), Brian Tonner (U. Central Florida), Samuel Traina (OSU)
Requested amount: \$15,400,000. Funded at \$ 7,000,000.

1999-2000 PI: "XANES, GIXAFS, DAS and MD investigation of metal ion outer-sphere complexes on mineral surfaces: New simulation and experimental approaches."

Funding: DOE/ LDRD to LBNL requested amount: \$117,700. Not funded.

1999-2001 PI: "Preferential binding of heavy metals and/or actinides by soil bacteria, and sequestration stability." Funding: DOE/NABIR Co-PIs: J.C. Hunter-Cevera and F.F. Roberto.
requested amount: \$1,087,671. Not funded.

1999-2002 Co-PI: "Synchrotron Radiation Research for Molecular Environmental Science."

Funding: DOE/strategic LDRD to LBNL

other PIs: D.K. Shuh (CSD), N.V. Smith (ALS), T. Tokunaga (ESD), G. Lamble (ESD) and S. Myneni (ESD) requested amount: \$427,400. (FY 1999) Funded for \$270,000.

1999-2000 Experimental participant, "Surface and Interface Theory for Experiment."

Funding: DOE/strategic LDRD to LBNL PI: M. A. Van Hove (Materials Science Division)
requested amount: \$600,000. Not funded.

1998-2001 PI: "Molecular-level studies of Fe-Al oxyhydroxide coating formation on quartz: nucleation and growth, effect of sorbed and dissolved silica, response to drying cycles, and sorption properties." Funding: DOE, Basic Energy Sciences, Geosciences
co-investigator: JA Davis USGS Menlo Park. requested amount: \$815,919. Funded at ca. \$570,000.

1996-1999 Co-PI: "Detectors and Other Instrumentation for Research in Environmental Chemistry and Heterogeneous Catalysis at the Stanford Synchrotron Radiation Laboratory"

Funding: DOE, Office of Energy Research P.I.: G.E. Brown, Jr.

requested amount: \$781,000. Funded.

1993-1997 Co-PI: "Synchrotron X-ray spectroscopic studies of Oxide Surfaces and oxide-water interfaces" Funding: NSF Geochemistry and Petrology

Principal Investigators: G.E. Brown, Jr. and G.A. Parks

Other Co-investigators: T. Kendelewicz and W.E. Spicer

Requested amount: \$620,460. Funded.

1993-1996 Senior Research Scientist, "Cation Chemisorption at Oxide Surfaces and Oxide-Water Interfaces: X-ray spectroscopic Studies and Modelling"

Funding: DOE, Office of Energy Research P. I.s: G.E. Brown, Jr. and G. A. Parks

Requested amount: \$712,729. Funded.

1994 Proposal to Hewlett-Packard Corporation for high speed workstation on which to perform molecular simulations of thin film interface structure and growth (with R. Route, Stanford, and R. Hiskis, HP Labs). Funded for all required hardware. ca. \$ 65,000.

1980-1984 Member of Center for Materials Research Thrust (IRG) program on Metastable Materials. Involvement: Radial distribution function analysis of amorphous metallic alloys.

1993-1998 Member of CMR Oxide Surface Structure and Reactivity IRG (Interdisciplinary Research Group) Involvement: Glancing-incidence EXAFS and X-ray scattering studies of adsorbate complexes on mineral and oxide surfaces; CES and transmission Mössbauer spectroscopy of surface chemistry in Fe oxides; XAS studies of hematite and metal oxide surfaces; x-ray reflectivity of substrate surfaces; synthesis of model substrate materials.

1992 Proposal to IBM corporation for joint research with Dr. P.C. Chen on the structure of thin metal film/polymer interfaces. Funded for \$25,000.

1992 Proposal to Digital Equipment for computer facilities to assist EXAFS data analysis at CMR. Amount requested \$26,000. Proposal not funded.

1990-1992 Associate Investigator, "Speciation of Transition Metals in Aqueous Solutions and Melts" Funding: NSF Geochemistry Principal Investigator: Prof. Gordon Brown, Jr. Stanford University Involvement: X-ray scattering and absorption studies of silicate melts and glasses; polarized EXAFS and near-edge studies of transition metal ions on surfaces.

1990 Proposal to Digital Equipment Corporation for a new local area network based on VAX 3300 and 5400 machines accepted as part of the Stanford Near West Campus gift allocation. Funded. Total gift approx. \$ 140,000.

1990 Proposal to Intel Corporation for a high speed computer work station for molecular simulation programming applications in the CMR X-ray diffraction laboratory. Funded. Total gift approx. \$26,000.

1986-1989 Associate Investigator, "Synchrotron Radiation studies of cation environments in minerals, glasses, melts and hydrothermal solutions" Funding: NSF Geochemistry Principal Investigator: Prof. Gordon Brown, Jr. Stanford Univ. Involvement: EXAFS, Differential anomalous scattering (DAS), XANES analysis of cation site geometries in geological materials at 77, 300 and 300-2000 K. \$450,000.

1985-1987 Associate Investigator, "Microstructure and surface properties of amorphous Ni_xTi_{1-x} " Funding: Collaboration between C.N.R.S. (France) and NSF/DMR (USA). Principal Investigator: Prof. Pierre Moine, Universite de Poitiers, Poitiers, France. Involvement: High temperature studies of NiTi melt structure using X-ray scattering methods; EXAFS and XANES analysis of NiTi alloy structure. \$ 120,000.

1981-1983 Associate Investigator, "Spectroscopic studies on the structure and properties of silicate melts" Funding: NSF Geochemistry Prof. Gordon Brown, Jr. Stanford Univ. Principal Investigator. Involvement: Mossbauer, electron spin resonance, RDF and EXAFS analysis of ion site geometries in silicate melts and glasses. \$360,000.

COURSES TAUGHT

Materials Science and Engineering 180 Stanford University "Atomic Arrangements in Solids" Mathematical crystallography, inorganic and metallic structures, crystal chemistry, X-ray and electron diffraction.

Geology 360 (with G.E. Brown, Jr., J. Stebbins) Stanford University "Seminar in Spectroscopy of Silicates and Oxides" Introduction to condensed matter spectroscopy including NMR, Mössbauer, Visible/IR, EXAFS and XANES and other techniques.

Civil Engineering 373 (with G. Redden and J. Leckie) Stanford University "Advanced Topics in Aquatic Interfacial Geochemistry" Multidisciplinary seminar in recent developments and ground-breaking concepts in interfacial geochemistry.

Ph.D. and Masters COMMITTEES

David A. McKeown, Geology Stanford University (Studies in aluminosilicate glass structure), Ph. D. 1985.

Lawrence R. Bernstein, Geology Stanford University (Crystal chemistry of Ge-bearing sulfide minerals), Ph.D. 1986.

William E. Jackson, Geology Stanford University (Structure of olivine stoichiometry glasses and melts), Ph.D. 1991.

Peter Fiske, Geology Stanford University (Volumetric properties of Silicate liquids: High Temperature Spectroscopic and Dilatometric Studies), Ph.D. 1994.

Dane Spearing, Geology Stanford University (NMR Studies of phase transitions in mineral systems), Ph.D. 1994.

Satish Myneni, (Ohio State University) Environmental Science Program (Adsorption kinetics of cations and oxyanions on Ettringite), Ph.D. 1995.

Maria Peterson, Geological and Environmental Sciences Stanford University (Surface Spectroscopy and Chromium Redox and Sorption at the Magnetite/Solution Interface), Ph.D. 1996.

Sabyasachi Sen, Geological and Environmental Sciences Stanford University (Intermediate-range ordering in silicate liquids: Static and dynamic aspects), Ph.D. 1996.

Aniefiok E. Akan-Etuk, Mechanical Engineering Stanford University (Pyrite Transformations during Combustion), Ph.D. 1998.

Anna M. George, Geological and Environmental Sciences Stanford University (The Structure and Dynamics of non-network forming elements in Silicate Liquids and Glasses), Ph.D. 1998.

Zhi Xu, Geological and Environmental Sciences Stanford University (Application of Two-dimensional Solid State NMR in Silicates), Ph.D. 1999.

Dipanjan Banerjee (University of Western Ontario, London, Ontario),

- Canada, Geology department. (Surface chemical studies of Birnessite reduction: Reaction with Chromium (III), Selenite, Oxalate and Humate) External Examiner. Ph.D. 1999.
- Thomas P. Trainor, Geological and Environmental Sciences Stanford University (Grazing Incidence XAFS and X-ray Standing Wave Studies of the Oxide/Solution Interface), Ph.D. 2001.
- Heather Boek-Ponader, Geology Stanford University (High temperature X-ray diffraction and EXAFS study of anorthite and anorthite glass), MS 1983.
- Brigid A. Rea, Soil Science (U.C. Berkeley) (Examining the Surface Structure of Two-Line Ferrihydrite with Iron Isotopic Exchange and Mössbauer, EXAFS and FTIR Spectroscopies), MS 1991.

POSTDOCTORAL FELLOWS ADVISED (LBNL/UC Berkeley)

- Victor Ostroverkhov Ph.D. 2001 Physics Case Western Reserve University (co-advised with Y. R. Shen) 2002-2005 Sum frequency generation spectroscopy of water on mineral surfaces
- Christopher Kim Ph.D. 2002 Geological and Environmental Sciences Stanford University (co-advised with Jill Banfield) 2002-2004 Synthesis and aggregation studies of nanoparticle goethite
- Benjamin Gilbert Ph.D. 2002 Physics Swiss Federal Inst. Technology, Lausanne (co-advised with Jill Banfield) 2002-2004 structural studies and reactivity of nanoparticle ZnS
- Young-Shin Jun Ph.D. 2005 Environmental Science Harvard University 2005-2007 kinetics of initial precipitation processes on mineral surfaces
- Chuanshan Tian Ph.D. 2005 Physics Fudan University, China (co-advised with Y. Ron Shen) 2005-2008 water structure on environmental interfaces (solid/water and water/air)
- Dino Spagnoli Ph.D. 2006 Chemistry Bath University, U.K. 2007- 2009 (co-advised with Jill Banfield and Ben Gilbert) simulations of nanoparticle structure, interactions and surface reactions
- Jordan Katz Ph.D. 2007 Chemistry CalTech (co-advised with Ben Gilbert and Roger Falcone) 2007-2010 Synthesis of functionalized oxide nanoparticles for rapid electron transfer experiments and time-resolved structural characterization
- Jaeho Sung Ph.D. 2007 Physics Seoul National University 2008-2011 Water structure at air-water/ethanol and water/oxide interfaces using phase-sensitive sum-frequency vibrational spectroscopy and x-ray spectroscopy
- David Singer Ph. D. 2008 Environmental Chemistry Stanford University 2008-2011 Sorption and precipitation of uranium species on natural surfaces and nanoparticles.
- Alexandro Fernandez-Martinez Ph. D. Environmental Sciences Grenoble University 2009-present Synchrotron characterization of processes attending CO₂ sequestration on the pore level; MD and spectral simulation of amorphous carbonate structures.
- Mengqiang Zhu Ph. D. Environmental and Soil Sciences University of Delaware 2010-present beginnings of precipitation of AMD materials

STANFORD SYNCHROTRON RADIATION LABORATORY (SSRL) PROPOSALS

587M Waychunas, G.A. and Apted, M.J. "X-ray absorption study of Fe and Ti in minerals", 1980-1982.

588M Apted, M.J., Waychunas, G.A. and Brown, G.E., Jr. "High temperature EXAFS study of zinc and iron chloride complexes", 1980-1982.

741M Brown, G.E., Jr., Waychunas, G.A. and Tossell, J.A. "K-edge and EXAFS study of Na, K and Ca in amorphous and crystalline aluminosilicates", 1982-1984.

812M Waychunas, G.A., Brown, G.E., Jr. and Pressesky, J.C. "High temperature EXAFS study 1985-1987.

881 MApted, M.J., Goldman, D. and Waychunas, G.A. "Redox-sensitive structural effects on dissolution of nuclear waste glasses", 1984-1986.

964M Waychunas, G.A., Dollase, W.A. and Ross, C.R. "EXAFS study of short range order in chain silicates", 1985-1987.

994Mp Waychunas, G.A. and Brown, G.E., Jr. "High temperature EXAFS study of Fe and Ca in silicate crystals and melts", 1986-1990.

1002Mp Brown, G.E., Jr., Ponader, C.W., Waychunas, G.A., Jackson, W.E. and Rothfus, S. "EXAFS study of trace element environments in quenched silicate melts of geochemical interest", 1986-1990.

Letter of Intent Waychunas, G.A. and Bernstein, L.W. "EXAFS and XANES study of Ge in sulfides and oxide minerals.", 1987.

1050Mp Waychunas, G.A., Apted, M.J. and Exharos, G. "X-ray anomalous scattering and EXAFS study of heavy metal complexes in aqueous solutions", 1987-1991.

1051M Waychunas, G.A. and Bernstein, L.W. "Crystal and aqueous chemistry of germanium in geochemically important systems", 1987-1991.

1088M Penner-Hahn, J.E., Fronko, R., Waldo, G., Wang, S. and Waychunas, G.A. "Polarized X-ray absorption near edge structure", 1987-1989.

Letter of intent Bernstein, L.W. and Waychunas, G.A. "EXAFS and XANES analysis of Ga in bone mineral.", 1988.

2075M Waychunas, G.A., Davis, J., Fuller, C. and Rea, B. "Characterization of Ferrihydrite Reactive Surface Sites and Structure.", 1989-1991.

2076Mp Waychunas, G.A., Dollase, W.A., Ross, C.R., Reeder, R.J. and Nord, G. "Investigation of Short Range Order in Mineralogical Solid Solutions.", 1989-1993.

2155M Brown, G.E., Jr., Schwartz, K. and Waychunas, G.A. "EXAFS Study of the Crystallization of Cordierite from $MgAl_2O_4$ and SiO_2 in the Presence of Bismuth Oxide Flux.", 1991-1993.

2157M Waychunas, G.A., Davis, J., Fuller, C. and Rea, B. "Structural characterization of ferrihydrite surface sites, structure and absorbate geometries.", 1991-1993.

Letter of Intent Waychunas, G.A., Davis, J., Fuller, C. and Rea, B. "Structural characterization of ferrihydrite surface sites, structure and absorbate geometries.", 1991.

2210Mp Brown, G.E. Jr., Waychunas, G.A., Pickering, I.J., Parks, G.A., Persson, P., Barbee, T.W. Jr., Bargar, J.R., Towle, S.N. and Liu, P. "Grazing-incidence XAS study of cation chemisorption at single-crystal oxide surfaces.", 1992-1996.

9094 Letter of Intent 9094 Waychunas, G.A., Davis, J.A. and Fuller, C.C. "Characterization of the structural role of SiO_2 in the transformation kinetics of Ferrihydrite.", 1992.

2228Mp Waychunas, G.A., Davis, J.A., Fuller, C.C., Brown, G.E., Jr. and Rowen, M. "EXAFS Studies of Chemisorption Processes on Ferrihydrite and Quartz Surfaces.", 1993-1997.

2248M Sen, S., Brown, G.E., Jr., Waychunas, G.A. and Stebbins, J.F. "Intermediate-range ordering in silicate glasses.", 1992-1994

Rapid Turn-Around XAS

O'Day, P., Carroll, S., Philips, B., Bourcier, W. and Waychunas, G.A. "EXAFS study of trace element coordination in natural samples at ambient and cryogenic temperatures.", 1994.

2255M Waychunas, G.A. and Rossman, G.R. "XAS characterization of Mn in naturally- and artificially-irradiated single crystals.", 1993-1995

2261Mp Myneni, S., Traina, S.J., Waychunas, G.A. and Logan, T.J. "Sorption and Coprecipitation of Arsenate and Chromate in Alkaline Environments.", 1994-1998

2325Mp O'Day, P., Carroll, S.A., Waychunas, G.A., Phillips, B., Bird, D., Neuhoff, P. and Sterne, P. "Coordination and Bonding of Metal ions in Natural Soils and Sediments using XAS." 1994-1998

9938M Carroll, S.A., O'Day, P. and Waychunas, G.A. "Coordination and Bonding of Metal Ions in Natural Soils and Sediments using XAS." UC/National Laboratories PRT, beam line 10-2, SSRL. 1995-1997

2285Mp Myneni, S.C.B., Waychunas, G.A. and Traina, S.J. "Hydration, Protonation and Metal Complexation Influences on Oxyanion-Mineral Surface Interactions." 1997-2001.

2330Mp Myneni, S.C.B., Zawislanski, P.T., Tokunaga, T.K., Waychunas, G.A. and Brown, G.E., Jr. "In-Situ Evaluation of Sediment Redox Equilibria from Fe and S Redox and Its Influence on Se Speciation." 1996-2000

9185M. Ravikumar, R., Fuerstenau, D.W. and Waychunas, G.A. "Characterization of Silver-Manganese Oxides." 1996

2462Mp Brown, G.E., Trainor, T.P., Liu, P., Kendelewicz, T., Bargar, J., Waychunas, G.A., and Barbee, T.W. "Grazing-Incidence EXAFS and MSW study of the Oxide/Solution Interface." 1997-2001.

2475Mp Waychunas, G.A., Davis, J.A. and Reitmeyer, R. "Grazing Incidence Study of Aqueous Fe³⁺ sorption and precipitation on Silica Surfaces." 1997-2001.

2543M Waychunas, G.A., Davis, J.A., Reitmeyer, R., Bargar, J., Carroll, S. A. and Sutton, S. "DAS, GIXAFS and XANES/MD Investigation of Outer-Sphere Complexes on Mineral Surfaces." 1998-2000.

Letter of intent Waychunas, G.A., Traina, S.J., Myneni, S.C.B. and Bigham, J.M. "Structural investigation of substituted schwertmannites." 1999

1E57M Waychunas, G.A., and Banfield, J. F. "Ti XANES and EXAFS of Anatase nanocrystals." 2000-2001

2708M Waychunas, G.A., Davis, J.A., White, A.F. and Vivet, D. V. "GIXAS and TRXRF study of Fe and Mn sorption on seeded quartz surfaces." 2001-2003.

2709M Waychunas, G.A., Nitsche, H., Shuh, D.K., Shaughnessey, D.A. and Booth, C.H. "GIXAS and REFLEXAFS study of Redox reactions and Valence Depth Profiles of Plutonyl analogues sorbed on Manganese oxide surfaces." 2001-2003.

2907MP "GIXAFS study of the effect of drying on surface complexation." Waychunas, GA, Ostroverkhov, V. (UCB/LBNL), Shen, Y.R. (UCB) and Myneni, S. (Princeton) 2004-2008.

2935MP "Characterization of Metal Ion Complexation by PAMAM Dendrimers in Aqueous Solutions via EXAFS and XANES." Waychunas GA, Diallo, M (Caltech), Goddard WA (Caltech). 2005-2009.

2936MP "The development of grazing-incidence SAXS capability at SSRL: Applications to reactions on mineral surfaces." Waychunas G.A., Toney, M.J. (SSRL), Davis, J.A.(USGS) 2005-2009.

NATIONAL SYNCHROTRON LIGHT SOURCE (NSLS) BEAM TIME PROPOSALS

Brown, G.E. Jr., Jackson, W.E., Waychunas, G.A. and Combes, J.-M. "Local Environments of Transition Metals in Silicate Melts and Glasses." 1989-1990

Waychunas, G.A., Dollase, W.A., Ross, C.R. and Reeder, R. "Short Range Order (SRO) determinations in mineralogic solid solutions via EXAFS." 1990

Waychunas, G.A., Davis, J.A., Fuller, C. and Rea, B.A. "Characterization of ferrihydrite reactive surface sites and structure." 1990

Waychunas GA, Jun, Y-S "Grazing-incidence soft x-ray study of silicate passivation on hematite surfaces" 2005-2007

ADVANCED LIGHT SOURCE (ALS) LBNL BEAM TIME PROPOSALS

98-142 Polarized and isotropic XANES spectroscopy on the Ca 2p edge of minerals: relationship of features to site geometry and bonding state. Waychunas, G.A. 1998.

98-143 Polarized soft x-ray studies of sorbed organic molecules on wet single crystal substrates. Waychunas, G.A. 1998

ALS-00203 Polarized and isotropic XANES spectroscopy on the Ca L-edge of minerals: relationship of 2p features to site geometry, next nearest neighbor type and bond length. Waychunas, G.A. (LBNL) 1998-2000

ALS-00202 Polarized soft X-ray studies of sorbed organic molecules on wet single crystal mineral substrates. Waychunas, G.A. (LBL), Davis, J.A. (USGS), Coston, J.A. (USGS), Reitmeyer, R. (USGS), Warwick, T. (LBNL) 1998-2000

ALS-00204 Development of a sample stage and confining system for "wet" environmental spectroscopy at the ALS: Tests of the effects on sorption of a reduced H₂O saturation pressure. Waychunas, G.A., Liu, P. and Shuh, D.K. 1998-2000

ALS-00463 Polarized and isotropic XANES spectroscopy on the Ca L-edge and K-edge of Minerals and Model compounds. Relationship of 2p and 1s features to site geometry, next nearest neighbor type and bond length. Waychunas, G.A. 1999-2001

ALS-00464 Ca and Mn L-edge and K-edge Polarized XANES spectroscopy in hydrous systems and at the mineral/water interface. Waychunas, G.A., Liu, P. and Shuh, D.K. 1999-2001

ALS-00687 XANES spectroscopy at the mineral/water interface. Waychunas, G.A. (LBL), Shuh, D.K. (LBL), Nitsche, H. (UCB) and Shaugnessey, D.A. (LBL) 2000-2002

ALS-00789 Structural analysis of sulfate in schwertmannite: the effect of pH, water saturation and sample preparation method. Waychunas, G.A. (LBL), Myneni, S.C.B. (Princeton), Traina, S. J. (Ohio State) and Bigham, J. (Ohio State) 2001-2003

ALS-00955 X-ray absorption investigations of ligand binding to ZnS and MnS:ZnS nanoparticles. Waychunas, G.A. (LBL), Banfield, J.F. (UCB), Gilbert, G. (UCB) 2002-2004.

ALS-00962 X-ray photoemission and absorption investigation of H₂O- and MeOH adsorption on ZnS (111). Waychunas, G.A. (LBL), Banfield, J.F. (UCB), Gilbert, G. (UCB) 2002-2004.

ALS-01292 O K-edge spectroscopy of alpha-FeOOH (goethite) nanoparticles. Waychunas GA, Kim C, Banfield, JF (UCB) (2005-2006)

ALS-01566 Grazing-incidence x-ray spectroscopy of silicate sorption on hematite and sapphire single crystals. Waychunas GA, Arai Y (USGS), Davis JA (USGS) (2005-2006)

ALS-01628 NEXAFS studies of metal complexation by dendritic nanoscale ligands. Waychunas GA, Diallo, M (Caltech), Goddard WA (Caltech) (2005)

ADVANCED PHOTON SOURCE (APS) BEAM TIME PROPOSALS

G000179 Characterization of Fe valence and physical state in marine and soil particulates via microXAS and microtomography. Glenn Waychunas (LBL) James Bishop (LBL), Inez Fung (UCB) and Phoebe Lam (LBL) 2001-2002 [13ID]

wayc3b07788a0e CTR study of the structure of the (0001) surface of hematite (α -Fe₂O₃), and its response to anion sorption. Glenn A. Waychunas (LBL), Thomas P. Trainor (UC), Peter J. Eng (UC), Matthew Neville (UC) and Gordon E. Brown, Jr (Stanford) 2002-2003 [13ID]

11IDC-2002-II-932 High energy X-ray scattering study of the schwertmannite structure. Glenn Waychunas (LBL) and James Davis (USGS) 2002-2003
GUP038 Crystal truncation rod diffraction study of the structure and reactivity of the hydrated Fe₂O₃ (1-102) surface. G Waychunas, T. Trainor, P. Eng 2003-2004 [11ID, 13ID]

GUP038 Crystal Truncation Rod diffraction study of the structure and reactivity of the hydrated α -Fe₂O₃ (1-102) surface. T. Trainor, P. Eng, G. Waychunas 2002-2003 [13ID]

GUP053 XAFS Studies of Goethite nanoparticle reactivity. G. Waychunas, C. Kim 2003-2004 [13BM]

GUP098 CTR study of the response of hematite (1-102) surface to sorption of selenate and sulfate anions. 2003-2004 [13ID]

GUP103 A Crystal Truncation Rod Study of U(VI) Adsorption on α -Fe₂O₃ Surfaces. J. Catalano, T. Trainor, P. Eng, G. Waychunas, G. Brown 2002-2004 [13ID]

GUP566 Bioavailability of marine particulate iron: mapping iron hotspots. G. Waychunas, P. Lam, J. Bishop 2003-2004 [13ID]

GUP642 Fate of Fe in marine particulates using bulk EXAFS. P. Lam, G. Waychunas, J. Bishop 2003-2004 [13ID]

GUP667 Crystal truncation rod study of U(VI) adsorption on Fe₂O₃. G Brown, G Waychunas, J Catalano, T Trainor, P Eng 2003-2004 [13ID]

GUP756 SAXS/WAXS studies of goethite nanoparticle formation, aggregation and reactivity. B Gilbert, G Waychunas, C Kim 2003-2005 [5ID]

GUP844 Crystal Truncation rod diffraction study of Pb(II) sorption on the hydrated hematite (1-102) and (0001) surfaces. T Trainor, P Eng, G Brown, G Waychunas 2002-2004 [13ID]

GUP894 CTR study of the structure of the hematite (1-102) surface and its response to anion sorption. G Waychunas, P Eng, T Trainor, G Brown 2003-2005 [13ID]

GUP916 XAFS study of goethite nanoparticle reactivity. C Kim, G Waychunas 2003-2005 [13BM]

GUP932 Investigation of the pH dependence of the hematite (0001) surface structure. P Eng, T Trainor, G Waychunas 2003-2005 [13ID]

GUP1520 SAXS/WAXS studies of goethite nanoparticle formation, aggregation and reactivity. Glenn Waychunas (LBL), Chris Kim (LBL), Ben Gilbert (UCB) and Sam Shaw (Oxford Univ. UK) 2003-2004 [5ID]

GUP 1604 CTR study of the quartz (00001)-water interface. G Waychunas, P Eng, T Trainor 2003-2005 [13ID]

GUP 1628, GUP 1991 XAFS study of nanogoethite reactivity. C Kim, G Waychunas 2003-2005 [13BM]

GUP2128 WAXS Studies of Goethite nanoparticle Structure. Glenn Waychunas (LBL), Christopher Kim (LBL), Jill Banfield (UC Berkeley) 2004-2006 [11ID]

GUP2134 Surface diffraction study of the wet ZnS (110) surface: the effect of pH and ligand type. Glenn Waychunas (LBL), Ben Gilbert (UC Berkeley), Jill Banfield (UC Berkeley) 2004-2006 [13ID]

GUP2607 Studies of ZnS nanoparticle aggregation using simultaneous SAXS/WAXS. C. Goodell, B Gilbert, G Waychunas, J Banfield 2004-2006 [5ID]

GUP2654 Crystal Truncation Rod (CTR) Study of the hydrated alpha-quartz (0001) surface. Glenn Waychunas (LBL), Tom Trainor (Univ. Alaska), Peter Eng (Univ. Chicago) 2004-2006 [13ID]

GUP2689 XAFS studies of nanogoethite reactivity. C Kim, G Waychunas 2004-2005 [13BM]

GUP3005, GUP3140 Ligand inhibited aggregation of nanoscale ZnS. C Goodell, B Gilbert, G Waychunas, J Banfield 2004-2006 [5ID]

GUP4345 CTR study of the structure of the (1-102) surface of hematite ($\alpha\text{-Fe}_2\text{O}_3$), and its response to anion sorption. Glenn Waychunas (LBL), Tom Trainor (Univ. Alaska), Peter Eng (Univ. Chicago). 2005-2007 [13ID]

GUP4952 Surface diffraction studies of the water-goethite interface. G Waychunas, P Eng, T Trainor, S Ghose 2006-2008 [13ID]

GUP4986 Structure and crystallization of nanometer-sized amorphous titania. B Chen, H Zhang, G Waychunas, B Gilbert, J Banfield 2006-2008 [11ID]

GUP4988 Structure of hydroxylated magnetite (001) and (111) surfaces. T Trainor, P Eng, S Ghose, G Waychunas 2005-2007 [13ID]

GUP5028 Micromechanical properties of harder and softer nanoparticles. B Chen, B Gilbert, H Zhang, G Waychunas, J Banfield 2006-2008 [20ID]

GUP6768 In-site surface diffraction studies of the water-Diaspore ($\alpha\text{-AlOOH}$) and water-Goethite ($\alpha\text{-FeOOH}$) interface. G Waychunas, S. Ghose, P. Eng, T. Trainor 2006-2008 [13ID]

GUP6782 Grazing-incidence EXAFS study of silicate monomer sorption on hematite single crystal surfaces. G Waychunas, Y-S Jun 2006-2007 [4ID]

GUP6790 Photostimulated Ligand-induced surface reduction of hematite: precursor studies for time-resolved CTR experiments. G Waychunas, B Gilbert, P Eng, S Ghose 2006-2008 [13ID]

GUP6947 Time-resolved pair distribution function analysis of interfacial charge transfer reactions in nanoparticles. B Gilbert, G Waychunas, K Attenkofer 2006-2007 [11ID]

GUP7976 In situ time-resolved GISAXS investigation of the kinetics of nucleation and growth of environmental nanoparticles on mineral-aqueous solution interfaces. Y-S Jun, G Waychunas, B Lee 2007-2008 [12ID]

GUP8098 A rapid 2D scan in reciprocal space using fast pixel array Pilatus detector. S Ghose, G Waychunas, T Trainor, P Eng 2007-2008 [13ID]

GUP8209 Technical developments for time-resolved x-ray absorption spectroscopy of nanoparticle suspensions. B Gilbert, G Waychunas, K Attenkofer 2007-2008 [11ID]

GUP8679 Photostimulated Ligand-induced surface reduction of hematite: precursor studies for time-resolved CTR experiments. G Waychunas, B Gilbert, P Eng, S Ghose 2007-2008 [13ID]

GUP8765 Kinetic study of nucleation and growth of iron oxide nanoparticles on mineral-aqueous solution interfaces using simultaneous SAXS/GISAXS techniques. Y-S Jun, B Lee, G Waychunas 2007-2009 [12ID]

GUP8786 A rapid 2D scan in reciprocal space using fast pixel array Pilatus detector. S Ghose, G Waychunas, T Trainor, P Eng 2008-2009 [13ID]

GUP9441 In-situ surface diffraction studies of the water-Diaspore (α -AlOOH) interface. Comparison with the water-Goethite (α -FeOOH) interface G Waychunas, S Ghose, P Eng, T Trainor 2007-2009 [13ID]

GUP9458 Photostimulated Ligand-induced surface reduction of hematite: precursor studies for time-resolved CTR experiments. G Waychunas, B Gilbert, K Attenkofer 2007-2009 [11ID]

GUP9461 Early nucleation and growth of iron oxide nanoparticles at mineral-water interfaces: Effect of temperature and foreign ions. Y-S Jun, B Lee, G Waychunas 2007-2008 [12ID]

GUP9471 Time-resolved x-ray spectroscopy of photosensitized iron oxide nanoparticles. B Gilbert, G Waychunas, K Attenkofer 2007-2009 [11ID]

GUP10105 Photoreduction and subsequent reoxidization of cobalt(II) in manganese oxide nanosheets. B Gilbert, G Waychunas, J Katz, K Attenkofer 2008-2009 [11ID]

GUP10561 Structure of α -Alumina(0001) & (1-102)/Water Interfaces: Surface X-ray Diffraction Study. G Waychunas, P Eng, T Trainir, S Ghose 2008-2009 [13BM]

GUP11286 Exploring competition between the uranium sequestration mechanisms adsorption, nucleation, and (co)precipitation by X-ray scattering and X-ray absorption spectroscopy. G Waychunas, D Singer 2008-2009 [12ID, 13ID]

GUP11381 The structure of the unreacted pyrite (100) – water interface. B Gilbert, G Waychunas, P Eng 2008-2009 [13BM]

CONSULTING PROJECTS (1983-1997)

Acurex Corporation	Crystallization kinetics of glass-ceramic fabrics.
Advanced Micro Devices	Control of texturing in sputtered Al films on Silicon
Ampex Corporation	Relationship between magnetic behavior and crystal structure of magnetic thin film storage devices.
Aracor	Growth of multilayer thin films on Si.
Aracor	Orientation of thin films on special substrates.
Catalytica Corporation	Identification and site occupation studies in zeolites.
Coherent Radiation	Optical properties of impurities in quartz windows for high power UV lasers.
ESL Corporation	Crystallography of HgCl_2 single crystals.
General Instrument Corp	Epitaxial layer studies in strained layer superlattices (SLSs).
GM Hughes Electronics	Analysis of problems associated with garnet-based Cr-activated phosphors.
Intel Corporation	Development of an automated generalized x-ray diffractometer geometry for versatile thin-film diffraction studies (GFD).
Interra Corporation	Cation mobility in nuclear waste encapsulation materials.

Lawrence Livermore NL	XAS analysis of contaminated soils from DOE National Laboratory remediation sites; computation of XANES from 3rd row transition metal compounds.
Lockheed Corporation	Pole Figure calculation and explanation for specially prepared Be alloys and fabrics; Pole figure calculation and analysis on W alloys; Cell dimensions of Invar alloys.
Materials Progress Corp.	High resolution cell dimensions of doped garnet crystals.
National Semiconductor	X-ray topography of SiO ₂ and other defects in high purity Si.
Phi Star Corporation	Texture and growth of Cu films used in circuitry boards.
Siltec Corporation	Procedures for characterization of nanometer thin films on Si.
SPAD Technologies, Inc.	Development of a curved crystal Bragg-Laue diffraction system for x-ray mammography.
Varian Associates	Structural differences among lead-doped glasses.
V-Ray Imaging Corporation	Design and Development of System for PDI (Phase Dispersion Introscopy) [i.e. phase contrast] X-ray imaging.