Curriculum Vitae

Yan Liang

Professor, Department of Geological Sciences, Brown University

EDUCATION

B.Sc.	Geology	Peking University, P. R. China	1984
M.Sc.	Geosciences	University of Houston	1989
Ph.D.	Geophysical Sciences	The University of Chicago	1994

PROFESSIONAL APPOINTMENTS

Professor	Brown University	2012-present
Assistant, Associate Professor	Brown University	1998-2012
Visiting, Research Scientist	Rensselaer Polytechnic Institute	1995-1998
Postdoctoral Research Associate	The University of Chicago	1995-1997

COMPLETED RESEARCH AND SCHOLARSHIP

Refereed Publications († = Liang's student)

Liang, Y. and Elthon, D. (1990) Evidence from chromium abundance in mantle rocks for extraction of picrite and komatiite melts. *Nature* 343, 551-553.

Liang, Y. and Elthon, D. (1990) Geochemistry and petrology of spinel lherzolite xenoliths from Xalapasco de La Joya, San Luis Potosi, Mexico: Partial melting and mantle metasomatism. *J. Geophys. Res.* 95, 15859-15877.

Richter, F. M. and **Liang**, Y. (1993) The rate and consequences of Sr diagenesis in deep-sea carbonates. *Earth Planet. Sci. Lett.* 117, 553-565.

Liang, Y., Richter, F. M. and Watson, B. E. (1994) Convection in multicomponent silicate melts driven by coupled diffusion. *Nature* 369, 390-392.

Liang, Y. (1995) Axisymmetric double-diffusive convection in a cylindrical container: Linear stability analysis with applications to molten CaO-Al_2O_3-SiO_2. In: *Double-Diffusive Convection* (eds. A. Brandt and J. Fernando). Geophysical Monograph Series 94, 115-124. American Geophysical Union.

Watson, E. B. and **Liang**, Y. (1995) A simple model for sector zoning in slowly-grown crystal: Implications for growth rate and lattice diffusion, with emphasis on accessory minerals in crustal rocks. *Am. Mineral.* 80, 1179-1187.

Liang, Y., Richter, F. M., Davis, A. M., and Watson, E. B. (1996) Diffusion in silicate melts: I. Self diffusion in CaO-Al_2O_3-SiO_2 at 1500°C and 1 GPa. *Geochim. Cosmochim. Acta* 60, 4353-4367.

Liang, Y., Richter, F. M., and Watson, E. B. (1996) Diffusion in silicate melts: II. Multicomponent diffusion in CaO-Al_2O_3-SiO_2 at 1500°C and 1 GPa. *Geochim. Cosmochim. Acta* 60, 5021-5035.

Liang, Y., Richter, F. M., and Chamberlin, L. (1997) Diffusion in silicate melts: III. Empirical models for multicomponent diffusion. *Geochim. Cosmochim. Acta* 61, 5295-5312.

Richter, F. M., **Liang**, Y., and Minarik, W. (1998) Multicomponent diffusion and convection in molten MgO-Al_2O_3-SiO_2. *Geochim. Cosmochim. Acta* 62, 1985-1991.

Richter, F. M., **Liang**, Y., and Davis, A. M. (1999) Isotope fractionation by diffusion in molten oxides. *Geochim. Cosmochim. Acta*. 63, 2853-2861.

Liang, Y. (1999) Diffusive dissolution in ternary systems: Analysis with applications to quartz and quartzite dissolution in molten silicates. *Geochim. Cosmochim. Acta* 63, 3983-3995.

Liang, Y. (2000) Dissolution in molten silicates: Effects of solid solution. *Geochim. Cosmochim. Acta* 64, 1617-1627.

Liang, Y., Price, J. D., Wark, D. A., and Watson, E. B. (2001) Nonlinear pressure diffusion in a porous medium: Approximate solutions with applications to permeability measurements using transient pulse-decay method. *J. Geophys. Res.* 106, 529-535.

Liang, Y. and Davis, A. M. (2002) Energetics of multicomponent diffusion in molten CaO-Al_2O_3-SiO_2. *Geochim. Cosmochim. Acta* 66, 635-646.

Liang, Y. (2003) Kinetics of crystal-melt reaction in partially molten silicates. 1. Grain scale processes. *Geochemistry Geophysics Geosystems* 4(5), 1045, doi: 10.1029/2002GC000375.

Liang, Y. (2003) On the thermo-kinetic consequences of slab melting. *Geophys. Res. Lett.* 30(24), 2270, doi: 10.1029/2003GL018969.

Liang, Y. and Guo, Y. (2003) Reactive dissolution instability driven by chemical diffusion with applications to harzburgite reactive dissolution. *Geophys. Res. Lett.* 30, doi: 10.1029/2003GL017687.

† Morgan, Z. T. and **Liang**, Y. (2003) An experimental and numerical study of the kinetics of harzburgite reactive dissolution with applications to dunite dike formation. *Earth Planet. Sci. Lett.* 214, 59-74.

† Lo Cascio, M, **Liang**, Y., and Hess, P. C. (2004) Grain-scale processes during isothermal-isobaric melting of lherzolite. *Geophys. Res. Lett.* 31, L16605, doi: 10.1029/2004GL020602.

† Morgan, Z. T. and **Liang**, Y. (2005) An experimental study of the kinetics of lherzolite reactive dissolution with applications to melt channel formation. *Contrib. Mineral. Petrol.* 150, 369-385, doi: 10.1007/s00410-005-0033-8.

Beck, A. R., Morgan, Z. T., and **Liang**, Y., and Hess, P. C. (2006) Dunite channels as viable pathways for mare basalt transport in the deep lunar mantle. *Geophys. Res. Lett.* 33, doi: 10.1029/2005GL024008.

† Morgan, Z. T., **Liang**, Y., and Hess, P. C. (2006) An experimental study of the kinetics of anorthosite dissolution in lunar picritic magmas with applications to lunar crustal assimilation processes. *Geochim. Cosmochim. Acta* 70, 3477-3491.

Cherniak, D. and **Liang**, Y. (2007) Rare earth element diffusion in natural enstatite. *Geochim. Cosmochim. Acta* 71, 1324-1340.

Saal, A. E., Kurz, M. D., Hart, S. R., Blusztajn, J. S., Blichert-Toft, J., **Liang**, Y. and Geist, D. J. (2007) The role of lithospheric gabbros on the composition of Galapagos lavas. *Earth Planet. Sci. Lett.* 257, 391-406.

† Lo Cascio, M, **Liang**, Y., Shimizu, N., and Hess, P. C. (2008) An experimental study of the grain scale processes of peridotite melting: Implications for major and trace element distribution during equilibrium and disequilibrium melting. *Contrib. Mineral. Petrol.* 156, 87-102, doi: 10.007/s00410-007-0275-8.

Liang, Y. (2008) Simple models for concurrent melting and melt migration in an upwelling heterogeneous mantle column: Analytical solutions. *Geochim. Cosmochim. Acta* 72, 3804-3821, doi: 0.1016/j.gca.2008.05.050.

† Morgan, Z. T., **Liang**, Y., and Kelemen, P. B. (2008) Significance of the composition profiles associated with dunite bodies in the Josephine and Trinity ophiolites. *Geochemistry Geophysics Geosystems* doi: 10.1029/2008GC001954.

† Thacker, C., **Liang**, Y., Peng, Q., and Hess, P. C. (2009) The stability and major element partitioning of ilmenite and armalcolite during lunar cumulate mantle overturn. *Geochim. Cosmochim. Acta* 73, 820-836 (doi: 10.1016/j.gca.2008.10.038).

Koleszar, A. M., Saal, A. E., Hauri, E. H., Nagle, A. N., **Liang**, Y., Kurz, M. D. (2009) Melt inclusions, the volatiles contents of the Galapagos plume and evidence of open system behavior. *Earth Planet. Sci. Lett.* doi: 10.1016/j.epsl.2009.08.029.

Liang, Y. and † Peng, Q. (2010) Non-modal melting in an upwelling mantle column: Steady-state models with applications to REE depletion in abyssal peridotites. *Geochim. Cosmochim. Acta* 74, 321-339, doi: 10.1016/j.gca.2009.09.029.

Liang, Y. and Parmentier, E. M. (2010) A two-porosity double lithology model for partial melting, melt migration and melt-rock reaction in the mantle: The nature of channel melt and the role of matrix dissolution. *J. Petrol.* 51, 125-152, doi:10.1093/petrology/egp086.

Liang, Y., Schiemenz, A., Hesse, M., Parmentier, E. M., and Hesthaven, J. S. (2010) High-porosity channels for melt migration in the mantle: Top is the dunite and bottom is the harzburgite and lherzolite. *Geophys. Res. Lett.* 37, L15306, doi: 10.1029/2010GL044162.

Liang, Y. (2010) Multicomponent diffusion in molten silicates: Theory, experiments, and geological applications. *Reviews in Mineralogy and Geochemistry*. 72, 409-446, doi: 10.2138/rmg.2010.72.9.

Schiemenz, A., **Liang, Y**., Parmentier, E. M. (2011) A high-order numerical study of reactive dissolution in an upwelling heterogeneous mantle: I. Channelization, channel lithology, and channel geometry. Geophysical Journal International, 186, 641-664, doi: 10.1111/j.1365-246X.2011.05065.x.

Hesse, M., Schiemenz, A., **Liang, Y**., and Parmentier, E. M. (2011) Compaction-dissolution waves in an upwelling mantle column. Geophysical Journal International, 187, 1057-1075, doi: 10.1111/j.1365-246X.2011.05177.x.

Liang, Y., Schiemenz, A., and Hesse, M. (2011) Waves, channels, and the preservation of chemical heterogeneities during melt migration in the mantle. 38, L20308, *Geophys. Res. Lett.* doi: 10.1029/2011GL049034.

† Sun, C. and **Liang**, Y. (2012) Distribution of REE between clinopyroxene and basaltic melt along a mantle adiabat: Effects of major element composition, water, and temperature. *Contrib. Mineral. Petrol.* 163, 807-823, doi: 10.1007/s00410-011-0700-x.

† Tursack, E. and **Liang**, Y. (2012) A comparative study of melt-rock reactions in the mantle: laboratory dissolution experiments and geological field observations. *Contrib. Mineral. Petrol.* 163, 861-876, doi: 10.1007/s00410-011-0703-7.

† Yao, L., Sun, C. and **Liang**, Y. (2012) A parameterized model for REE partitioning between low-Ca pyroxene and basaltic melts with applications to adiabatic mantle melting and pyroxenite-derived melt and peridotite interaction. *Contrib. Mineral. Petrol.* doi: 10.1007/s00410-012-0737-5.

Cherniak, D. and **Liang**, Y. (2012) Ti diffusion in natural pyroxene. *Geochim. Cosmochim. Acta*, doi: 10.1016/j.gca.2012.09.021.

Liang, Y., Sun, C., and Yao, L. (2012) A REE-in-two-pyroxene thermometer for mafic and ultramafic rocks. *Geochim. Cosmochim. Acta,* in revision.

† Dygert, N., **Liang**, Y., and Hess, P. C. (2012) The importance of melt TiO_2 in affecting high field strength element partitioning between Fe-Ti oxides and lunar picritic glass melts. *Geochim. Cosmochim. Acta,* in revision.

† Sun, C. and **Liang**, Y. (2012) Distribution of REE and HFSE between low-Ca pyroxene and lunar picritic glass melts around multiple-saturation points. *Geochim. Cosmochim. Acta*, in review.

Zhang, N., Parmentier, E. M., and **Liang**, Y. (2012) Instability and distribution of ilmenite-bearing cumulates after the overturn of an initially stratified lunar mantle. *Earth Planet. Sci. Lett.*, in review.

Non-Refereed Publications

Liang, Y., Lo Cascio, M., Morgan, Z., Peng, Q., Kelemen, P. (2007) Melt-peridotite reaction in the mantle: Grain-scale processes and geological applications. *Journal of China University of Geosciences,* 18, 194-197.

Abstracts and Short Papers (since 2010)

Liang, Y. Schiemenz A., and Parmentier, E. M. (2010) Melting and melt migration in a heterogeneous lunar mantle: Physical processes and chemical consequences. *Lunar and Planetary Science Conference, 41th*, #2241.

Parmentier, E. M. and **Liang**, Y. (2010) Formation of pure anorthosite during lunar magma ocean solidification: Implications for the melt-solid segregation process. *Lunar and Planetary Science Conference, 41th*, #1824.

Liang, Y, Xia, Y., and Bons, P. (2010) Grain growth and dissolution during crystal-melt interactions. *Geochim. Cosmochim. Acta* 74, *Supplement*, A604.

Liang, Y. (2010) Kinetics of crystal-melt interaction in multicomponent partially molten silicates. Abstract V44A-06 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

† Dygert, N. J. and **Liang**, Y. (2010) Compaction driven melt locatization in dunites and associated rocks in the mantle: Field observations and numerical experiments. Abstract T23A-2229 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

Schiemenz, A., **Liang**, Y., Hesse, M. A., and Parmentier, E. M. (2010) Waves and channels for melt migration in an upwelling mantle. Abstract DI43C-02 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

† Sun, C. and **Liang**, Y. (2010) Distribution of REE between clinopyroxene and basaltic melt along a mantle adiabat: Effects of major element composition, water, and temperature. Abstract V23B-2399 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

† Tursack, E. and **Liang**, Y. (2010) A comparative study of melt-rock reactions in the mantle: Laboratory dissolution experiments and geological field observations. Abstract V23B-2454 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

† Yao, L., Dygert, N. J., Peterson, M. E., Sun, C., Wetzel D. T., and **Liang**, Y. (2010) "A bundle of columns" model for trace element fractionation during melting and melt migration in a vertically upwelling, chemically and lithologically heterogeneous mantle. Abstract V11A-2258 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

† Sun, C., Yao L., and **Liang**, Y. (2011) Some speculations on the distribution of REE between orthopyroxene and lunar picritic glass melts at multiple-saturation points. *Lunar and Planetary Science Conference, 42th*, #2009.

† Dygert, N., **Liang**, Y., and Hess, P. C. (2011) Experimental evidence for high field strength element incompatibility in titaniferous phases in equilibrium with high titanium mare basalts and picritic glass melts. *Lunar and Planetary Science Conference, 42th*, #1956.

Liang, Y. and Schiemenz, A. (2011) Waves, channels, and diffusive porous flow: Geochemical implications for melt migration in an upwelling heterogenous mantle. *Geochim. Cosmochim. Acta* 72, *Supplement*, A1324.

† Sun, C. and **Liang**, Y. (2011) Simple models for trace element fractionation during melting, melt transport and melt-rock reaction in a chemically and lithologically heterogeneous mantle. Abstract V23B-2569 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

† Yao, L., E., Sun, C., and **Liang**, Y. (2011) Self-consistent models for REE partitioning among high-Ca pyroxene, low-Ca pyroxene, and basaltic melts with applications to REE distribution during adiabatic mantle melting and pyroxenite-derived melt and mantle interaction. Abstract V23B-2570 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec.

† Dygert, N. J. **Liang**, Y., and Kelemen, P. (2011) Trace element abundances in pyroxenes from a dunite-harzburgite-lherzolite sequence at the Trinity ophiolite: Evidence for multiple episodes of melt migration and melt-rock reaction. Abstract V31D-2557 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec.

Zhang, N., Parmentier, E. M., and **Liang**, Y. (2011) The stability of the ilmenite-rich cumulates and its implications for structures in the lunar mantle and core. Abstract P13D-1698 presented at 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec.

Liang, Y., Sun, C., Yao, L., and Hess, P. (2012) A REE-in-two-pyroxene thermometer for lunar plutonic rocks with applications to thermal evolution of the Moon. *Lunar and Planetary Science Conference, 43th*, #1987.

† Sun, C. and **Liang**, Y. (2012) Trace element partitioning between low-Calcium pyroxene and lunar picritic glass melts at multiple-saturation points with applications to melting and melt migration in a heterogeneous lunar cumulate mantle. *Lunar and Planetary Science Conference, 43th*, #1952.

† Yao, L. and **Liang**, Y. (2012) An experimental study of the solidus of a hybrid lunar cumulate mantle: Implications for the temperature at the core-mantle boundary of the moon. *Lunar and Planetary Science Conference, 43th*, #2258.

† Dygert, N., **Liang**, Y., and Hess, P. C. (2012) The effect of melt TiO_2 on Fe-Ti oxide-picritic basalt hfse partitioning: Parameterized models, lunar applications. *Lunar and Planetary Science Conference, 43th*, #2033.

Zhang, N., Parmentier, E. M., and **Liang**, Y. (2012) Instability and distribution of ilmenite-rich cumulates after the overturn of an initially stratified lunar mantle. *Lunar and Planetary Science Conference, 43th*, #2641.

Theses

Liang, Y. (1989) Geochemistry and petrology of spinel lherzolite xenoliths from Xalapasco de La Joya, San Luis Potosi, Mexico: Partial melting and mantle metasomatism. Unpublished M.Sc. Thesis, University of Houston.

Liang, Y. (1994) Models and experiments for multicomponent chemical diffusion in molten silicates. Ph.D. Thesis, The University of Chicago.

STUDENT ADVISING

Postdoc:	Marc Hesse,	2008-2009
	Alan Schiemenz,	2009-2010
	Nan Zhang	2011-present
Graduate Student:	Zarchary T. Morgan,	M.Sc. (2002), Ph.D. (2006)
	Mauro Lo Cascio,	M.Sc. (2003), Ph.D. (2008)
	Carla Thacker	M.Sc. (2008)
	Qinglan Peng	M.Sc. (2009)
	Chenguang Sun	began 9/2008, M.Sc. (2010)
	Nicholas Dygert	began 9/2009
	Lijing Yao	began 9/2009, M.Sc. (2011)
	Conroy Baltzell (co-supervise with Marc Parmentier), began 9/2012	
Undergraduate Students:	Kevin Wheeler, UTRA (2000), senior thesis (2001)	
	Keith Bocian, UTRA (2000)	
	Shauna Edison, senior thesis (2005)	
	Jesse Kass, senior thesis (2007)	
	Carla Thacker, senior thesis (2007)	
	Emily Tursack, senior thesis (2011)	
	Lee Saper (2012)	
	Michelle Graf (2012-present)	