

Kurt C. Friehauf

Department of Physical Sciences
Boehm Science Bldg. Room 135
Kutztown University
Kutztown, PA 19530

Tel (610) 683-4446
Fax (610) 683-1352
e-mail friehauf@kutztown.edu
www <http://faculty.kutztown.edu/friehauf>

Education

Stanford University

Ph.D. – Geological and Environmental Sciences, June 1998

Dissertation: Geology and Geochemistry of Porphyry-Related, Carbonate-hosted, Massive Replacement Cu-Au Deposits – A Case Study of the Superior District, Arizona

advisor: Marco T. Einaudi

Colorado State University

B.S. in Geology, May 1989

Course-work included mineral deposits, industrial minerals, exploration geochemistry, fluid inclusions studies, hydrothermal alteration, advanced structural geology

Academic/Teaching experience

Kutztown University, Kutztown, Pennsylvania

Professor 2010 – present (Associate Professor 2004–2010, Assistant Professor 1999 – 2004)

Teach “hard rock” geology and general geoscience courses and accompanying labs:

- Economic Geology + Lab
- Mineralogy + Lab
- Optical Mineralogy + Lab
- Igneous and Metamorphic Petrology + Lab
- Petrology and Geochemistry + Lab
- Environmental Geology + Lab
- Hydrogeology + Lab
- Field Geology
- Geology of National Parks and Monuments
- Geophysics + Lab
- Structural Geology + Lab
- Physical Geology (science majors) + Lab
- Introduction to Geology (non-science majors) + Lab
- Senior Seminar in Geology
- Writing that Rocks! – “Shakespeare and Schist” Geology in Literature workshop (June 2007)
- Minerals of Eastern Pennsylvania workshop (June 2009)

Research focuses on chemical interaction of rocks and water.

Projects: Geology of the Haib porphyry copper deposit (Namibia)

Geology of Mount Fairplay volcanic-hydrothermal complex (Alaska)

Geology of porphyry molybdenum deposits of Qinling Mountains (Henan, China);

Origin of giant Baiyun Obo REE deposits (Inner Mongolia, China);

Evolution of porphyry mineralization in Ertsberg porphyry Cu-Au district (Irian Jaya, Indonesia);

Modeling sulfur isotope distillation in massive replacement ores, Superior district (Arizona);

Origin of regional belt of metasomatic iron deposits in eastern Pennsylvania/New Jersey/New York;

Controls on cave formation and groundwater flow in dolomitic limestone (Pennsylvania)

Guide Undergraduate research in: economic geology, petrology, geochemistry, and groundwater hydrogeology.

China University of Geosciences, Beijing, China

Visiting lecturer May 2002, December 2003, May 2004, May 2005, May 2006, May 2007, May 2008, May 2009

Teach 3-4 week long graduate-level short courses on “The Geology of Metallic Mineral Deposits”

University of Arizona, Tucson, Arizona

Research Associate July 1998 – July 1999

Investigating metasomatic processes related to flow of connate brines in the contact aureoles of plutons intruding sedimentary basins, to gold deposits of Mexico, and to porphyry copper-gold deposits of Irian Jaya; developing comprehensive GIS database of the geology and mineral resources of Mexico; collaborating with graduate student researchers.

Stanford University, Stanford, California

Teaching Assistant Spring 1998

***** Centennial Teacher of the Year Award *****

Presented lectures, designed labs, guided students doing geologic mapping in the field, advised students on projects, and graded papers for geologic mapping course including labs using laser surveying equipment, GPS, AutoCAD, and GIS

Industry experience

Magma Mining Company, Superior, Arizona

Geologist June 1992 – October 1994

Mapped geology, logged diamond drill core, and sampled ore on surface and in active underground mine in porphyry-related carbonate-hosted "manto-type" Cu-Au-Ag deposit.

Magma Nevada Mining Company, Ely, Nevada

Geologist July 1991 – September 1991

Mapped surface geology and alteration, logged RC drill cuttings (both on the rig and in the office), and made interpretive synthesis of this data for two gold exploration targets in a porphyry copper deposit. Mapped drill cuttings from blast patterns in open pit mine. Made presentations to local community members.

ASARCO, Inc., Denver, Colorado

Geologist June 1989 – August 1989

Mapped geology and hydrothermal alteration on scales from 1"=1000 feet to 1"= 10 feet, assessed value of lode mines/prospects in Colorado and New Mexico for gold mining.

Resource Associates of Alaska, Inc. (NERCO Exploration and Western Mining Co.), Fairbanks, Alaska

Geologist May 1988 – September 1988

Mapped geology on scales from 1"=1000 feet to 1"= 10 feet, sampled stream/soil for geochemical survey, mapped and sampled trenches, ran a proton magnetometer survey, interpreted geochemical data in helicopter-assisted exploration for gold.

Publications

all abstracts available at <http://faculty.kutztown.edu/friehauf>

Papers

Friehauf, Kurt C., and Einaudi, Marco T., *in prep*, Reaction path modeling of high-sulfidation state Cu-Au ore fluids in carbonate rocks – a case study at the Superior porphyry-related deposit, Arizona.

Friehauf, Kurt C., Smith, Robert C., II, and Volkert, Richard A., *in prep*, Regional metallogeny and geology of the Mid-Atlantic Iron Oxide Belt of Pennsylvania, New Jersey, and New York – A Comparative Study of the Proterozoic- and Mesozoic-Hosted Deposits and Implications on Structural Reconstruction of the Reading Prong Belt.

Friehauf, Kurt C., Titley, Spencer R., and Gibbins, Stacie, L., *in prep*, Vein abundance measurements an effective vector for proximity to ore, Ertsberg porphyry Cu-Au deposit, West Papua, Indonesia.

Volkert, R.A., Monteverde, D.H., **Friehauf, K.C.**, Gates, A.E., Dalton, R.F., and Smith, R.C., II, 2010, Geochemistry and origin of Neoproterozoic ironstone deposits in the New Jersey Highlands and implications for the eastern Laurentian rifted margin in the north-central Appalachians, USA, *in* Tollo, R.P., Bartholomew, M.J., Hibbard, J.P., and Karabinos, P.M., *eds.*, *From Rodinia to Pangea: The Lithotectonic Record of the Appalachian Region*: Geological Society of America Memoir 206, p. 283–306.

Friehauf, K.C., 2008, Iron-sulfur redox and its effect on sulfur-isotope fractionation in carbonate-hosted Cu-Au replacement ores, Superior, Arizona, *in* Spencer, J.E., and Titley, S.R., *eds.*, *Ores and orogenesis: Circum-Pacific tectonics, geologic evolution, and ore deposits*: Arizona Geological Society Digest 22, p. 583-590.

Mathur, Ryan, Ruiz, Joaquin, Titley, Spencer R., Gibbins, Stacie L., and **Friehauf, Kurt C.**, 2005, A detailed Re-Os isotope study of ores and sediments from Ertsberg District: Evidence linking porphyry copper mineralization to periphery skarn mineralization and the importance of the surrounding continental crust as a source for metals: *Ore Geology Reviews*, v. 26, no. 3-4, p. 207-226.

Friehauf, Kurt, Gibbins, Stacie, and Titley, Spencer, 2005, Porphyry-Style Mineralization in the Ertsberg Diorite, Gunung Bijih (Ertsberg/Grasberg) District, West Papua, Indonesia: *in* Porter, T.M., *ed.*, *Super Porphyry Copper & Gold Deposits - A Global Perspective*, PGC Publishing, Adelaide, Australia, v. 2, p. 357-366.

Friehauf, Kurt C., Smith, Robert C., II, and Volkert, Richard A., 2001, Comparison of the Geology of Proterozoic Iron Oxide Deposits in the Adirondack And Mid-Atlantic Belt of Pennsylvania, New Jersey, and New York: *in* Potter, Mike, *ed.*, *Hydrothermal Iron-Oxide Copper-Gold & Related Deposits a Global Perspective - Volume 2: Australian Mineral Foundation Monograph series*, Porter, T.M., *ed.*, PGC Publishing, Australia, p. 247-252.

Friehauf, Kurt C., 1999, Review of MAC short course on Mineralized Intrusion-related Skarn Deposits: *Economic Geology*, v. 94, no. 3, p. 439-440.

Friehauf, Kurt C., and Pareja, Guillermo A., 1998, Can Oxygen Isotopic Haloes be Produced Around High-Temperature Dolostone-Hosted Ore Deposits? – Evidence from the Superior District, Arizona: *Economic Geology*, v. 93, p. 639-650.

Papers Presented at Professional Meetings

(italics indicates student co-authors)

- Xiao, Ping, Frieauf, Kurt, Wang, Yanbin, and Wang, Cuizhi, 2010, The implication of similarities and systematic variations among the monometallic high-fluorine porphyry deposits in the East Qinling Molybdenum Belt, China: 2010 Denver GSA Annual Meeting (31 October – 3 November, 2010) Geological Society of America Abstracts with Programs, vol. 42, no. 5, p. 580.*
- Storm, Lauren, Frieauf, Kurt, Yuan, Zhenlei, Xiao, Ping, and Moorehead, Anthony, 2009, Mineralization within the Dong Gou porphyry molybdenum deposit, Eastern Qinling Mountains, Henan, China [abs.]: 2009 Portland GSA Annual Meeting (18-21 October 2009), Geological Society of America Abstracts with Programs, vol. 41, no. 7, p. 84.*
- Frieauf, Kurt, 2007, Iron-sulfur redox and its effect on sulfur isotope fractionation in carbonate-hosted Cu-Au replacement ores, Superior, Arizona [abs.]: Arizona Geological Society Ores and Orogenesis Symposium (September 24-30, 2007), Tucson, AZ.**
- Smoyer, Justin, Kuhn, Michelle, Frieauf, Kurt, and Quinn, Paul V. Sr., 2006, Design for a manually controlled multiple electrode electrical resistivity array for student geophysical surveys [abs.]: Geological Society of America Northeastern Section – 41st Annual Meeting (20–22 March 2006), Harrisburg, PA, Program with Abstracts, v. 38, no. 2, p. 89.*
- Frieauf, Kurt C., Dilliard, Kelly, and Pope, Michael C., 2005, A Geochronology Puzzle – Integrating Relative and Absolute Age Studies in Introductory Courses [abs.]: Geological Society of America Annual Meeting (October 16-19, 2005) Salt Lake City, UT, Program with Abstracts, vol. 37, no. 7, p. 152.**
- Artz, Zachary J., Frieauf, Kurt C., and Xiao, Rongge, 2005, Comparison of Banded Ores in the Main/East, West, and South Orebodies of the Giant Bayan Obo REE District, Inner Mongolia, China [abs.]: Geological Society of America Annual Meeting (October 16-19, 2005) Salt Lake City, UT, Program with Abstracts, vol. 37, no. 7, p. 500.*
- Gibbins, Stacie L., Titley, Spencer, and Frieauf, Kurt, 2005, Porphyry Cu-Au Mineralization in the Ertsberg Intrusion, West Papua, Indonesia: Style, Timing, and Sources of Hydrothermal Fluids [abs.]: Geological Society of America Annual Meeting (October 16-19, 2005) Salt Lake City, UT, Program with Abstracts, vol. 37, no. 7, p. 314.*
- Frieauf, Kurt C., Dilliard, Kelly, and Pope, Michael C., 2005, A Geochronology Puzzle – Integrating Relative and Absolute Age Studies in Introductory Courses [abs.]: Geological Society of America Annual Meeting (October 16-19, 2005) Salt Lake City, UT, Program with Abstracts, vol. 37, no. 7, p. 152.**
- Wolfinger, S., Ward, K., Holland, J., Nase, A., Ferguson, E., Zellner, G., Frieauf, K., Tindall, S., and Schultz, L., 2004, A multidisciplinary study of controls on groundwater flow in a karst aquifer in the Ordovician Beekmantown Group, Berks County, PA [abs.]: Geological Society of America Northeastern Section - 39th Annual Meeting (March 27–29, 2004) Washington D.C., Program with Abstracts, v. 36, no. 2, p. 128.*
- Frieauf, K., Titley, S., and Gibbins, S., 2003, Application of Vein Abundance Studies in Exploration in the Ertsberg Porphyry Deposit, West Papua, Indonesia [abs.]: Geological Society of America Annual Meeting (November 2-5, 2003) Seattle, WA, Program with Abstracts, v. 35, no. 6, p. 400.**
- Cook, E., Frieauf, K., Gibbins, S., and Titley, S., 2003, Gold Occurrences in the Stockwork Mineralization in the Ertsberg Diorite, West Papua, Indonesia [abs.]: Geological Society of America Annual Meeting (November 2-5, 2003) Seattle, WA, Program with Abstracts v. 35, no. 6, p. 232.*
- Gibbins, S., Titley, S., Frieauf, K., 2003, Age, Origin, Petrology and Petrography of the Ertsberg Diorite, West Papua, Indonesia [abs.]: Geological Society of America Annual Meeting (November 2-5, 2003) Seattle, WA, Program with Abstracts v. 35, no. 6, p. 400.*
- Hoefert Catherine M., Burris, Lea, Yenchik, John, Black, Laurel E., and Frieauf, Kurt C., 2003, Mappin' Without Diggin': An Application of Magnetometry Techniques in the Rittenhouse Gap Mining District in Berks County, Pennsylvania [abs.]: Geological Society of America Northeastern Section - 38th Annual Meeting (March 27–29, 2003) Halifax, Nova Scotia, Program with Abstracts, v. 35, no. 3, p. 94.*
- Frieauf, Kurt C., Smith, Robert C., II, and Volkert, Richard A., 2001, Regional Trends in the U.S. Mid-Atlantic Proterozoic Iron Oxide Belt [abs.]: Geological Society America Abstracts with Programs, v. 33, no. 6, p. A4.**
- Frieauf, Kurt C., Soebari, Lasito, and Titley, S.R., 2000, Porphyry-Style Mineralization in the Ertsberg Diorite, Gunung Bijih (Grasberg) District, West Papua [abs.]: Geological Society America Abstracts with Programs, v. 32, no. 7, p. A137.**
- Gibbins, S., Frieauf, Kurt C., and Titley, S.R., 2000, Unusual Advanced Argillic Alteration of the SW Rim of the Grasberg Cu-Au Porphyry Deposit, Irian Jaya, Indonesia [abs.]: Geological Society America Abstracts with Programs, v. 32, no. 7, p. A137.*
- Orner, Richard, and Frieauf, Kurt C., 2000, Geology of the Rittenhouse Gap Iron District, Berks County, Pennsylvania [abs.]: Geological Society America Abstracts with Programs, v. 33, no. 7, p. A83.*

- Friehauf, Kurt C.**, Soebari, Lasito, and Titley, Spencer R., 2000, Porphyry-Style Mineralization in the Ertsberg Diorite, Gunung Bijih (Ertsberg/Grasberg) District, Irian Jaya, Indonesia [ext. abs.]: Special Field Conference on Advances in the Geology of the Ertsberg/Grasberg District, Irian Jaya, Indonesia, (hosted by Institut Teknologi Bandung = Bandung Institute of Technology, Bandung, Java, Indonesia) September 26-30, 2000.
- Mather, R., Gibbins, S., Titley, S.R., **Friehauf, K.C.**, and Ruiz, J., 2000, Results and implications of recent Re-Os studies of the Grasberg mineral system, Gunung Bijih (Ertsberg/Grasberg) District, Irian Jaya, Indonesia [ext. abs.]: Special Field Conference on Advances in the Geology of the Ertsberg/Grasberg District, Irian Jaya, Indonesia, (hosted by Institut Teknologi Bandung = Bandung Institute of Technology, Bandung, Java, Indonesia) September 26-30, 2000.
- Titley, S.R., and **Friehauf, K.C.**, 1999, Evolution of the Practice of Economic Geology in the 20th Century [abs]: Geological Society America Abstracts with Programs, v. 31, no. 7, p. A20.
- Greenhoot, C.A., **Friehauf, K.C.**, and Barton, M.D., 1999, Geology of the Metates Pyrite-Arsenopyrite-Gold-Silver Deposit, Durango, Mexico [abs.]: Geological Society America Abstracts with Programs, v. 31, no. 7, p. A406.
- Friehauf, Kurt C.**, 1998, Characteristics of carbonate-hosted high-sulfidation state copper-gold ores in porphyry systems— a case study of the Superior district, Arizona [abs]: Geological Association of Canada/ Mineralogical Association of Canada Quebec 1998 Abstracts with Programs, vol. 23, p. A-58.
- Friehauf, Kurt C.**, 1997, Cu-Au massive replacement ores of the Bingham (UT), Bisbee (AZ), and Superior (AZ) districts – A petrographic comparison of late-stage porphyry-related ores in carbonate rocks [abs]: Geological Society America Abstracts with Programs, vol. 29, no. 6, p. A446.
- Friehauf, Kurt C.**, 1996, Reaction paths of high-sulfidation state copper-gold ore fluids in carbonate rocks -- A case study at the Superior porphyry-related deposit, AZ [abs]: Geological Society America Abstracts with Programs, vol. 28, no. 7, p. A403.
- Friehauf, Kurt C.**, 1995, Carbonate-replacement Cu-(Au) deposits associated with a high-sulfidation state Butte-type vein system, Superior District, AZ [abs]: Soc. Econ. Geol. Field Conference on Carbonate-hosted Zinc Deposits, St. Louis, MO.
- Friehauf, Kurt C.**, 1995, Skarn and Cu-(Au)-rich massive sulfide/specularite carbonate-replacement deposits of the Superior District, AZ [abs]: Geological Society Nevada Symposium on the Geology and Ore Deposits of the American Cordillera, Reno, Nevada, Programs with Abstracts, p. A32-A33.

Grants

- Pennsylvania State System of Higher Education Faculty Development Grant – \$7,890 – *The Chicken Alaska White Gold Project: Undergraduate Geologic Field Experience in the Alaska-Yukon Region and Electron Microscope Laboratory – Determining the Geologic Conditions of Gold Deposition* (May 2011– August 2012)
- Kutztown University Research Grant – \$3,850 - *Geologic investigation of Hualong nickel deposits in eastern Qinghai Province, China – Integrating undergraduate student overseas cultural experiences with scientific research* (Summer 2008)
- Pennsylvania State System of Higher Education Diversity and Equity Grant – \$7,560 – *Kutztown University Women in Science Project* (July 2007– July 2009)
- Pennsylvania State System of Higher Education Faculty Development Grant – \$5,705 – *Comparative geology of porphyry copper deposits in the eastern Tianshan region, northwest China* (May 2007– October 2008)
- Kutztown University Research Grant – \$7,900 - *Geologic investigation of the Baiyun Obo Rare Earth Element District, Inner Mongolia, China – Integrating undergraduate student learning experiences with faculty research* (Summer 2003-Summer 2004)
- Pennsylvania State System of Higher Education Faculty Development Grant – \$5,252 – *Geologic investigation of the Baiyun Obo Rare Earth Element District, Inner Mongolia, China – Integrating undergraduate student learning experiences with faculty research* (Summer 2003-Summer 2004)
- Co-authored research grant from P.T. Freeport Indonesia with Spence Titley – \$50,000 annually – *Geology of the Ertsberg porphyry deposit* (1999-2002), University of Arizona)
- Council on Undergraduate Research grant – \$3,000 – *Geology of the Rittenhouse Gap Iron Mine, Berks County, Pennsylvania* (Richard Orner – Summer 2000), Kutztown University
- Co-authored Friends of Mineralogy Undergraduate Research Grant – \$500 – *Geology of the Rittenhouse Gap Iron Mine, Berks County, Pennsylvania* (Richard Orner – Summer 2000), Kutztown University
- Co-authored National Science Foundation grant – \$244,000 – *Geologic processes in the porphyry-epithermal transition* (Marco T. Einaudi – 1995-1997 EAR 9418301), Stanford University, California

Community service

* indicates current activity

Kutztown University

- * Chair and webmaster of the Kutztown University Undergraduate Research Committee (Autumn 2001 – Present)
- * Kutztown University Geology Club Faculty Advisor (September 1999 – Present)
- * Kutztown University Outdoors Club Faculty Advisor (September 2006 – Present)
- * Chair of Physical Sciences Departmental Tenure and Promotion Committee for geology faculty (September 2005 – Present)
- * Kutztown University Geology Program webmaster (August 2009 – Present)
- * Search committee for College of Liberal Arts and Sciences Dean (April 2011-present)
- * Physical Sciences Representative for visitation days + science open house (September 1999 – Present [*Speaker 2006*])
- Kutztown University Women in Science Project (July 2007– May 2010)
- Geological Society of America Biggs Earth Science Teaching Award Committee (March 2010)
- Council for Teacher Education (September 2009 – May 2010)
- Physical Science Faculty Scholarship Committee (September 2009 – May 2010)
- Chambliss Academic Achievement Award Committee (September 2009 – May 2010)
- Liberal Arts and Sciences First Year Text Committee (Autumn 2002 – May 2010)
- Chair of Departmental Promotion Committee for geology faculty (September 2005 – May 2009)
- Co-Chair tenure-track Marine Geology Search Committee (Autumn 2007 – May 2009)
- Co-Chair tenure-track Geophysics Search Committee (Autumn 2007 – May 2009)
- Co-Chair tenure-track Geology Search Committee (Autumn 2008 – May 2009)
- Temporary Geology Search Committee (Summer 2001 [chair], Autumn 2001 [chair], Autumn 2004, Spring – Summer 2005 [chair], Spring 2006 [chair], Spring 2007 [chair], Spring 2008 [chair], Spring 2009 [chair])
- Environmental Science Program Committee (Autumn 2004 – May 2009)
- Chair of Liberal Arts and Sciences Curriculum Committee (September 2005 – May 2008 [*secretary 2002 – 2005, member 2001-2002*])
- Steering Committee for the Kutztown University report to the Middle States Commission on Higher Education (December 2005 – May 2008)
- Geology Five Year Review Committee Chair (2006 – 2007)
- College of Liberal Arts and Sciences Strategic Planning Committee (Autumn 2005 – Spring 2007)
- Faculty and Staff annual Make a Difference campaign (March 2006 – May 2006)
- Tenure-track Physics Search Committee (2001–2002, 2004 – 2005)
- Tenure-track Environmental Chemistry Search Committee (2004 – 2005)
- Special Student Awareness Retention Team for College of Liberal Arts (Spring 2003 – Spring 2005)
- Chair of Ribbon-Cutting Committee for dedication of new Boehm Science Building (2002 – 2003)
- Chair of Tenure-track Structural Geology Search Committee (Autumn 2001)
- Academic Technology Committee (September 2001 – May 2003)
- Liberal Arts and Sciences Freshman Retention Committee (September 2001, 2002, 2003)
- Marine Science Program Committee (Autumn 2001)
- Physical Science Committee to Increase Enrollment and Retention (Spring 2001)
- Graduate School Council (September 1999 – May 2001)
- Zeta Tau Alpha (ZTA) Sorority Faculty Advisor ($\Sigma\Omega\Gamma$ 2000-2006, ZTA 2006 – May 2008)
- DaVinci Center Science Majors Fair for High School Students considering college (March 1, 2006, Allentown, PA)
- Phi Sigma Pi Honor Fraternity Faculty Advisor (September 2004 – October 2005, Kutztown University)
- Sigma Omega Pi Sorority Faculty Advisor (August 2001 – May 2005, Kutztown University)
- Kutztown University representative to Pennsylvania State Science High School Teachers Association meeting in Hershey, PA (November 2004, 2005 Kutztown University)
- Speaker for high school students pondering going to college (Spring 2005, Kutztown University)
- Liberal Arts and Sciences Dean's Special Welcoming Awareness Team (Spring 2003 – 2004, Kutztown University)
- Volunteer for Science Olympiad Competition (Kutztown University – 2000, 2002)

Non-university-related service

- * Associate Editor – Journal of Geoscience Education (January 2007 – Present)
- Cub Scout Pack 101 Den 3 Den Leader (September 2009-May 2011)
- Society of Economic Geologists Student Affairs Committee (September 2005 – December 2008)
- Member of research committees for two University of Arizona M.Sc. / Ph.D. students (Stacie Gibbins and Chris Greenhoot (1999-2006)
- Judge for Reading Eagle “Berks’ Best” Competition (Kutztown University – 2001-2003, 2006-2010)
- Speaker to Kutztown University Science for Elementary Educators undergraduate and graduate courses (2001-2004)

Professional affiliations

Society of Economic Geologists
Geological Society of America
National Association of Geoscience Teachers

Short course training

- Teaching Field Geology in the 21st Century – National Association of Geoscience Teachers *On the Cutting Edge* workshop (August 12-19, 2011, Bozeman, Montana)
- Teaching Hydrogeology in the 21st Century – National Association of Geoscience Teachers *On the Cutting Edge* workshop (July 23-28, 2005, Lincoln, Nebraska)
- Geometrics training on operation of Geode seismic data recorder (January 3-5, 2005, San Jose, California)
- Early Career Geoscience Faculty: Teaching, Research, and Managing Your Career – National Association of Geoscience Teachers *On the Cutting Edge* workshop (June 30 – July 5, 2001, Williamsburg, Virginia)
- Mineralized intrusion-related skarn systems – Mineralogical Association of Canada (May 1998, Québec City, Québec)
- NSF Innovative and effective techniques for teaching geoscience National Association of Geoscience Teachers workshop (October 1996, Denver, Colorado)
- Effective teaching of hydrogeology: How to make do with scant real-world data – Geological Society of America/ National Association of Geoscience Teachers workshop (October 1996 Denver, Colorado)

Other Teaching Experience, Honors, Activities

Volunteer oral presentations and fieldtrips for various universities and geological organizations

- *Geology and origin of porphyry copper deposits* (University of Namibia, Windhoek, Namibia, August 2011)
- *Field studies of the Bayan Obo Rare Earth Element deposit, Inner Mongolia, China* (Pennsylvania Earth Sciences Association, March 2009)
- *Geology of porphyry copper deposits and Comparative Geology of the Grasberg and Ertsberg Porphyry Cu-Au Systems, West Papua, Indonesia* (Henan Geological Survey, Zhengzhou, China, June 2008)
- **Commencement speaker** for graduation – *Crystallization of Magma and Fate of Igneous Rock – A Geologist's Perspective* – Kutztown University, December 2007
- *Hubbert's Peak: a Perspective on the Future of Oil* – Pennsylvania Renewable Energy and Sustainable Living Festival (Kempton, PA, September 23, 2005 and 2007)
- *Preparing for an Academic Career in the Geosciences: On the Cutting Edge* Workshop for Graduate Students and Post-Doctoral Fellows (National Association of Geoscience Teachers workshop, University of Oklahoma, July 31-August 3, 2008; University of Wisconsin, August 2-5, 2007; Stanford University, July 26-31, 2006; Pennsylvania State University, July 20-22, 2005)
- *Geology of minerals used in pigments* – Invited lecture for Dept. of Art Education & Crafts – Kutztown University (Autumn 2006, 2007)
- *Geology of Clay* – Invited lecture for Dept. of Art Education & Crafts – Kutztown University (June 2007) *Geology of Clay* – Invited lecture – Kutztown University (June 2007)
- Taught seven 3-4 week short courses on *The Geology of Metallic Mineral Deposits* (China University of Geosciences – Beijing, Beijing, China, May 2002, December 2003, May 2004, May 2005, May 2006, May 2007, May 2008, May 2009)
- *Comparative Geology of the Grasberg and Ertsberg Porphyry Cu-Au Systems, West Papua, Indonesia* (University of Geneva, Switzerland, April 12, 2006)
- *Geology and Geochemistry of Cordilleran Lode Deposits of the Superior District, Arizona* (University of Geneva, Switzerland, April 10, 2006)
- *Ring of Fire – Volcanism and seismic activity in the Circum-Pacific* (Museum of Reading, Reading, PA, March 5-6, 2005)
- *Geology of the Grasberg-Ertsberg porphyry copper district, West Papua, Indonesia* (Geological Survey of Inner Mongolia, June 2004, Hohhot, Inner Mongolia, China)
- *Geology of porphyry copper deposits* (Chan An University, Xi'an, China, June 2002)
- Led fieldtrip of *Rittenhouse Gap iron deposit, Berks Co., Pennsylvania* (Kutztown University – June 2002)
- *How Geologists Prospect for Gold – Hands-on exercises for teaching geology in the classroom* [Science for Elementary Education courses] (Kutztown University – multiple presentations 2002, 2003)
- *How Porphyry Copper Systems Work - Geology of the Ertsberg Porphyry Copper Deposit, Irian Jaya, Indonesia* (Harrisburg Area Geological Society speaker – January 2002)
- *The Good, the Bad, and the Ugly – Contrasting styles of porphyry mineralization in New Guinea's wild west* (SUNY-Albany – October 13, 2001)
- Led fieldtrip to *Yerington porphyry copper district (Nevada)* (University of Geneva (Switzerland) September 25-30, 2001)

- Led fieldtrip to *Cornwall iron deposit, Lebanon, Pennsylvania* (Philadelphia Geological Society – June 2001)
 - *Treasure in the Clouds - Geology of the Ertzberg Porphyry Copper System, Irian Jaya, Indonesia* (Philadelphia Geological Society speaker – January 2001)
 - *Have you ever met a somatism that you didn't like? – Contact metamorphism and metasomatism related to granitoid intrusions* (Bryn Mawr University, PA, November 2000)
 - *Geology of porphyry copper-gold deposits* (Millersville University, PA, October 2000)
 - *Geology, biology, and chemistry of Acid Mine Drainage* (Kutztown University Environmental Club, PA, March 2000)
 - *Chemical and physical controls on carbonate-hosted mineralization by late-stage ore fluids in porphyry copper systems* (South Dakota School of Mines and Technology, Rapid City, South Dakota, April, 1997)
 - *Have you ever met a somatism that you didn't like? – Contact metamorphism and metasomatism related to granitoid intrusions* (Bowling Green State University, Bowling Green, Ohio, January, 1997, University of Eau Claire, Eau Claire, Wisconsin, March, 1999)
 - *Geology and ore deposits of the Superior porphyry-related district, Arizona* (University of Oregon, Eugene, Oregon, December, 1996)
 - *Evaluation of ^{13}C - ^{18}O isotopic evidence for fluid flow in carbonate-aquifers* (Stanford University – presented in part as a capella song)
 - *Reaction paths of acidic geothermal solutions in carbonate aquifers* (Stanford University)
 - *Geology of skarn and massive sulfide replacement deposits, Superior District, Arizona* (Stanford University)
 - *What is a porphyry copper deposit?* (Stanford University)
 - *Ore Deposits of British Columbia* (Stanford University)
 - *Reaction path modeling using CHILLER/SOLVEQ computer programs (workshop)* (Stanford University)
 - *Irreversible thermodynamic modeling of calcium metasomatism in alkalic volcanic rocks* (Stanford University)
 - *Organized and presented two workshops on the use of AutoCAD in solving geologic problems (workshop)* (Stanford University)
 - *Theory and practice of X-ray Diffractometry* (Stanford University)
- Geophysical electrical resistivity study of a thrust fault near Kutztown, PA with 9th grade student Hannah Wolfe (November 2004 – February 2005) (see http://faculty.kutztown.edu/friehauf/science_outreach/resistivity.html)
- Nobel School (5th graders) – Plant Cells and Animal Cells with Dr. Chris Sacchi (Kutztown University, March 2005)
- Speaker for BAESI short course for teachers on Teaching Techniques for Economic Geology at the K-12 grade level, November 1996 through February 1997, San José State University, San José, California
- Guest Speaker to Santa Clara Valley Gem and Mineral Society, March, 1996 San José, California
- Guest Speaker and Science Fair Judge to various primary schools/districts (4-5 each year), San Mateo, Santa Clara, and Newark school districts, California
- Assisted Stanford sedimentology group with turbidite mapping project (geologic mapping and laser surveying), February 1997
- Volunteer T.A. for general introductory geology field trips, 1990-1996, Stanford University, California
- Elected Graduate Student Representative to the Dean of the School of Earth Sciences 1995-1996, Stanford University
- Mentor in Stanford Dept. Geological and Environmental Sciences mentoring program 1995-1996, Stanford University
- Liaison between Stanford School of Earth Sciences and Menlo-Atherton High School 1995-1996, Stanford University
- Volunteer for Stanford Disabled Student's Office 1995, Stanford University, California

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