

DR. GREGORY K. DRUSCHEL

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POSITIONS:

Associate Professor, University of Vermont Department of Geology – August 2010 – current
Assistant Professor, University of Vermont Department of Geology – January 2004 – current
Associate Professor, University of Vermont Rubenstein School of the Environment and Natural Resources – September 2007 – current
Associate Professor, University of Vermont College of Engineering and Mathematics – April 2009 - current
Director, University of Vermont iRWE Environmental Microbiology Laboratory – January 2006 - current
Postdoctoral Researcher, University of Delaware College of Marine Studies – August 2002 - January 2004

RESEARCH INTERESTS

I study the interdependence of microbial activity and geochemical cycling in a range of environments. The goal is to gain insight on defining the role of microbes in different environments and how much they affect the stability and transport of a variety of compounds in those environments. Germaine topics addressing these questions include the pathways and kinetics of redox reactions, molecular clusters and reactions driving nanoparticle formation and dissolution, relating microbial ecology to geochemical niches, and the application of statistical, thermodynamic, kinetic, and molecular models to predictive analysis of environmental perturbation. I also investigate the application of mineralogy and geochemistry to problems impacting human health.

EDUCATION

Ph.D., Geochemistry, University of Wisconsin, Madison. September, 2002. Dissertation: Sulfur Biogeochemistry: Kinetics of Intermediate Sulfur Species Reactions in the Environment. Advisor: Dr. Jillian F. Banfield.
M.S., Geology, Washington State University. May 1998. Thesis: Geothermal Systems in the Idaho Batholith: Geology and Geochemistry. Advisor: Dr. Philip Rosenberg.
B.S., Geology, Earth Science, and Chemistry (minor). Muskingum College, New Concord, OH. May 1995. Honors Thesis: The variation of iron and arsenic concentrations in the surface water of an acid mine drainage area at the Wills Creek Reservoir.

PUBLICATIONS

Brady A., G. Slater, C. Omelon, G. Southam, G. Druschel, D. Andersen, I. Hawes, B. Laval and D.S.S. Lim, 2010: Photosynthetic isotope biosignatures in laminated micro-stromatolitic and non-laminated nodules associated with modern, freshwater microbialites in Pavilion Lake, B.C. *Chemical Geology*. Vol. 274, Iss. 1-2, p. 56-67
Bond P.L., Druschel G.K., and Banfield J.F., 2000: Comparison of acid mine drainage microbial communities in physically and geochemically distinct ecosystems. *Applied and Environmental Microbiology*, Vol. 66, Iss. 11, pp 4962-4971.

- Clingenpeel, S.R., D'Imperio, S., Oduro, H., Druschel, G.K., and McDermott, T.R., 2009: Cloning and In situ Expression Studies of the *Hydrogenobaculum* Arsenite Oxidase Genes. Applied and Environmental Microbiology, Vol. 75(10), p. 3362-3365.
- Drizo, A., Cummings, J., Weber, D., Twohig, E., and Druschel, G., 2008: New Evidence of phosphorus rejuvenation in EAF Steel Slag. Environmental Science and Technology, Vol. 42(16), p. 6191-6197.
- D'Imperio, S., Lehr, C.R., Oduro, H., Druschel, G., Kuhl, M., and McDermott, T.R. (2008): On the relative importance of H₂ and H₂S as energy sources for primary production in geothermal springs. Applied and Environmental Microbiology. Vol. 74, p. 5802-5808.
- Druschel, G.K., Emerson, D., Sutka, R., and Luther, G.W., 2008: Low oxygen and chemical kinetic constraints on the geochemical niche of neutrophilic iron(II) oxidizing microorganisms. Geochimica et Cosmochimica Acta. Vol. 72, p. 3358-3370.
- Druschel, G.K. and Borda, M., 2006: Comment on "Pyrite dissolution in acidic media" by M. Descostes, P. Vitorge, and C. Beaucaire. Geochimica et Cosmochimica Acta, Vol. 70, p. 5246-5250.
- Druschel, G.K., Hartmann, A., Lomonaco, R. and Oldrid, K., 2005: Determination of sediment phosphorus concentrations in St. Albans Bay, Lake Champlain: Assessment of internal loading and seasonal variations of phosphorus sediment-water column cycling. Report to the Vermont Agency of natural resources, 71 p., <http://www.vermont.gov/cleanandclear/stalbansbay.htm>
- Druschel G.K., Rosenberg P.E., 2001: Non-magmatic fracture-controlled hydrothermal systems in the Idaho Batholith: South Fork Payette geothermal system. Chemical Geology, Vol. 173, Iss. 4, pp 271-291.
- Druschel, G.K., Schoonen, M.A.A., Nordstrom, D.K., Ball, J.W., Xu, Y., And Cohn, C., 2003: Sulfur geochemistry of hydrothermal waters in Yellowstone National Park, Wyoming, USA. III: An anion-exchange resin technique for sampling and preservation of sulfoxyanions in natural waters. Geochemical Transactions Vol. 4, No. 3, p. 12-19.
- Druschel, G.K., Labrenz, M., Thomsen-Ebert, T., Fowle, D.A. and Banfield, J.F., 2002: Biogenic Precipitation of Monomineralic Nanocrystalline Sulfides: Implications of Observed and Modeled Processes to Ore Deposition. Economic Geology Vol. 97, No. 6, p.1319-1329.
- Druschel, G.K., Hamers, R.J., and Banfield, J.F., 2003: Kinetics and mechanism of homogeneous polythionate oxidation at low pH with oxygen and ferric iron. Geochimica et Cosmochimica Acta Vol. 67, No. 23, p. 4457-4469.
- Druschel, G.K., Hamers, R.J., Luther, G.W., and Banfield, J.F., 2003: Kinetics and mechanism of trithionate and tetrathionate oxidation at low pH by hydroxyl radicals. Aquatic Geochemistry. V. 9 No. 2, p. 145-164.
- Druschel, G.K., Baker, B.J., Gihring, T.H., and Banfield, J.F., 2004: Acid mine drainage biogeochemistry at Iron Mountain, California. Geochemical Transactions Vol. 5, No. 2, pp. 13-32.
- Druschel, G.K., Sutka, R., Emerson, D., Luther, G.W., Kraiya, C., and Glazer, B., 2004: Voltammetric investigation of Fe-Mn-S species in a microbially active wetland. In: Proceedings of the Eleventh International Symposium on Water-Rock Interaction WRI-11. Wanty, R.B. and Seal, R.R (eds.). p. 1191-1194.
- Edwards K.J., Bond P.L., Druschel G.K., McGuire M.M., Hamers R.J., Banfield J.F., 2000: Geochemical and biological aspects of sulfide mineral dissolution: lessons from Iron Mountain, California. Chemical Geology, Vol. 169, Iss. 3-4, pp 383-397.
- Gihring, T.M., Druschel, G.K., McCleskey, R.B., Hamers, R.J., and Banfield, J.F., 2001: Rapid arsenite oxidation by *Thermus aquaticus* and *Thermus thermophilus*: Field and laboratory investigations. Environmental Science and Technology, Vol. 35, No. 19, pp. 3857-3862.
- Labrenz M., Druschel G.K., Thomsen-Ebert T., Gilbert B., Welch S.A., Kemner K.M., Logan G.A., Summons R.E., De Stasio G., Bond P.L., Lai B., Kelly S.D., Banfield J.F., 2001: Formation of sphalerite (ZnS) deposits in natural biofilms of sulfate-reducing bacteria. Science, Vol. 290, Iss. 5497, pp 1744-1747.
- Labrenz, M. and Druschel, G.K., 2011: Zn. Contribution to the Encyclopedia of Geobiology. Springer Encyclopedia of Earth Science Series (EESS).
- Lee, M., Drizo, A., Rizzo, D.M., Druschel, G., Hayden, N., Twohig, E., 2010: Evaluating the efficiency and temporal variation of pilot-scale constructed wetlands and steel slag phosphorus removing filters for treating dairy wastewater. Water Research, Vol. 44, No. 14, p. 4077-4086.

- Luther, G.W., III, Glazer, B., Ma, S., Trouwborst, R., Schultz, B.R., Druschel G.K., Kraiyya, C., 2003: Iron and sulfur chemistry in a stratified lake: Evidence for iron-rich sulfide complexes. *Aquatic Geochemistry* V. 9, No. 2, p. 87-110.
- Luther, G.W., III, Glazer, B., Ma, S., Trouwborst, Moore, T.S., Metzger, E., Kraiyya, C., Waite, T.J., Druschel G.K., Sundby, B., Taillefert, M., Nuzzio, D., Shank, T.M., and Brendel, P.J., 2008: Use of voltammetric solid state (micro)electrodes for studying biogeochemical processes: Laboratory measurements to real time measurements with an in situ electrochemical analyzer (ISEA). *Marine Chemistry* V. 108, No. 3-4, p. 221-235.
- Macalady, J.L., Dattagupta, S., Schaperdorth, I., Albertson, L.K., Eastman, D., and Druschel, G.K., 2008: Sulfide/oxygen supply ratio predicts outcome of competition among sulfur-oxidizing bacteria in cave waters. *ISME journal*. Vol. 2(6), p. 590-601.
- Montanari, A., 2008: Stigobionti: Vita Acquatica nelle Grotte di Frasassi. Detailed pamphlet on cave biology and chemistry of the Frasassi cave system in central Italy handed out to school groups –listed as collaborator.
- Mouser, P. J., D. M. Rizzo, G. K. Druschel, S. E. Morales, N. Hayden, P. O’Grady, and L. Stevens, 2010. Enhanced detection of groundwater contamination from a leaking waste disposal site by microbial community profiles, *Water Resour. Res.*, 46, W12506, doi:10.1029/2010WR009459.
- Oduro, H., and Druschel, G.K. (in review): The formation and oxidation of FeS(aq) molecular clusters: Decoupling iron sulfide mineral surface dissolution and oxidation reactions. *Chemical Geology*
- Pearce, A.R., Bierman, P.R., Druschel, G.K., Massey, C., Rizzo, D.M., Watzin, M.C., and Wemple, B.C., 2010: Pitfalls and successes of developing an interdisciplinary watershed field camp: *Journal of Geoscience Education*, Vol. 58, No. 3, p. 145-154.
- Pearce, A.R., Rizzo, D.M., Watzin, M.C., Druschel, G.K., and Stevens, L. in review. Identifying conditions associated with cyanobacteria blooms in Missisquoi Bay, Lake Champlain, USA, using a self-organizing map. *Limnology and Oceanography*.
- Porada, H., and Druschel, G.K., 2010: Microbial mats participating in the deposition of the siliciclastic ‘ore formation’ in the Copperbelt of Zambia. *African Earth Sciences*, Vol. 58, No. 3, p. 427-444
- Roesler, A.J., Gammons, C.H., Druschel, G.K., Oduro, H., and Poulson, S.R., 2007: Geochemistry of flooded underground mine workings influenced by bacterial sulfate reduction. *Aquatic Geochemistry*. Vol. 13, No. 3, p. 211-235.
- Smith, L., Watzin, M., Matys, E., and Druschel, G.K., accepted pending revision: Relating Sediment Nutrient Mobility to Seasonal and Diel Redox Fluctuations at the Sediment-Water Interface in a Eutrophic Freshwater Lake. *Limnology and Oceanography*.
- Taunton, A., Gunter, M.E., Druschel, G.K., and Wood, S.A., 2010: Geochemistry in the lung: Reaction-path modeling and experimental examination of rock-forming minerals under physiologic conditions. *American Mineralogist*, Vol. 95, p. 1624-1635.

ABSTRACTS AND PRESENTATIONS

- Druschel, G.K., 2010. New Insights on Biogeochemical Processes Affecting Geologic and Environmental Systems from High Resolution Redox Chemistry. Presented to the Department of Geology, Miami University, October 22, 2010.
- Druschel, G.K., 2010. Redox profiling in stratified systems. Anoxygenic Phototrophic Ecosystems NSF Workshop, Fayetteville Green Lake, NY, October 12, 2010.
- Cade-Menun, B., Smith, L., Hill, J., Watzin, M., and Druschel, G., 2010. Phosphorus characterization in fresh water lake sediments using ³¹P NMR spectroscopy. Presented at the 6th International Phosphorus Workshop (IPW6), Sevilla, Spain, September 29, 2010.
- Druschel, G.K., 2010. Elemental sulfur mineralogy, surface chemistry, and aqueous chemistry affecting microbial metabolisms. Presented at the Thirteenth Annual Chinese-American Kavli Frontiers of Science Symposium, U.S. National Academies of Science Arnold and Mabel Beckman Center, Irvine, CA. September 24, 2010.
- Druschel, G.K., 2010. New geochemical insights into microbial iron and sulfur cycling. Presented to the Department of Geological Sciences, University of Colorado-Boulder, September 8, 2010.
- Druschel, G.K., 2010. Elemental sulfur mineralogy, surface chemistry, and aqueous chemistry affecting microbial metabolisms. Presented at the 2010 Goldschmidt Conference, Knoxville, TN, June 17, 2010.

- Lazareva, O., Druschel, G., and Pichler, T., 2010. Elemental sulfur mineralogy, surface chemistry, and aqueous chemistry affecting microbial metabolisms. Presented at the 2010 Goldschmidt Conference, Knoxville, TN, June 17, 2010.
- Druschel, G.K., and Greiner, E., 2010. Sulfur cycling in stratified lakes as seen through *in situ* Au-amalgam voltammetry. Presented at the 2010 AGU Ocean Sciences Meeting, Portland, OR., February 24, 2010.
- Druschel, G.K., Smith, L.G., Watzin, M., 2009. Diurnal and seasonal redox changes in lake sediments: implications for nutrient flux and cyanobacterial blooms. Presented at the 2009 Geological Society of America conference, Portland, OR, October 18, 2009.
- Smith, L.G., Watzin, M., Hill, J., Cade-Menun, B., Druschel, G.K., 2009. Nutrient speciation and mobility governed by redox changes of iron oxyhydroxide minerals controlled by sediment microorganisms in shallow, eutrophic, missisquoi bay, lake champlain. Presented at the 2009 Geological Society of America conference, Portland, OR, October 19, 2009.
- Smith, L.G., Bierman, P.R., Druschel, G.K., Pearce, A., Rizzo, D., Wemple, B., Watzin, 2009. An interdisciplinary approach to teaching watershed field science. Presented at the 2009 Geological Society of America conference, Portland, OR, October 19, 2009.
- Druschel, G.K., Eastmann, D., and Macalady, J., 2009. Biological controls on detailed sulfur cycling and the formation of the Frasassi caves. Presented at the Frasassi Stygobionts and their sulfidic environment meeting, Genga, Italy, September 10, 2009.
- Smith, L.G., Watzin, M., Matys, E., and Druschel, G.K., 2009. Relating nutrient mobility to sediment redox changes in Missisquoi Bay, Lake Champlain. Presented at the 2009 Northeast Sectional Geological Society of America Meeting, Portland, ME, March 22, 2009.
- Druschel, G.K., 2009. Water, microbes, and minerals: Diving into the complexity of geological and environmental processes to uncover new and exciting avenues of discovery. Presented to the Geology Department, Kent State University, March 9, 2009.
- Druschel, G.K., 2008. New insights on biogeochemical processes affecting geologic and environmental systems from high resolution redox chemistry. Presented to the Environmental Science and Engineering Program, California Institute of Technology, November 19, 2008.
- Druschel, G.K., 2008. New insights on biogeochemical processes affecting geologic and environmental systems from high resolution redox chemistry. Presented to the Geology and Environmental Science Departments, University of California – Riverside, November 18, 2008.
- Druschel, G.K., 2008. Microbial Geochemistry: Putting together redox geochemistry, mineralogy, and microorganisms to better understand environmental and geological processes. Presented to the Biochemistry Department, University of Vermont, November 14, 2008.
- Druschel, G.K., and Watzin, M.C., 2008. The Missisquoi bay system: what triggers cyanobacterial blooms – linking external and internal loading effects on the ecosystem. Presented at the 2008 Joint International workshop on the Missisquoi Bay watershed, October 24, 2008
- Druschel, G.K., 2008. Voltammetric electrodes and the delineation of detailed microbial redox chemistry over fine spatial and temporal scales. Presented at the 2008 Chapman conference on Biogeophysics, Portland, Maine, October 14, 2008.
- Druschel, G.K., Emerson, D., and Macalady, J., 2008. Environmental voltammetry to characterize microbial habitats. Presented at the 2008 Goldschmidt Conference, Vancouver, British Columbia, July 15, 2008.
- Oduro, H. and Druschel, G.K., 2008. Formation and oxidation of FeS(aq) molecular clusters: Decoupling iron sulfide mineral dissolution and oxidation reactions. Presented at the 2008 Goldschmidt Conference, Vancouver, British Columbia, July 15, 2008.
- Druschel, G.K., Smith, L.G., Melchior, M., and Watzin, M., 2008. Redox chemistry and internal nutrient loading mechanisms across the sediment-water interface in Lake Champlain bays. Presented at the Northeast Regional American Chemical Society Meeting, Burlington, VT, July 2, 2008.
- Druschel, G.K., Oduro, H., Eastman, D., Smith, L., Boyd, E., Macalady, J.L., and Gammons, C.H., 2007. Electrochemical determinations of key redox species associated with microbial activity. Presented at the 2007 Geological Society of America conference, Denver, CO, October 29, 2007.
- Pearce, A., Bierman, P., Druschel, G.K., Massey, C., Rizzo, D., Watzin, M., and Wemple, B., 2007: Developing a watershed field course to inspire interdisciplinary learning. Presented at the 2007 Geological Society of America conference, Denver, CO, October 31, 2007.
- Druschel, G.K., 2007: *In situ* microelectrodes in the field and in the lab: New insights on iron-sulfur speciation and microbial function. Presented to the Marine Sciences Program, University of South Carolina, March 23, 2007.
- Druschel, G.K., Lorenson, G., Oduro, H., and McDermott, T., 2006. Arsenic and sulfur transformations in hydrothermal spring waters and microbial mats of Yellowstone National Park. Presented at the 2006 American Geophysical Union National Meeting, December 11, 2006.
- Druschel, G.K., 2006: Linking chemistry and microbes: using *in situ* microelectrodes in the field and in the lab. Presented to the Department of Geology, Virginia Tech University, November 2, 2006

- Druschel, G.K., 2006: Linking chemistry and microbes: using *in situ* microelectrodes in the field and in the lab. Presented to the School of Geography and Earth Sciences, McMaster University, Hamilton, Ontario, Canada, October 25, 2006
- Angel, R., Nagouker, N., and Druschel, G.K., 2006. Community Analysis of Bacteria using T-RFLP technique across the Sediment at St. Albans Bay, Lake Champlain VT, U.S.A with Respect to Redox Gradient. Presented at the 2006 International Society for Microbial Ecology International Meeting, Vienna, Austria, August 20-26, 2006.
- Druschel, G.K., Lorenson, G.W., Eastman, D.E., Oduro, H., and Macalady, J. Voltammetric determination of iron, sulfur, and arsenic redox speciation in natural waters as a guide to microbial sampling strategies. Presented at the 2006 National Meeting of the American Chemical Society, San Francisco, CA, September 11, 2006.
- Druschel, G.K., 2006: Linking chemistry and microbes: using *in situ* microelectrodes in the field and in the lab. Presented to Montana State Thermal Biology Program as part of a visiting scholar program, May 29, 2006.
- Druschel, G.K., 2006: Linking chemistry and microbes: using *in situ* microelectrodes in the field and in the lab. Presented to the Plant and Soil Sciences Department, University of Vermont, January 27, 2006
- Druschel, G.K., 2006: Minerals and Microbes: Field studies in California, Vermont, Montana, and Italy. Presented to the Burlington Gem and Mineral Society, January 26, 2006.
- Druschel, G.K., 2006: In situ microelectrodes in the field and in the lab: Linking geochemical cycling with microbial activity. Presented to the Department of Geology, University of South Florida, January 20, 2006.
- Druschel, G.K., Lorenson, G., Eastmann, D.A., Macalady, J., 2005: Redox speciation and biogeochemical gradients: Assessing spatial niches and monitoring dynamics in natural systems with voltammetric microelectrodes. Presented at the 2005 National Meeting of the American Geophysical Union, San Francisco, CA, December 8, 2005
- Mouser, P.J., Rizzo, D.M., Druschel, G.K., O'Grady, P., and Stevens, L., 2005: Innovative Methods for Integrating Knowledge for Long-Term Monitoring of Contaminated Groundwater Sites: Understanding Microorganism Communities and their Associated Hydrochemical Environment. Presented at the 2005 National Meeting of the American Geophysical Union, San Francisco, CA, December 8, 2005
- Druschel, G.K., 2005: Geochemical niches for microbes and details of sulfur cycling seen through the use of voltammetric microelectrodes. Presented to the Geology Department, Massachusetts Institute of Technology, October 28, 2005.
- Druschel, G.K., 2005: Tools and Methods for thinking about the role microbes play in environmental processes. Presented to the Peace Partners: Arab-Israel-Vermont Global Water Resources Symposium, October 6, 2005.
- Druschel, G.K., 2005: Microbial Geochemistry: Field excursions and lab experiments to look at the links between microbes and geochemical cycling. Presented to the Geology Department at Middlebury College, September 27, 2005.
- Druschel, G.K., 2005: In situ microelectrodes in the field and in the lab: Linking geochemical cycling with microbial activity. Presented to the Geology Department of McGill University, September 23, 2005.
- Druschel, G.K., 2005: Methods to investigate sediment and water column redox chemistry changes associated with nutrient availability. Presented at the PRIME Meeting, Tyler Place, VT, September 12
- Druschel, G.K., 2005: In situ microelectrodes in the field and in the lab: Linking geochemical cycling with microbial activity. Presented to the School of Natural Resources, September 6, 2005.
- Druschel, G.K., Lorenson, G.L., Mouser, P., Rogers, D., Oduro, H., Hartmann, A., and Rizzo, D.M., 2005: Using voltammetry in the environment to constrain microbial activity. Presented at the annual EPSCoR meeting, Burlington, VT, August 15, 2005.
- Druschel, G.K., 2005: Determination of sediment phosphorus concentrations in St. Albans Bay, Lake Champlain: Assessment of internal loading and seasonal variations of phosphorus sediment-water column cycling. Presented to the St. Albans Town Selectboard meeting, July 11, 2005.
- Lorenson, G., Rogers, D., Price, R., Edwards, K., and Druschel, G.K., 2005: Application of in situ Au-amalgam microelectrodes in Yellowstone National Park to guide microbial sampling. Presented at the 2005 Goldschmidt Conference, Moscow, ID, May 2005.
- Druschel, G.K., Lorenson, G., Rizzo, D., Rogers, D., and Edwards, K., 2005: Field, lab, and computational tools and techniques for linking geochemical and microbial processes in a range of environments. Presented at the 2005 Goldschmidt Conference, Moscow, ID, May 2005.
- Druschel, G.K., 2005: Assessing redox gradients with in situ voltammetric microelectrodes over many orders of magnitude. Presented at the 1st German-American Conference on Biogeochemical Gradients, Tubingen, Gemrnay, May 5, 2005.
- Druschel, G.K., 2005: In situ microelectrodes in the field and in the lab: Linking geochemical cycling with microbial activity. Presented to the Geology Department at Washington University in St. Louis, MO March 23, 2005.
- Druschel, G.K., 2005: In situ microelectrodes in the field and in the lab: Linking geochemical cycling with microbial activity. Presented to the Geology Department at Penn State University April 4, 2005.

- Druschel, G.K., 2004: Current state of research on P loading in St. Albans Bay, VT. Presented to the St. Albans Bay Watershed Association, September 2004. I
- Druschel, G.K., Emerson, D., Luther, G.W., Sutka, R., Kraiya, C., and Glazer, B., 2004: Environmental limits of the circumneutral iron-oxidizing bacterial isolate ES-1: Field, culture, and kinetic results from voltammetric analyses. Presented at the V.M. Goldschmidt Conference, Copenhagen, Denmark June 2004.
- Druschel, G.K., 2004: Models, tools, and observations regarding microbial activity: Metal sulfide formation and oxidation examples. Presented to the Geosciences Department, University of Goettingen, Goettingen, Germany, May 14, 2004.
- Druschel, G.K. and Borda, M., 2003. Co-chairs, Symposium on: Metal Sulfide Formation And Reactivity: A Multi-Disciplinary Approach To The Role Of Metal Sulfide Minerals In Past And Present Environments. Symposia at the March, 2003 American Chemical Society Annual Meeting.
- Druschel, G.K., Borda, M., Hamers, R.J., Luther III, G.W., and Banfield, J.F., 2002: Elemental Sulfur Reactions at Low Ph and Their Implication for Microbial Activity in Acid Mine Drainage Environments. Presented at the Fall 2002 Meeting of the American Geophysical Union.
- Druschel, G.K., Hamers, R.J., and Banfield, J.F., 2001: Competitive Oxidation Kinetics and Microbial Ecology: Intermediate Sulfur Transformations in Acid Mine Drainage Environments. Presented at the Fall 2001 Meeting of the American Geophysical Union.
- Druschel, G.K., Hamers, R.J., and Banfield, J.F., 2001: Tetrathionate catalysis by natural sulfide minerals in acid mine drainage systems. Presented at the 2001 National Meeting of the American Chemical Society.
- Druschel, G.K., Chan, C.S., Moreau, J., Thomsen-Ebert, T., Labrenz, M., Fowle, D., Welch, S.A., and Banfield, J.F., 2001: Biogenic precipitation of monomineralic nanocrystalline sulfides: Implications of observed and modeled processes to metal contaminant remediation and ore deposition. Presented at the 2001 Goldschmidt Conference.
- Druschel, G.K., Hamers, R.J., and Banfield, J.F., 2000: Oxidation kinetics of tetrathionate at low pH: Implications for pyrite oxidation mechanisms and microbial ecology in acid mine drainage environments. Presented at the 2000 Goldschmidt Conference.

RESEARCH GRANTS

- VT DEC, A proposal for determination of sediment phosphorus concentrations in St. Albans Bay, Lake Champlain, 2005: Assessment of internal loading and seasonal variations of phosphorus sediment-water column cycling. Druschel (PI) \$25,000. Completed
- ACS-PRF Type SE grant, support for ACS symposia on metal sulfide chemistry presented at the 2003 ACS National Meeting, New Orleans, USA. 2003. Druschel and Borda. \$3,600. Completed
- VT EPSCoR Equipment Grant, Development of a biogeochemical kinetics reactor vessel as a tool for geology, chemistry, microbiology, environmental science, mathematics, and engineering to deconstruct complex environmental systems. 2005 \$9,842. Completed.
- UVM Dean's Fund: Development of new *in situ* voltammetric probes for long term deployment in hydrothermal areas. 2005. Druschel, \$2,000. Completed
- VT EPSCoR Graduate Research Assistantship, Investigation of elemental sulfur oxidation as a biocomplexity model: Coupling geochemical and microbial ecology data using Artificial Neural Networks. 2006 Druschel. 1 year graduate assistantship for current masters student, \$26,000 completed.
- HELiX Award to A. Hartmann, G. Druschel, advisor: Evaluating the effect of sedimentary Fe/S redox changes coupled with P and N release in St. Albans Bay, Lake Champlain and its effect on secondary algal blooms over the course of the summer. 2005. \$3,500 Completed
- National Science Foundation, Research Experience for Undergraduates Program (NSF-REU) supplement, 2005: Microbial community controls on sulfide oxidation rates and cave formation in a subsurface biogeochemical system. PI: Macalady, Druschel (Collaborator). \$22,788. Completed
- National Science Foundation, Earth Sciences, 2005: Piloting an Interdisciplinary Watershed Field Camp. PI: Bierman, Co-PI's: Druschel, Wemple, Rizzo, Watzin. \$151,522. Funded, completed.
- National Science Foundation, Earth Sciences, 2006: Collaborative Research: Experimental determination of Fe isotope fractionation in sulfide minerals. PI: Johnson; Co-PI's: Druschel, Schoonen. \$450,000. Funded, active.
- National Oceanographic and Atmospheric Administration, 2006: Emerging threats to the Lake Champlain Ecosystem. PI: Watzin; Co-PI's: Druschel, Lini, Levine, Madsen. \$139,209. Funded, completed.

- United State Department of Agriculture, 2006: CSREES Special Research Grant, Environmentally Friendly Products. Alternative Technologies for P Removal from Agricultural Effluents . PI: Drizzo; Co-PI: Druschel, Vayda, Darby. \$104,952. Funded, completed.
- United State Department of Agriculture, 2007: Environmentally friendly product: Alternative technologies for phosphorus removal from agricultural effluents. PI: Drizzo; Co-PI: Druschel, Ross. \$168,207. Funded, completed.
- United State Department of Agriculture, 2007: Constructed Wetlands Center for Research, Education, and Outreach at the University of Vermont: pollutant removal processes and mechanisms. PI: Drizzo; Co-PI: Druschel, Ross. \$165,013 Funded, completed.
- United State Department of Agriculture, 2008: Environmentally friendly product: Alternative technologies for phosphorus removal from agricultural effluents. PI: Drizzo; Co-PI: Druschel, Vayda, Darby. \$107,038. Funded, active
- National Aeronautics and Space Administration, 2008: Determination of four sulfur isotopes fractionation during sulfide oxidation by biotic and microbial processes in Yellowstone National Park pools, springs and streams with different pH values. PI: Kamyshny, Co-I's: Druschel, Farquahar. \$94,026, Funded, active.
- Multiscale study of bioremediation using a complex system cellular automata approach. University of Vermont Interdisciplinary Research Development Fund. \$30,000. Funded, completed.
- National Science Foundation, Major Research Instrumentation 2009: Acquisition of equipment to support an Environmental Materials Characterization. PI: Druschel; Co-PI's: Hughes, Landry, Gunter. \$207,000 Funded.
- National Science Foundation, Earth Sciences: CAREER: Fundamental cell-mineral-redox interactions in the sulfur system. PI: Druschel. \$400,000. Funded, active.
- National Science Foundation, Earth Sciences, 2010: Collaborative Research: Shallow-sea hydrothermal systems: Micron-scale sedimentary sulfur cycling and its impact on ocean processes. PI: Fike; Co-PI's: Amend, Druschel. \$114,139 (UVM portion). Pending.
- National Institute for Environmental Health and Safety, 2010. Carcinogenic Properties of Asbestos and other Amphiboles in the Environment. PI: Mossman, Co-PI's: Druschel, Gunter, Heintz, Hughes, Landry, Losert, Lower, Rabenhorst, Shukla, Upadhaya, Vacek, and Wylie. 10.7M direct costs, pending.
- National Science Foundation Experimental Program to Stimulate Competitive Research (EPSCoR), 2010. Adaptation to Climate Change in the Lake Champlain Basin: New Understanding through Complex Systems Modeling (RACC). PI: van Houten, Co-PI's: Druschel, Rizzo, Koliba, Watzin, Bromblies, Erickson. 20M., pending.

PROFESSIONAL ACTIVITIES

- Co-Editor-in-Chief for Geochemical Transactions, 2011-
- Associate Editor for 4 journals: Geological Society of America Bulletin (2010-current), Aquatic Geochemistry (2006-current), Geochemical Transactions (2006-current), and Geobiology (2008-current)
- Reviewer for the National Science Foundation, Department of Energy, Geochimica et Cosmochimica Acta, Environmental Science and Technology, Aquatic Geochemistry, Journal of Geophysical Research, and Geochemical Transactions, Journal of Materials Chemistry, Aquatic Geochemistry, Geochemical Transactions, Astrobiology, Earth Science Reviews, Earth and Planetary Science Letters,
- Chaired and organized symposia at: the March 2003 ACS national meeting in New Orleans on "Metal sulfide chemistry", the 2005 Goldschmidt Meeting in Moscow, Idaho on "Geochemical controls on microbial processes", the December 2006 AGU National Meeting in San Francisco on "Biogeochemistry of extreme environments", the July 2008 Goldschmidt Meeting in Vancouver, British Columbia on "Sulfur Cycling: New approaches and techniques to the investigation of inorganic, organic, and biological reactions involving sulfur."; the February 2010 AGU Ocean

Sciences Meeting in Portland, Oregon on “Biogeochemical Sulfur Cycling in Reducing Environments and Stratified Systems”

- Planning Committee, U.S. Academy of Sciences-Chinese Academy of Sciences Chinese-American Kavli Frontiers of Science Symposium, 2011, China.
- Panel member, Environmental Protection Agency Graduate Fellowships panel, February 14-16, 2006; Panel Member, National Aeronautics and Space Administration Astrobiology Panel, February, 2008.
- Member of the ACS Division of Geochemistry, Geochemical Society, Mineralogical Society, American Geophysical Union, and Geological Society of America.
- Member of the Lake Champlain Basin Program’s advisory board on Toxics in Lake Champlain.
- Member of the Saint Albans Bay remediation assessment advisory board
- Faculty advisor for Sigma Gamma Epsilon honorary and Geology Club. 2004-2009
- UVM College of Arts and Sciences Academic Standards Committee, 2008-2009 (1 yr term)
- Chair, UVM College of Arts and Sciences Curriculum Committee, August 2009-present (3-year term)

STUDENT ADVISEES

Primary Advisor, Graduate:

Greg Lorenson (M.S., 2006) Application of *in situ* Au-amalgam microelectrodes in Yellowstone National Park to guide microbial sampling

Harry Oduro (M.S., 2007) Role of FeS_(aq) in the dissolution and precipitation of FeS minerals

Lydia Smith (M.S., 2009) Nutrient forms and processes affecting their mobility in Mississquoi Bay

Angel Garcia (M.S., current) Elemental sulfur particle size analysis using voltammetry, dynamic laser particle scattering, and Raman Spectroscopy

Nicole Schufelt (M.S., current) Quantifying phosphorus fluxes at different redox conditions in Lake Champlain sediments.

Graduate student committees (only ones with significant role):

Paula Mouser (Ph.D. w/Rizzo 2006)

Heather Burgess (M.S. w/Lini 2007)

Andrea Pierce (curr Ph.D. w/Rizzo)

Kate Crawford (M.S. w/Watzin, 2007)

Julia LaRouche (M.S. w/ Bowden 2008)

Martin Lee (M.S. w/Rizzo 2009)

Simon Bird (M.S. w/Drizo 2008)

Lesley Schuster (M.S. w/Watzin, 2010)

Jane Duxbury (M.S. w/Bierman 2008)

Nick Johnson (M.S. w/Hill, 2010)

Bethany Zinni (M.S. w/Lini 2006)

Anthony McInnis (Ph.D. w/Todd)

Primary advisor, undergraduate theses:

Aaron Hartmann (B.S., Biology 2004) Seasonal variation of nutrients in Lake Champlain bay sediments

Kristin Katoski (B.S. Env. Science 2005) The role of sulfur dioxide degassing during pyrite oxidation

Danielle Eastmann (B.S., Geology 2007) Microbial sulfur cycling and cave formation in the Frassassi cave system, Marche, Italy.

Molly Ogden (B.A., Education 2007) Designing classroom demonstrations to illustrate cave formation processes

Mike Bower (B.S., Env. Science 2007) Voltammetric electrode techniques for the analysis of arsenic species in natural waters

Garth Cummings (B.S., Soil Science 2007) Geochemical modeling of minerals associated with EAF slag filters

Lydia Smith (B.S., Geology, 2007) Redox chemistry stratification and spatial variability in Green Lake, NY.

Maartje Melchior (B.S., Geology, 2007) Nitrogen cycling in pore waters of Missisquoi Bay over seasonal and diel periods

Emily Matys (B.A., Natural Resources, 2008) Lake Champlain sediment-water nutrient equilibrium chemistry

Tyler George-Minetti (B.A., Geology 2008) Identification and conditions for formation of glaucocerinite and related minerals at the Pike Hill Mine, VT

Christy Leonard (B.A., Geology, 2008) Mineral phases responsible for P immobilization in slag filter technology

Ian Donovan (B.A., Geology, 2008) Hydrothermal Geochemistry - Relating reservoir changes to geologic domains in the Lardarello area, Italy

Ed Greiner (B.S., Geology 2009) Using gel-coated electrodes to investigate intermediate sulfur chemistry at Green Lake

Aliza Gordon (B.S., Env. Science 2009) Acid-volatile sulfide measurements in Lake Champlain sediments

Alyssa Findlay (B.A, Env. Studies, 2010) Chromium and nickel mineral association and solubility in sediments from the VAG asbestos mine near Lowell, VT.

Laura Wilson (B.S., Geology, current) XRF calibration of metal content in asbestos mine materials and the spatial distribution of metals along Hutchins Brook

Tim White (B.S., Env. Science, Current) Quantifying nutrient equilibrium between sediment and water under variable redox conditions.

Brianna Birchmann (B.A., Geology, current) XRF calibration for rapid 2-D analysis of P, Fe, Mn, Ca, and Al in wet v. dry lake sediments.