

David W. Szymanski

Geologist & Forensic Scientist

EDUCATION

Ph.D., Geological Sciences, December 2007
Michigan State University, East Lansing, MI
Dissertation Topic: Chemical evolution of magmas in northern Costa Rica

M.S., Forensic Chemistry, December 2004
Michigan State University, East Lansing, MI
Thesis Topic: Trace element analysis of glass evidence via laser ablation ICP-MS

M.S., Geological Sciences, December 1999
Michigan State University, East Lansing, MI
Thesis Topic: Faulting as a mechanism for emplacement of magmas in the Earth's crust

B.A., Geology, *Summa cum laude*, May 1996
University of St. Thomas, St. Paul, MN
Minor in Criminal Justice

PROFESSIONAL APPOINTMENTS

Forensic Scientist, 2003 to present
Forensic Science Consultants, Williamston, MI

- Analyze trace evidence and serve as an expert in civil and criminal investigations.

Assistant Professor of Natural and Applied Sciences, 2009 to present
Bentley University, Waltham, MA

- Teach science courses with as focus on the intersection of science, policy and business.
- Demonstrate the applications of scientific thought and understanding in business.
- Faculty mentor for Earth, Environment and Global Sustainability Liberal Studies Major (LSM).

Geological Society of America/USGS Congressional Science Fellow, 2008-2009
Office of U.S. Senator Jon Tester (Montana), Washington D.C.

- Wrote legislation and advised the senator on energy, natural resource, and other science policy.

ICP-MS Laboratory Manager and Staff Research Assistant, 2005-2009
Department of Geological Sciences, Michigan State University, East Lansing, MI

- Managed and maintained Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and five sample preparation laboratories, including one EPA Class-100 clean laboratory.

Contract Forensic Analyst, 2004-2008
ICP-MS Laboratory, Michigan State University, East Lansing, MI

- Developed and put into practice a technique for the trace elemental analysis of glass fragments by laser ablation (LA) ICP-MS for the Michigan State Police.
- Processed over 40 glass cases for the Michigan State Police Forensic Laboratory.
- Court-qualified expert witness in glass analysis in Michigan (Saginaw, Lansing, Grand Rapids).

TEACHING EXPERIENCE AND EDUCATION RESEARCH

Assistant Professor of Natural and Applied Sciences, September 2009 to present

- Courses taught: Environmental Chemistry (with laboratory)
Principles of Geology (with laboratory)
Forensic Science (with laboratory)
Energy Balance of Bioethanol (directed study)
Federal Environmental and Natural Resource Policy

*Instructor, Midwest Forensics Resource Center (MFRC) Low-Explosives Workshop
June 2008, "Crystallography and Crystal Symmetry"
Michigan State University, East Lansing, MI*

Instructor, May-July 2005

Center for Integrative Studies in Science, Michigan State University

- Taught introductory geology for non-science majors.

Graduate Teaching Assistant, 1996-1999 and 2001-2004

Department of Geological Sciences, Michigan State University

Instructed and coordinated laboratories in: Introductory Geology

Igneous and Metamorphic Petrology

Structural Geology

- Guest lectured for faculty members on topics such as earth structure, phase chemistry, geological distribution of trace elements, and stable isotopes.
- Assisted and led student field work in Kentucky, Wisconsin, Tennessee, and Ontario, Canada.

Graduate Research Assistant, 2004-2006

Integrative Studies in Physical Sciences, Michigan State University

- Developed teaching materials for the identification of misconceptions in undergraduate science courses in a multi-disciplinary group funded by the National Science Foundation (NSF).

Instructor and Organizer, Midwestern Association of Forensic Scientists (MAFS) Workshop, May 2005

Introduction to Forensic Glass Comparisons Using Laser Ablation (LA) ICP-MS

Michigan State University

Guest Lecturer, Soil and Glass Evidence CJ 805 Survey of Forensic Science and CJ 210 Forensic Science, 2004,

Michigan State University

TEACHING HONORS

Innovation in Teaching Award, Bentley University, 2011

Curricular Service-Learning Faculty Award, Bentley University, 2011

Teaching Excellence, Department of Geological Sciences, Michigan State University, 2004-2005

Teaching Excellence, Department of Geological Sciences, Michigan State University, 2002-2003

Nomination for Teaching Excellence, College of Natural Science, Michigan State University, 1998-1999

Teaching Excellence, Department of Geological Sciences, Michigan State University, 1997-1998

RELATED POSITIONS AND EMPLOYMENT

Graduate Research Assistant, 1997-1998 and 2001-2005

Department of Geological Sciences, Michigan State University, East Lansing, MI

- Maintained equipment and supplies for X-ray Fluorescence (XRF) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) laboratories.
- Prepared a variety of geological, biological and forensic samples for analysis using fusion and chemical techniques (acid digestions).
- Trained undergraduate students in sample preparation.

Intern Geologist, 1998

Union Pacific Resources, Fort Worth, TX

- Developed and implemented a method for the estimation of pore pressure gradients in deep water oil exploration.

INTERNATIONAL EXPERIENCE

Field work, Costa Rica, Central America, 2001, 2003, 2004, 2007, 2012

- Determine volcanic stratigraphy and collect samples from Miocene-Pliocene volcanic deposits with scientists from the United States and Costa Rica.

University of Costa Rica, San José, Costa Rica

Invited Lecturer, "Forensic Geology," July, 2004

PROFESSIONAL ORGANIZATIONS AND AFFILIATIONS

American Academy of Forensic Sciences (AAFS)

American Association for the Advancement of Science (AAAS)

American Geophysical Union (AGU)

Geological Society of America (GSA)

Geological Society of Washington, D.C. (GSW)

Midwestern Association of Forensic Scientists (MAFS)

National Association of Geoscience Teachers (NAGT)

SERVICE

Bentley University

- Natural and Applied Sciences (NAS) Curriculum Committee, 2009-present
- Student Affairs Committee, Board of Trustees, 2010-present
- Institutional Review Board (IRB) for University Research, 2011-present
- Bentley Service-Learning Center (BSLC) Advisory Board, 2011-present
- Faculty Honors Council, 2012-present
- Search Committee, Bentley Service-Learning Center (BSLC) Director, 2012
- Sustainability Task Force, 2011-present
- First Year Seminar (FYS) Faculty Advisor, 2011-present
- Wilder Teaching Workshop Leader: "Sustainability, Responsible Management and the Curriculum," April 2012

National and International Leadership

- Geology and Public Policy Committee (GPPC) of the Geological Society of America (GSA), which reviews, writes and recommends public policy position statements for the society
 - Chair-Elect, 2010-11; Chair, 2011-12; Past-Chair, 2012-13
 - Congressional Science Fellow Selection Subcommittee, 2008-2012
 - Climate Change Position Statement Revision, *ad-hoc* Subcommittee 2010
- Search Committee for GSA Director of Geoscience Policy, 2011

Disciplinary Research

- Review Panelist, National Research Council, National Academies, *Precision Geodetic Infrastructure: National Requirements for a Shared Resource*, 2010
- Reviewer for the *Revista de Ciencias Forenses*, journal produced by the Costa Rican Association of Professional Forensic Scientists
- Reviewer for *Journal of the American Society of Trace Evidence Examiners*, 2010
- Reviewer for “Volcanic activity, hazards, and monitoring” (Chapter 41) in *Central America: Geology, Resources and Hazards*; Bundschuh & Alvarado (eds.), 2007
- Session Convener, Geological Society of America Annual Meeting:
 - “STEMming the Tide: How Can We Promote Science Literacy?” (2011, Minneapolis)
 - “Understanding Risk and Communicating Uncertainty to the Public” (2012, Charlotte)
- National Science Foundation (NSF) reviewer, EAR-Instrumentation & Facilities, 2005-2012; Geoscience Education (GeoEd), 2010-11; Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES, formerly CCLI), 2011
 - TUES panel member, July 2011; Conference for PIs, January 2013

Business Community

- Progressive Business Leaders Network (PBLN) & Environmental Working Group
 - CEO Summit, October 2009, October 2010
 - CEO Forum: Vision for a Clean and Competitive Commonwealth, February 2011

GRANTS, AWARDS, AND HONORS

Faculty Summer Research Grant, Bentley University, 2011-13
 Student Research Assistantship, funded by the Jeanne and Dan Valente Center for Arts and Sciences, Bentley University and National Biomedical Research Foundation, 2010-13
 Henry E. Rauch Faculty Enrichment Grant, Bentley University, 2009-10
 Geological Society of America-US Geological Survey Congressional Science Fellowship, 2008-09
 NSF-funded Earth Science Literacy Initiative (ESLI) Writer’s Workshop, St. Louis, MO, 2008
 New Scientist Award, Midwestern Association of Forensic Scientists (MAFS), 2006
 Pringle-Drake Endowed Fellowship, Geological Sciences, MSU, 2005
 Michigan Space Grant Consortium (MSGC) Graduate Research Award, 2004
 Pringle-Drake Endowed Fellowship, Geological Sciences, MSU, 2003
 Geological Society of America (GSA) Student Research Grant, 2002
 Geological Society of America (GSA) Student Research Grant, 1998
 Distinguished Alumni Award, Geological Sciences, MSU, 1997-1998

MAJOR RESEARCH GRANTS

2012, National Science Foundation (\$143,873) Collaborative Pathways Project: Enhancing climate change communication between broadcast meteorologists and their viewing audience, P.T. Davis (PI), E.A. Oches, D.W. Szymanski, H. Meldrum (Bentley; \$143,744); L. Doner, S. Miller, L.B. Avilés, M. McGarry (Plymouth State University; \$106,192)

PEER-REVIEWED PUBLICATIONS

Price, J.R. and **Szymanski, D.W.**, *in review*, The effects of road salt on stream water chemistry of two small forested watersheds in Catoctin Mountain, Maryland, USA, *Aquatic Geochemistry*.

Price, J.R., Rice, K.C., and **Szymanski, D.W.**, 2012, Mass-balance modeling of mineral weathering rates and CO₂ consumption in the forested Hauver Branch watershed, Catoctin Mountain, Maryland, USA, *Earth Surface Processes and Landforms*, DOI: 10.1002/esp.3373.

Szymanski, D. W., Hadlock, C. R., Zlotkowski, E. A., 2012, Using Public Sector Research Projects to Engage Undergraduates, *Council of Undergraduate Research (CUR) Quarterly*, 33: 19-26.

Price, J.R., Hardy, C., Tefend, K.S., and **Szymanski, D.W.**, 2012, Solute geochemical mass-balances and mineral weathering rates in small watersheds II: Biomass nutrient uptake, more equations in more unknowns, and land use/land cover effects, *Applied Geochemistry*, 27:1247-1265, DOI:10.1016/j.apgeochem.2012.01.020.

Deering, C.D., Vogel, T.A., Patino, L.C., **Szymanski, D.W.**, and Alvarado, G.E., 2012, Magmatic processes that generate chemically distinct silicic magmas in NW Costa Rica and the evolution of juvenile continental crust in oceanic arcs, *Contributions to Mineralogy and Petrology*, 163:259-275, DOI: 10.1007/s00410-011-0670-z.

LaGoo, L., Schaeffer, L., **Szymanski D.W.**, and Waddell Smith R., 2010, Detection of Gunshot Residue in Blowfly Larvae and Decomposing Porcine Tissue using Inductively Coupled Plasma Mass Spectrometry (ICP-MS), *Journal of Forensic Sciences*, 55: 624-632, DOI: 10.1111/j.1556-4029.2010.01327.x.

Gazel, E., Carr, M.J., Hoernle, K., Feigenson, M.D., **Szymanski, D.W.**, Hauff, F., and van den Bogaard, P., 2009, Galapagos-OIB signature in southern Central America: Mantle refertilization by arc-hot spot interaction, *Geochemistry Geophysics Geosystems*, 10, DOI: 10.1029/2008GC002246.

McGaw, E.A., **Szymanski, D.W.**, and Waddell Smith, R., 2009, Determination of trace elemental concentrations in document papers for forensic comparison using inductively coupled plasma mass spectrometry, *Journal of Forensic Sciences*, 54: 1163-1170, DOI: 10.1111/j.1556-4029.2009.01096.x.

McGaw, E.A., **Szymanski, D.W.**, and Waddell Smith, R., 2009, Characterization of Undigested Particulate Material Following Microwave Digestion of Recycled Document Papers, *Journal of Forensic Sciences*, 54: 1171-1175, DOI: 10.1111/j.1556-4029.2009.01088.x.

Price, J.R., Heitmann, N., Hull, J., and **Szymanski, D.W.**, 2008, Long-Term Average Mineral Weathering Rates from Watershed Geochemical Mass Balance Methods: Using Mineral Modal Abundances to Solve More Equations in More Unknowns, *Chemical Geology*, 254: 36-51, DOI: 10.1016/j.chemgeo.2008.05.012.

Bommarito, C.R., Sturdevant, A.B., and **Szymanski, D.W.**, 2007, Analysis of forensic soil samples via high performance liquid chromatography and ion chromatography, *Journal of Forensic Sciences*, 52: 24-30, doi: 10.1111/j.1556-4029.2006.00301.x.

Sibley, D.F., Anderson, C.W., Heidemann, M., Merrill, J.E., Parker, J.M., and **Szymanski, D.W.**, 2007, Box Diagrams to Assess Students' Systems Thinking about the Rock, Water and Carbon Cycles, *Journal of Geoscience Education*, 55: 138-146.

POPULAR PUBLICATIONS (*student coauthors)

Davis, P.T., Oches, E.A., and **Szymanski, D.W.**, "Development process poses serious health concerns," *The Boston Globe* [Boston, MA], 31 Oct 2011: A10. (print)

Davis, P.T., and **Szymanski, D.W.**, "The conflict on climate," *Waltham News Tribune* [Waltham, MA], 18 Feb 2011: 9. (print)

Markow, W.*, Adams, V.*, Bucci, G.*, Green, D.*, and **Szymanski, D.W.**, 2011, Closing the Energy Efficiency Information Gap for Small Businesses, *The Sustainability Review*, vol. 3, no. 2, May 23, 2011. (<http://www.thesustainabilityreview.org/2011/05/closing-the-energy-efficiency-information-gap-for-small-businesses/>)

Szymanski, D.W., 2009, Congressional Science Fellow: Final Report, *GSA Today*, v. 19, no. 12: 20-21.

Szymanski, D.W., 2009, Congressional Connections and Earth Science Literacy, *GSA Today*, v. 19, no. 7: 34-35.

Szymanski, D.W., 2009, Quantifying Change on Capitol Hill, *GSA Today*, v. 19, no. 3: 23-24.

Szymanski, D.W., 2007, Magmatic evolution of ignimbrites in the Bagaces Formation, Guanacaste Province, Costa Rica, Ph.D. Dissertation, Michigan State University, 340 pp.

Szymanski, D.W., 2004, Use of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for the discrimination of glass fragments in forensic casework, M.S. Thesis, Michigan State University, 42 p.

Szymanski, D.W., 1999, Faulting in an extensional environment: An emplacement mechanism for the Little Cottonwood Stock, Central Wasatch Mountains, Utah, M.S. Thesis, Michigan State University, 98 pp.

ABSTRACTS AND PRESENTATIONS (*student coauthors)

- Szymanski, D.W.**, Oches, E.A., Snyder, B.J.S., Gulati, G.J., and Davis, P.T., 2012, A multidisciplinary approach to teaching sustainability: Corn ethanol across the curriculum, *Geological Society of America Abstracts with Programs*, Vol. 44, No. 7.
- Oches, E.A., **Szymanski, D.W.**, Snyder, B.J.S., Gulati, G.J., and Davis, P.T., 2012, Exploring corn-ethanol as a complex problem to teach sustainability concepts across the science-business-liberal arts curriculum, AGU 2012 Fall Meeting (*invited*).
- Szymanski, D.W.**, Bucci, G.D.* , Adams, V.E.* , Green, D.V.* , and Markow, W.N.* , 2011, Engaging undergraduate students in national energy policy through service-learning, *Geological Society of America Abstracts with Programs*, Vol. 43, No. 5.
- Oches, E.A., **Szymanski, D.W.**, and Davis, P.T., 2011, Preparing the next generation of business leaders to confront environmental challenges, *Geological Society of America Abstracts with Programs*, Vol. 43, No. 5.
- Szymanski, D.W.** and Wohlers, E.R., 2011, Teaching water quality through technology-enhanced laboratory modules in undergraduate business education, *Geological Society of America Abstracts with Programs*, Vol. 43, No. 5.
- Price, J.R. and **Szymanski, D.W.**, 2011, Mass balance modeling of mineral weathering rates in the Haver Branch watershed, Catoctin Mountain, Maryland: the role of biomass, solving more equations in more unknowns using solid-phase data, and carbon dynamics, *Geological Society of America Abstracts with Programs*, Vol. 43, No. 5.
- Oches, E.A., **Szymanski, D.W.**, Davis, P.T., and Ledley, F.D., 2010, Integrating Earth and environmental science into a business curriculum toward enhanced workforce science literacy, ***Geological Society of America Annual Meeting: Abstracts with Programs***, v. 42 no. 5.
- Vogel, T.A., Deering, C.D., Patino, L.C., Alvarado, G.E. and **Szymanski, D.W.**, 2010, Magmatic processes that generate chemically distinct silicic magmas in NW Costa Rica and the evolution of juvenile continental crust in oceanic arcs, *AGU 2010 Fall Meeting*, V52B-04.
- Szymanski, D.W.**, Patino, L.C., Vogel, T.A., and Alvarado, G.E., 2007, The importance of mixing in the evolution of silicic magmas in northern Costa Rica, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., V33C-1513.
- Vogel, T.A., Valley, J.W., Patino, L.C., Alvarado, G.E. and **Szymanski, D.W.**, and Deering, C.D., 2007, Oxygen Isotopes of Silicic Volcanic Deposits of NW Costa Rica: A Key to Understanding Crustal Evolution in Central America?, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., T44C-08.
- Szymanski, D.W.**, Patino, L.C., Vogel, T.A., and Alvarado, G.E., 2006, Using Multivariate Polytopic Vector Analysis (PVA) to Test a Model of Magma Mixing for the Papagayo Tuff, Northern Costa Rica, *Eos Trans. AGU*, 87(52), Fall Meet. Suppl., V11B-0590.

- Price, J.R., Hull, J., and **Szymanski, D.W.**, 2006, Long-term chemical weathering rates in the periglacial piedmont physiographic province of southeastern Pennsylvania: watershed geochemical mass-balance, saprolitization rates, and evidence for a modern saprolite, ***Geological Society of America Annual Meeting: Abstracts with Programs***, v. 38, no. 7.
- Szymanski, D.W.**, 2006, Application of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) in glass analysis schemes, Midwestern Association of Forensic Scientists Advanced Trace Evidence Symposium, Ames, IA (*invited*).
- Szymanski, D.W.**, Patino, L.C., Vogel, T.A., and Alvarado, G.E., 2006, Juvenile Continental Crust in Costa Rica: High-Silica Miocene-Pliocene Ignimbrites of the Bagaces Formation, *Eos Trans. AGU*, 87(36), Jt. Assem. Suppl., V41A-11.
- Szymanski, D.W.**, Patino, L.C., Bommarito, C.R., and Siegel, J.A., 2004, Trace element profiles of float glass fragments determined by laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), *Abstracts of the 56th Annual Meeting of the American Academy of Forensic Sciences*, Dallas, TX.
- Vogel, T.A., Patino, L.C., Alvarado, G.E. and **Szymanski, D.W.**, 2004, Silicic Ignimbrites within the Costa Rican Volcanic Front: Evidence for the formation of continental crust, AGU Western Pacific Meeting, V34-01 (*invited*).
- Szymanski, D.W.**, Patino, L.C., Bommarito, C.R., and Siegel, J.A., 2003, Use of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for float glass fragment discrimination by elemental analysis: Preliminary results, Midwest Association of Forensic Scientists Fall Meeting, Columbus, OH.
- Szymanski, D.W.**, Patino, L.C., Vogel, T.A., and Alvarado, G.E., 2002, Generation of Continental Crust in Central America: New Field and Geochemical Observations on Silicic Magmatism in Costa Rica, *Eos Trans. AGU*, 83(47), Fall Meet. Suppl., V12C-09.
- Patino, L.C., **Szymanski, D.W.**, Vogel, T.A., and Hannah, R.S., 1999, Rare Earth Element analysis of rocks by laser ablation ICP-HEX-MS, ***Geological Society of America Annual Meeting: Abstracts with Programs***, v. 31, no. 7.
- Szymanski, D.W.**, Cambray, F.W., and Vogel, T.A., 1999, A shear zone associated with emplacement of the Little Cottonwood Stock, Central Wasatch Mountains, Utah ***Geological Society of America Annual Meeting: Abstracts with Programs***, v. 31, no. 7.

INVITED TALKS

What Will it Take to Truly Reduce Our Greenhouse Gas Emissions?, Progressive Business Leaders Network (PBLN) CEO Summit, Waltham, MA, February 2011

Integrating ICP-OES Elemental Analysis into Water Quality Lab Exercises for Undergraduates, Thermo Fisher Scientific Trace Elemental Analysis Seminar, New Bedford, MA, October 2010

Helping Low-Income Households Reduce Energy Bills and Greenhouse Gas Emissions through Improved Manufactured Housing, United States Senate, Washington, D.C., June 2009

Beyond Soil: Geology, Forensic Chemistry and Glass, Smithsonian National Museum of Natural History, Mineral Sciences Division, March 2009

Unraveling the Histories of Magmas Using Chemistry, Department of Chemistry and Chemical Biology, Indiana University-Purdue University Indianapolis, March 2008

New Insights into the Chemical Evolution of Explosive Magmas from Northern Costa Rica, Department of Earth Sciences, Indiana University-Purdue University Indianapolis, November 2007

ANALYTICAL COMPETENCIES

Chemistry and Geochemistry

- Skilled in ICP-MS and reaction cell operation, maintenance and repair.
- Proficiency in ICP-MS sample introduction systems, including laser ablation (Cetac LSX 200 Plus), hydride generation (Cetac HGX-100), and nebulization.
- Preparation of numerous types of samples by fusion and acid digestion.
- Knowledge of operation and use of Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES), X-ray fluorescence (XRF), gas chromatography-mass spectrometry (GC-MS), infrared spectroscopy (IR) and infrared microspectroscopy, and microspectrophotometry.

Microscopy

- Extensive laboratory experience with polarizing light microscope (PLM) and stereoscope.
- Knowledge of operation and use of scanning electron microscopy (SEM).