

## Joel Z. Bandstra, Ph.D.

### *Environmental Engineer and Geochemical Modeler*

Saint Francis University  
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#### Education:

**Ph.D. Environmental Science & Engineering** Oregon Health & Science University, 2005

Dissertation: Kinetic Modeling of Heterogeneous Chemical Reactions with Applications to the Reaction of Organic Oxidants on Iron Metal (Supervised by Paul Tratnyek)

**Complex Systems Summer School**

Santa Fe Institute, 2004

Project: Intercellular Communication in the Emergent Behavior of Microbial Communities: Growth, Maturation, and Structure Formation in Biofilms

**B.S. Civil and Environmental Engineering (Mathematics Minor)**

Clarkson University, 1998

Senior Project: Recovery, Transport, and Disposal of Copper Mine Tailings

#### Work Experience:

**Senior Environmental Engineer**

2021-present

*MineraLogic LLC*, [mnlogic.com](http://mnlogic.com), Duluth, MN

- Building reactive transport and geochemical models for mitigation of acid rock drainage from active tailings management facilities
- Developing tools to assess carbon sequestration potential in stockpiles of mining-disturbed earth materials
- Providing consulting services for 10 hours per week during the academic year and on a full-time basis in the summer

**Program Founder; Assistant → Associate → Full Professor**

2008-present

*Saint Francis University*, [Environmental Engineering Program](#), Loretto, PA

- Started a new program in environmental engineering, the first ABET accredited degree at SFU
- Recruited students and faculty, growing the program to 50+ students and 4 full-time staff
- Developed and taught courses ranging from basic engineering science to environmental engineering design with a focus on applied environmental modeling
- Secured extramural funds to build out laboratory facilities and to provide rich co-curricular experiences for students
- Led successful bids for initial ABET accreditation (2012) and general review (2018)
- Excelled in the standard professorial activities—teaching, scholarship, advising, service
- Engaged the broader community through regular STEM outreach activities

**Postdoctoral Scholar** 2005 – 2008

*Pennsylvania State University, Department of Geosciences, University Park, PA*

- Served as the Kinetics Synthesis Specialist in the NSF-EMSI funded Center for Environmental Kinetics Analysis (CEKA)
- Advised CEKA graduate students in data analysis
- Curated environmental kinetics databases currently hosted through the [Critical Zone Exploration Network](#)
- Authored a successful NSF grant proposal to develop cyberinfrastructure for environmental chemistry and geochemical kinetics information
- Conducted original research on geochemical kinetics scaling laws and fractal surface topography with applications to critical zone science

**Graduate Research Assistant** 1998-2005

*Oregon Health & Science University, Division of Environmental and Biomolecular Systems, Portland, OR*

- Performed basic and applied research in heterogeneous chemical kinetics, electrochemistry, and groundwater remediation funded by the EPA and DOD
- Published 7 peer reviewed articles, 4 extended abstracts, and gave 6 technical presentations
- Improved the data processing techniques used within OHSU's Center for Groundwater Research
- Contributed to proposals for funding to the EPA, NSF, and DOE

**Teaching Assistant and Tutor** 1995-1998

*Clarkson University, Department of Mathematics and Campus Tutoring Services, Potsdam, NY*

- Taught two sections of Differential Equations recitation per semester
- Tutored group sessions in Strengths of Materials, Physics, Calculus, and Differential Equations

**Independent Consulting Experience:**

2017-2019: Coastal stormwater management for a mining concern in Patagonian Chile

2020-Present: Pit lake water quality modeling in support of mine closure planning

**Professional Licensure:**

Engineer-in-Training. Pennsylvania License ET028951. Anticipate eligibility for the PE exam in Fall 2024.

**Computational Skills and Experience:**

**Programming Languages and General-Purpose Data Analysis Software**

- Advanced experience with Python including numpy/scipy, matplotlib, scikit-learn, etc.
- Basic experience with C and Fortran especially through cython and f2py
- Advanced user of Igor Pro and MS Excel/VBA for statistical analyses and data visualization
- Basic user of Matlab and R

**Reactive Transport and Geochemical Modeling Tools**

- Advanced user of PHREEQC and PHAST
- Basic user of MINTEQA2 and MODFLOW

**Additional Technical Software**

- Intermediate user of HEC-RAS and HEC-HMS
- Basic user of EPA SWMM and WinTR-55

- Basic user of ANSYS FLUENT and CFX
- Basic user of AutoCAD Civil 3-D, Inventor Pro, and ArcGIS (ArcMap)

### Numerical Methods and High Performance Computing

- Member of the XSEDE user community (using SDSC Comet for kinetic Monte Carlo simulations)
- Advanced experience with general-purpose numerical routines including non-linear regression, Monte Carlo methods, ODE-IVPs, and finite difference and finite volume methods for BVPs
- Intermediate experience with time-series techniques including auto-regressive moving-average models and Gaussian process regression (kriging)
- Basic experience with finite element methods
- Developing a new technique for optimized number and placement of knots in shape restricted regression splines

### Extramural Funding:

1. **Bandstra J**, L Rushitskaya. **\$370,000**. National Oceanic and Atmospheric Administration, Bay Watershed Education and Training Program (B-WET). “Headwaters to Estuaries: Enhancing Meaningful Watershed Educational Experiences with Immersive Technology.” 2018-2020.
2. Strosnider W, Wagner R, **Bandstra J** **\$20,000**. United States Geological Survey-Pennsylvania Water Resources Research Center. “Passive Co-Treatment of Acid Mine Drainage and Municipal Wastewater: A Novel Solution to Protect and Restore Water Quality” 2015-2016.
3. **Bandstra JZ**, RA Clark, Y Li, W Strosnider, N Youmbi **\$499,755**. National Science Foundation-Division of Undergraduate Education. “STEPping Up: An Interdisciplinary Mentoring Network to Recruit and Retain STEM Majors” 2012-2016.
4. Strosnider W., **J Bandstra**. **\$30,000**. Dominion Higher Education Partnership Program. 2013-2014.
5. Strosnider W., **J Bandstra**. **\$186,000**. Foundation for Pennsylvania Watersheds. “Watershed Restoration Amplification Program.” 2012-2014.
6. **Bandstra J**. (in collaboration with A Olsen, U. Maine, and X Nu, Penn State) **\$18,564**. National Science Foundation-Division of Earth Sciences. “Collaborative Research: A Reaction Kinetics Database for Modeling Biogeochemical Systems.” 2011-2012
7. **Bandstra J**. **\$80,000**. PA Dept. of Community and Economic Development (KIZ Starter Kit). “Increasing SFU’s capabilities in biological or biomimetic energy conversion, storage, and transmission technologies.” 2010-2011
8. Felix A, **J Bandstra**, R Clark, E Zovinka, J Harris, W Strosnider, B Hargitai. **\$285,000**. PA Dept. of Education. “STEM Engaging Educators in Design-based Science.” 2010-2012

### Publications (undergraduate student author):

1. Qin H; Y Daquiang, **J Bandstra**, Y Sun, G Cao, X Guan. (2020) Ferrous ion mitigates the negative effects of humic acid on removal of 4-nitrophenol by zerovalentiron. *Journal of Hazardous Materials*.
2. Qin H; X Guan, **J Bandstra**, R Johnson, P Tratnyek. (2018) Modeling the Kinetics of Hydrogen Formation by Zerovalent Iron: Effects of Sulfidation on Micro- and Nano-Scale Particles. *Environmental Science and Technology*.
3. Smyntek P, J Chastel, R Peer, E Anthony, J McCloskey, E Bach, R Wagner, **J Bandstra**, W Strosnider. (2017) Assessment of sulphate and iron reduction rates during reactor start-up for passive anaerobic co-treatment of acid mine drainage and sewage. *Geochemistry: Exploration, Environment, Analysis*

4. Xu C, B Zhang, Y Wang, Q Shao, W Zhou, D Fan, **J Bandstra**, Z Shi, P Tratnyek. (2016) Effects of sulfidation, magnetization, and oxygenation on azo dye reduction by zerovalent iron. *Environmental Science and Technology*.
5. **Bandstra J**, S Brantley. (2015) Understanding the mechanisms of solid-water reactions through analysis of surface topography. *Physical Review E*
6. Lopano C, P Heaney, J Post, **J Bandstra**, S Brantley. (2011) Determination of cation exchange rates in synthetic birnessite using time-resolved synchrotron X-ray diffraction. *Geochimica et Cosmochimica Acta*.
7. **Bandstra J**, D Ross, S Brantley, W Burgos. (2011) Compendium and synthesis of bacterial manganese reduction rates. *Geochimica et Cosmochimica Acta*.
8. Williams J, **J Bandstra**, D Pollard, S Brantley. (2010) The temperature dependence of feldspar dissolution determined using a coupled weathering – climate model for Holocene-aged loess soils. *Geoderma*.
9. **Bandstra J**, S Brantley. (2008) Stochastic modeling of surface evolution during mineral dissolution. *Geochimica et Cosmochimica Acta*.
10. **Bandstra J**, S Brantley. (2008) Fitting Kinetic Data for Geochemical Reactions. *Kinetics of Water Rock Interactions*; Eds. S. L. Brantley, J. D. Kubicki, and A. F. White.
11. **Bandstra J**, H Buss, R Campen, J Moore, E Hausrath, L Liermann, A Navarre, J Jang, S Brantley. (2008) Compilation of Mineral Dissolution Rates. *Kinetics of Water Rock Interactions*; Eds. S. L. Brantley, J. D. Kubicki, and A. F. White.
12. Brantley S, **J Bandstra**, J Moore, A White. (2008) Factors controlling curvature of reaction fronts in soil profiles. *Geoderma*.
13. Conrad C, G Icopini, H Yasuhara, **J Bandstra**, S Brantley, P Heaney. (2007) Modeling the kinetics of silica nanocolloid formation and precipitation in environmentally relevant aqueous solutions. *Geochimica et Cosmochimica Acta*.
14. **Bandstra J**, P Tratnyek. (2005) Central limit theorem for chemical kinetics in complex systems. *Journal of Mathematical Chemistry*.
15. **Bandstra J**, R Miehr, R Johnson, P Tratnyek. (2005) Remediation of 2,4,6-Trinitrotoluene (TNT) by iron metal: Kinetic controls on product distributions in batch and column experiments. *Environmental Science and Technology*.
16. Johnson R, P Tratnyek, R Miehr, R Thoms, **J Bandstra**. (2005) Reduction of hydraulic conductivity and reactivity in zero-valent iron columns by oxygen and TNT. *Ground Water Monitoring & Remediation*.
17. Nurmi J, **J Bandstra**, P Tratnyek. (2004) Packed powder electrodes for characterizing the reactivity of granular iron in borate solutions. *Journal of the Electrochemical Society*.
18. **Bandstra J**, P Tratnyek. (2004) Applicability of single-site rate equations for reactions on inhomogeneous surfaces. *Industrial and Engineering Chemistry Research*.
19. Miehr R, P Tratnyek, **J Bandstra**, M Scherer, M Alowitz, E Bylaska. (2004) The diversity of contaminant reduction reactions by zero-valent iron: Role of the reductate. *Environmental Science and Technology*.
20. Agrawal A., W Ferguson, B Gardner, J Christ, **J Bandstra**, P Tratnyek. (2002) Effects of carbonate species on the kinetics of 1,1,1-Trichloroethane by zero-valent iron. *Environmental Science and Technology*.

**Conference Presentations and Extended Abstracts (undergraduate student author):**

1. **Bandstra J**, W Strosnider. (2019) Modeling the Effects of Mass Transfer Limitations in Limestone-Based Passive Treatment Systems. American Society of Mining and Reclamation National Conference, Big Sky, MT.
2. Tratnyek P, H Qin, R Johnson, **J Bandstra**, J Schulte, X Guan. (2018) Modeling the Kinetics of Hydrogen Formation by Iron: Effects of Sulfidation. Gordon Research Conference, Environmental Sciences: Water. Holderness, NH.
3. Spellman C, D Madl, A Rose, E Zovinka, **J Bandstra**, W Strosnider (2017) Mass transport controls on aluminum removal in limestone based treatment systems. American Society of Mining and Reclamation National Conference, Morgantown, West Virginia.
4. Schulte J, P Youmbi, D Madl, R Krupa, **J Bandstra**, E Zovinka. (2017) Laboratory simulation of the open limestone channel at abandoned mine: Swank 13. National Meeting of the American Chemical Society. San Francisco, CA.
5. Tratnyek P, M Bradley, **J Bandstra**, Y Lan. (2017) Electrochemical characterization of minerals and their redox reactions with solutes. National Meeting of the American Chemical Society. San Francisco, CA.
6. **Bandstra J**. (2017) Mineral surface topography related to weathering rate for a 3-D model crystal. National Meeting of the American Chemical Society. San Francisco, CA. (*Invited*)
7. Mosier DR, CJ Spellman, JP Krug, CJ Weyant, LJ Stern, RC Krupa, TR Spangler, DK Wolfe, **J Bandstra**, WH Strosnider, EP Zovinka (2016) Analysis of the open limestone channel at the Swank 13 Abandoned Coal Mine, Reade Township, Pennsylvania. Council on Undergraduate Research: Posters on the Hill, Washington, District of Columbia. (*Invited*)
8. Rensel S, J Gaughan, S Wolfe, L Aviles, C Spellman, K Tomkowski, W Strosnider, **J Bandstra** (2016) Open limestone channels for acid mine drainage treatment: Effects of agitation on pH increase. American Society of Mining and Reclamation National Conference, Spokane, Washington.
9. Spellman C, K Tomkowski, S Carvajal Sanchez, C Weyant, J Krug, L Stern, D Wolfe, D Mosier, A Rose, EP Zovinka, **J Bandstra**, W Strosnider (2016) Open limestone channel performance for aluminum-rich acid mine drainage. American Society of Mining and Reclamation National Conference, Spokane, Washington.
10. Mosier D, J Krug, C Weyant, L Stern, D Wolfe, C Spellman, W Strosnider, **J Bandstra**, Edward Zovinka. (2016) Analysis of the open limestone channel at the Swank 13 abandoned coal mine. National Meeting of the American Chemical Society. Washington DC
11. Smyntek P, **J Bandstra**, R Wagner, W Strosnider, C Marcillo (2015) Removal and behavior of metal contaminants during passive co-treatment of synthetic acid mine drainage and synthetic municipal wastewater. American Chemical Society National Meeting, Boston, Massachusetts.
12. Li Y, E Zovinka, R Clark, W Strosnider, N Youmbi, **J Bandstra** (2015) STEPping Up: An Interdisciplinary Mentoring Network to Recruit and Retain STEM Majors. Joint Mathematics Meeting, San Antonio, Texas. (*Invited*)
13. Chastel J, R Peer, E Bach, E Anthony, J McCloskey, P Smyntek, R Wagner, **J Bandstra**, W Strosnider (2014) Single-stage anaerobic passive co-treatment of acid mine drainage and municipal wastewater. Geological Society of America Annual Meeting, Vancouver, Canada.

14. Carvajal-Sanchez S, WH Strosnider, C Spellman, J Vinglish, A Rose, E Zovinka, **J Bandstra (2014)** Open limestone channels for acid mine drainage treatment: Performance and design guidance. Susquehanna River Symposium, Lewisburg, Pennsylvania.
15. McCloskey J, R Peer, E Bach, E Anthony, J Chastel, P Smyntek, R Wagner, **J Bandstra**, W Strosnider (2014) Passive co-treatment of acid mine drainage and municipal wastewater: Simple anaerobic trials. Susquehanna River Symposium, Lewisburg, Pennsylvania.
16. Mazzur JE, MA Messina, JA Golanoski, AW Renz, NJ Frank, S Carvajal, **J Bandstra**, WHJ Strosnider, R Wagner, CJ Spellman (2014) The effect of sodium chloride on the rate of calcite dissolution for acid mine drainage. Susquehanna River Symposium, Lewisburg, Pennsylvania.
17. Zoubareva T, L Mignogna, D Mack, D Civis, J Skipper, N Lassak, A Conrad, **J Bandstra**, A Rose, W Strosnider (2014) Dissolution variability in open limestone channel substrate: Simple lab trials. American Society of Mining and Reclamation National Conference, Oklahoma City, Oklahoma.
18. Neptune AA, FS Llanos Lopez, RR Callapa, KJ Palmer, RW Nairn, **J Bandstra**, WH Strosnider (2012) The Pailaviri tailings deposit, Potosí, Bolivia: extreme acid mine drainage generation. American Society of Mining and Reclamation National Conference, Tupelo, Mississippi.
19. **Bandstra, J.** The Lab/Field Discrepancy in Mineral Weathering: Is Surface Evolution to Blame? 2012 ACS Student Member Symposium, April 14, 2012. Duquesne University. **(Invited)**
20. Rogers R, S Alegre, D Carroll, T Montgomery, K Raus, S Bush, C Breazile, A Neptune, K Palmer, **J Bandstra**, WH Strosnider, F Llanos López, J Alvarez, RW Nairn (2011) Treating severely contaminated mine waters at 16,000 feet: a project based service learning opportunity in the Bolivian Andes. International WaTER Conference, Norman, Oklahoma.
21. **Bandstra, J.** Modeling of Mineral Dissolution Rates. Aquatic geochemistry symposium. Universidad Autonoma Tomas Frias. Potosi, Bolivia. May 2011. **(Invited)**
22. Felix AL, **J Bandstra**, WHJ Strosnider (2010) Design-based science for STEM student recruitment and teacher professional development. Mid-Atlantic American Society for Engineering Education Conference, Easton, Pennsylvania.
23. Mueller K, P Mitra, CL Giles, B Garrison, J Kubicki, **J Bandstra. (2008)** CHEMXSEER: Cyber-Tools for Environmental Chemistry and Geochemistry. Joint Meeting of The Geological Society of America.
24. K Mueller, P Mitra, CL Giles, B Garrison, J Kubicki, S Brantley, B Sun, Y Liu, W Brouwer, S Nangia, **J Bandstra. (2008)** ChemXSeer: Cyber-tools for researchers in environmental chemistry. National Meeting of the American Chemical Society. Washington DC.
25. **Bandstra, J.** Binary Random Markov Field Model of Surface Evolution. Special Penn State/Université Paul Sabatier Joint Low Temperature Geochemistry Seminar. Penn State University, April 2008. **(Invited)**
26. **Bandstra, J;** Brantley, S. L. Stochastic Modeling of Surface Roughness Evolution During Mineral Dissolution. Goldschmidt 2007, Cologne, Germany, August 2007
27. CL Giles, P Mitra, K Muller, J Kubicki, B Garrison, J Wang, B Sun, Y Liu, Q Tan, L Bolelli, X Lu, A Jaiswal, K Bai, I Councill, W Brouwer, J Fernandez, **J Bandstra. (2008)** iConference2008.
28. L Bolelli, X Lu, Y Liu, A Jaiswal, K Bai, I Councill, P Mitra, JZ Wang, K Mueller, J Kubicki, B Garrison, **J Bandstra**, CL Giles. (2007) ChemXSeer: a chemistry web portal for scientific literature and datasets. Open Repositories Conference, San Antonio, Texas

29. K Mueller, W Brouwer, N Washton, B Garrison, S Nangia, S Brantley, **J Bandstra**, J Kubicki, P Mitra, CL Giles. (2006) The development of collaborator tools to facilitate multi-disciplinary, multi-scale environmental kinetics research. Meeting of the Geological Society of America. Philadelphia, Pa.
30. N Washton, K Mueller, M Davis, J Kubicki, **J Bandstra**, J Moore, S Brantley. (2006) New tools and concepts for understanding the evolution of mineral surface area for extrapolation of environmental dissolution kinetics. Meeting of the Geological Society of America. Philadelphia, Pa.
31. **Bandstra, J**; Moore, J.; Wang, J.; Mitra, P.; Giles, C. L.; Brantley, S. L.; and Kubicki, J. D. Developing and Using Kinetics Databases in Environmental Chemistry. Sixteenth Symposium on Thermophysical Properties, Boulder, CO, July 2006.
32. K Mueller, N Washton, B Garrison, J Kubicki, **J Bandstra**, P Mitra, CL Giles, J Wang (2006) Developing collaborative tools to facilitate multi-disciplinary, multi-scale research in environmental molecular sciences. National Meeting of the American Chemical Society
33. CL Lopano, PJ Heaney, JE Post, **J Bandstra**, SL Brantley (2006) Kinetic Analyses of Cation Exchange Rates in Synthetic Birnessite Measured by Time-Resolved Synchrotron X-ray Diffraction. American Geophysical Union Spring Meeting.
34. **J Bandstra**, W Burgos, B Peyton. (2006) Annual Environmental Remediation Sciences Program PI Meeting. Warrenton, VA
35. K Mueller, **J Bandstra**, J Kubicki, L Criscenti, J Moore, N Washton, S Brantley. (2005) New tools and concepts for understanding the evolution of mineral surface area for extrapolation of environmental kinetics. American Geophysical Union Fall Meeting
36. **JZ Bandstra**, SL Brantley. (2005) Existence, Uniqueness, and Limitations of Scaling Laws Relating Mineral Dissolution Rates to Surface Roughness. American Geophysical Union Fall Meeting.
37. CF Conrad, PJ Heaney, **J Bandstra**, G Icopini, H Yasuhara, SL Brantley. (2005) Modeling the Kinetics of Silica Polymerization and Precipitation in Aqueous Solutions as a Function of pH and Ionic Strength. American Geophysical Union Fall Meeting
38. **J Bandstra**. (2005) Relating Empirical and Mechanistic Rate Laws for Dissimilatory Metal Reducing Bacteria. Annual Meeting of the Geological Society of America. Salt Lake City, UT.
39. **J Bandstra**, P Tratnyek, S Brantly. (2005) Relating the kinematics and the dynamics of reacting surfaces. National Meeting of the American Chemical Society
40. **J Bandstra**, P Tratnyek. (2003) Effects of surface heterogeneity on the kinetics of interfacial electron transfer. National Meeting of the American Chemical Society
41. R Miehr, **J Bandstra**, R Po, P Tratnyek. (2003) Remediation of 2, 4, 6-trinitrotoluene (TNT) by iron metal: kinetic controls on product distributions in batch and column experiments. National Meeting of the American Chemical Society
42. P Tratnyek, R Miehr, **J Bandstra**. (2002) 5 Permeable Reactive Barriers-Kinetics of reduction of TNT by iron metal. *IAHS Publications-Series of Proceedings and Reports-Intern Assoc Hydrological Sciences*
43. P Tratnyek, R Miehr, **J Bandstra** (2002) Kinetics of reduction of TNT by iron metal. *IAHS PUBLICATION*
44. **J Bandstra**, P Tratnyek. (2001) Relating Empirically Derived and Mechanistic Kinetic Models for Solute Reduction and Formation of Precipitates in Reactive Barriers of Iron Metal. American Geophysical Union Fall Meeting.

## Outreach:

### **Environmental Engineering Design Academy**

*Program Founder and Lead Instructor. 2009 - Present*

Every summer since 2009 I have led a one-week residential STEM academy for high school juniors focused on environmental engineering. The program introduces young people to environmental engineering through hands-on projects and field trips. Twenty four percent of the more than 120 participants have enrolled in environmental engineering at SFU and many more have gone on to major in environmental engineering at other colleges. The program has attracted funding from the National Science Foundation, the Palumbo Trust, and the Dominion Foundation.

### **Pre-Undergraduate Research Experience in the Environment**

*Program Director. 2012 - 2017*

This National Science Foundation funded summer bridge program brought together a team of incoming freshman from several STEM disciplines to conduct a two-week long research project mentored by upper-classmen. The program helped incoming freshman acculturate to university life and form an academic identity as a STEM major. Participants were retained in-major at higher rates than the university average.

### **Professor in Residence**

*Bishop Guilfoyle Catholic High School. 2017-2018*

*Bishop Carroll Catholic High School. 2018-2019*

For two academic years I served as an instructor at two regional Catholic High Schools where I taught an Introduction to Engineering course. The project-based course was designed to help the students assess their interest in engineering as a career. Guest speakers introduced students to the major sub-disciplines in engineering. Many of the participants have gone on to major in engineering.

### **Francis Worldwide**

*Instructor. 2020-2021*

Directed an on-line Introduction to Engineering course for a college-in-high school audience. Similar to the professor in residence program, the course was designed to guide students with an interest in engineering as a career. As an on-line course, the hands-on projects were oriented toward developing skills in modern engineering design and computational tools.

### **Presentations and Hands-On Projects in K-12 Classroom Settings**

*Kayaking the Storm-Surge: Lessons learned about the environment from 30 years of whitewater boating.* NOAA Bay Watershed Environment Training Webinar Series. April 2021.

*Career Opportunities in Environmental Engineering.* Future Business Leaders of America Career Development Webinar Series. March 2021.

*Water Filtration: A Human Health Fundamental.* Norwin STEM Day Presenter. April 2018, April 2019, April 2020

*The Engineering of Roller-Coasters: A Guided VR Tour.* Altoona High School. February 2020

*Engineering: A Career for You?* Altoona High School. November 2019, December 2019

*A Guide to Transformational College Experiences.* Bishop McCort Catholic High School. November 2017, November 2018, November 2019



*Disinfecting Water in 10 Minutes.* Quantum Quest Fest at the Johnstown CTC. May 2017, May 2018, May 2019

*How do we make our drinking water clean?* Longer Elementary STEM Day Presenter: January 2019

*Mini-Punkin Chunkin.* Holy Trinity Catholic School Trebuchet Outreach Project. October 2018

*Mini-Punkin Chunkin.* Divine Mercy Catholic School Trebuchet Outreach Project. October 2018

*Constructing Popsicle Stick Bridges.* Franktown Elementary Gifted Program. May 2017

*Water Filtration: A Human Health Fundamental.* Glendale High School STEM Day Presenter. October 2015

*Using Statistics to Save the Planet.* Fox Chapel Senior High School presentation to the AP Statistics and Earth Science classes in honor of their winning entries in the PA Statistics Competition: May 2013, May 2014

*Using Statistics to Save the Planet.* Mt. Lebanon High School presentation to the AP Statistics class in honor of their winning entries in the PA Statistics Poster Competition. May, 2013.

*Do Statistics and Math Matter? The Perspective of an Environmental Engineer.* Invited presentation to the State College High School AP statistics class. State College, Pa. May 2011.

*Engineering Career Options at Saint Francis University.* Career Showcase. Johnstown, PA. May, 2011.

*Engineering Career Options at Saint Francis University.* Northern Cambria High School Career Fair. January 2009.

*Engineering Career Options at Saint Francis University.* Ferndale High School Career Fair. January 2009.

### **STEM Competitions and Festivals**

*Saint Francis Engineering Design Challenge.* Mentor and project judge. Fall 2020.

*Biotechnology Division Judge.* TSA Regional Competition. February 2017, February 2018, February 2019, February 2020, February 2021

*Presenter.* Saint Francis University Science Day. Annually in November 2009 - Present.

*Volunteer.* Bedford Elementary Watershed Festival. May 2018.

*Scholarship Judge.* Pittsburgh Regional Science and Engineering Fair. March 2011, March 2013

### **K-12 Teacher Professional Development**

*Program Co-Director and Instructor.* Headwaters to Estuaries. A week-long NOAA-BWET funded program to assist K-12 teachers in developing meaningful watershed educational experiences. July 2018, 2019, 2020.

*Instructor.* Math/Science Partnership-Reflection and Application of Mathematical Practice. A week-long professional development seminar for K-12 math teachers funded by PA Dept. of Ed. July 2013, 2014, 2015.

*Instructor.* Math/Science Partnership-STEM Engaging Educators in Design-based Science. A week-long professional development seminar for K-12 science teachers funded by PA Dept. of Ed. July 2010, 2011, 2012.

*Presenter.* "Incorporating Math and Computation into Simple Engineering Design Projects." Central PA Regional STEM Education Conference. Johnstown, Pa. June 2011.

### **Courses Taught:**

Introduction to Physics I	SFU: Fa2008, Fa2009
Introduction to Physics II	SFU: Sp2009, Sp2010
General Physics II	SFU: Sp2021
Introduction to Engineering I	SFU: Fa2014, Fa2015, Fa2018, Fa2019, Fa2020 Bishop Guilfoyle: 2017-2018 Bishop Carroll: 2018-2019
Introduction to Engineering II	SFU: Sp2011, Sp2019
Engineering Statics	SFU: Fa2009, Fa2010, Fa2018, Fa2019
Engineering Dynamics	SFU: Sp2009, Sp2011, Sp2013, Sp2017
Mechanics of Materials	SFU: Sp2018
Environmental Aspects of Petroleum Development	SFU: Fa2015, Sp2018, Sp2019, Sp2021
Fluid Mechanics	SFU: Fa2010, Fa2011, Fa2012, Fa2013, Fa2014 Fa2015, Fa2016, Fa 2019, Sp2020, Fa2020
Fluid Mechanics Lab	SFU: Fa2010, Fa2012, Fa2013, Sp2020
Aquatic and Atmospheric Chemistry	SFU: Fa2019
Transport Processes	SFU: Sp2011, Sp2012, Sp2013, Sp2014, Sp2015, Sp2018, Sp2021
Modeling and Simulation of Environmental Systems	SFU: Sp2011, Sp2013, Sp2014, Sp2015, Sp2017, Sp2018, Sp 2019, Sp2020, Sp2021
Environmental Engineering Measurements I	SFU: Sp2011
Chemical and Biological Reactor Design	SFU: Sp2012
Mechanics of Soils and Geological Materials	SFU: Fa2011
Environmental Hydraulics and Hydrology	SFU: Fa2011, Fa2012, Fa2013, Fa2014, Fa2015, Fa2016, Fa2017, Fa2018
Hazardous Materials Engineering	SFU: Sp2012
Ecological Engineering	SFU: Fa2020
Environmental Engineering Capstone Design	SFU: 2014-2015, 2015-2016, 2015-2017, 2017-2018, 2018-2019

### **Professional Society Memberships:**

Association of Environmental Engineering and Science Professors  
American Chemical Society  
American Geophysical Union  
Society for Industrial and Applied Mathematics  
American Society of Mining and Reclamation

## Peer Reviewer:

### Manuscript Reviews

Over five dozen manuscripts for the following:

- Environmental Science and Technology
- ES&T Letters
- Geochimica et Cosmochimica Acta
- Geochemical Transactions
- Industrial and Engineering Chemistry Research
- Science of the Total Environment
- Journal of Physical Chemistry
- Journal of Agricultural and Food Chemistry

### Grant Proposal Reviews

- National Science Foundation
  - Division of Chemical, Bioengineering, Environmental, and Transport Systems
  - Division of Undergraduate Education; Improving Undergraduate STEM Education Program
- Department of Energy, Office of Basic Science
- Chesapeake Bay Trust

### External Program Reviews

- State University of New York, College of Environmental Science and Forestry. Performed on-site review of a proposed Master of Engineering program in Environmental Resources Engineering.
- Pacific University. Provided guidance on resources and curricular structure for proposed programs in ecological engineering and general engineering.

## Professional References:

Dr. Paul G. Tratnyek (graduate advisor)  
Professor  
Institute of Environmental Health; Division of Environmental and Biomolecular Systems  
Oregon Health & Science University  
3181 SW Sam Jackson Park Road  
Portland, OR 97239-3098  
ph: 503-346-3431  
e-mail: [tratnyek@ohsu.edu](mailto:tratnyek@ohsu.edu)

Dr. Susan L. Brantley (post-doc advisor)  
Distinguished Professor of Geosciences  
Pennsylvania State University  
2217 Earth & Engineering Science Building  
University Park, PA 16802  
ph: 814-865-1619  
fax: 814-865-3191  
e-mail: [spb7@psu.edu](mailto:spb7@psu.edu)

Dr. John Harris (former supervisor)  
Professor of Mathematics, Engineering, and Computer Science  
Saint Francis University  
Science Center 004  
Loretto, PA 15940  
ph: 814-472-3082  
e-mail: [jharris@francis.edu](mailto:jharris@francis.edu)

Dr. William Strosnider (former colleague)  
Director Baruch Marine Field Laboratory  
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