

CURRICULUM VITAE

Peter Crowley Ryan

Geology Department, Middlebury College
Middlebury, VT 05753
(802) 443-2557
FAX: (802) 443-2072
pryan@middlebury.edu

Academic Degrees:

Dartmouth College, Geology, **PhD**, 1994.

- Dissertation Topic: Geochemistry and mineralogy of Cretaceous sandstones.
- Advisor: Robert C. Reynolds, Jr

University of Montana, Geology, **MS**, 1991

- Thesis Topic: High-grade diagenesis of Precambrian sandstone and shale.
- Advisor: Graham Thompson

Dartmouth College, Earth Sciences, **BA**, 1988. Honors.

Appointments:

2009 – present Professor of Geology and Environmental Studies, Middlebury College
2012 – 2013 Visiting Research Scientist, Inst Andaluz de Ciencias de la Tierra, Spain.
2003 – 2009 Associate Professor, Geology and Env. Studies, Middlebury College.
2007 – 2008 Visiting Research Scientist, Estación Experimental del Zaidín, Spain.
2003 – 2007 Director of Program in Environmental Studies, Middlebury College.
1998 – 2003 Assistant Professor, Geology Dept., Middlebury College.
1999, 2002 Visiting Research Scientist, Macaulay Institute, Aberdeen, Scotland.
1995 – 2002 Faculty Affiliate (Adjunct), University of Montana, Missoula.
1994 – 1998 Instructor, Environmental Science Program, Salish Kootenai College.

Textbook

Ryan, P.C., 2014. *Environmental and Low-Temperature Geochemistry*. Wiley-Blackwell.
ISBN: 978-1-4051-8612-4. 416 pages.

Research Papers (* = student co-author):

Ryan, P.C., West, D.P., Hattori, K., Studwell, S.*, Allen, D., Kim, J., 2015. The influence of metamorphic grade on arsenic in metasedimentary bedrock aquifers: A case study

- from western New England, USA. *Science of the Total Environment* 505, 1320–1330. <http://dx.doi.org/10.1016/j.scitotenv.2014.05.021>.
- Mango, H. and Ryan, P.C., 2015. Source of arsenic-bearing pyrite in southwestern Vermont, USA: Sulfur isotope evidence. *Science of the Total Environment* 505, 1331-1339. <http://dx.doi.org/10.1016/j.scitotenv.2014.03.072>.
- Kim, J., Ryan, P.C., Klepeis, K., Gleeson, T., North, K. *, Bean, J. *, Davis, L. *, Filoon, J. *, 2014. Ordovician thrust fault controls hydrogeology and geochemistry of a bedrock aquifer system in NW Vermont: northeastern Appalachian foreland. *Geofluids* 14, 266-290. DOI: 10.1111/gfl.12076.
- Ryan, P.C., Kim, J.J., Mango, H., Hattori, K., Thompson, A. *, 2013. Arsenic in a fractured slate aquifer system, New England (USA): Influence of bedrock geochemistry, groundwater flow paths, redox and ion exchange. *Applied Geochemistry* 39, 181-192. doi: <http://dx.doi.org/10.1016/j.apgeochem.2013.09.010>.
- Ryan P.C., Huertas, F.J., 2013. Reaction pathways of clay minerals in tropical soils: insights from kaolinite-smectite synthesis experiments. *Clays and Clay Minerals* 61, 303-318.
- Ryan, P.C., Kim, J., Wall, A.J., Moen, J.C. *, Corenthal, L.G. *, Chow, D.R. *, Sullivan, C.M. *, Bright, K.S. *, 2011, Ultramafic-derived arsenic in a fractured bedrock aquifer. *Applied Geochemistry* 26, 444-457.
- Kim, J., Klepeis, K., Ryan, P., Gale, M., McNiff, C., Ruksznis, A., and Webber, J., 2011, A bedrock transect across the Champlain and Hinesburg thrusts in west-central Vermont: integration of tectonics with hydrogeology and groundwater chemistry. In *Guidebook for Field Trips in Vermont and Adjacent New York: New England Intercollegiate Geological Conference Guidebook* (West, D.P., Jr., Ed.), C5 1-23.
- Ryan P.C., Huertas, F.J., 2009. The temporal evolution of pedogenic Fe-smectite to Fe-kaolin via interstratified kaolin-smectite in a moist tropical soil chronosequence. *Geoderma* 151, 1-15.
- Ryan P.C., Hillier S, Wall A.J. *, 2008, Stepwise effects of the BCR sequential chemical extraction procedure on dissolution and metal release from common ferromagnesian clay minerals: a combined solution chemistry and X-ray powder diffraction study. *Science of the Total Environment* 407, 603-614.
- Munroe J.S., Ryan P.C., Carlson H.A. *, and Miller E.K., 2008, Testing Latest Wisconsinan Ice Flow Directions in Vermont through Quantitative X-ray Diffraction Analysis of Soil Mineralogy. *Northeastern Geology and Environmental Sciences*, 29(4): 263-275.
- Munroe J.S., Farrugia G. *, Ryan P.C., 2007, Parent material and chemical weathering in alpine soils on Mount Mansfield, Vermont, USA. *Catena* 70(1), 39-48.
- Fisher G.B. *, Ryan P.C., 2006, The smectite to disordered kaolinite transition in a tropical soil chronosequence, Pacific Coast, Costa Rica. *Clays and Clay Minerals* 54, 571-586.

- Kautz C.Q. *, Ryan P.C., 2003, The 10 Å to 7 Å halloysite transition in a tropical soil sequence, Costa Rica. *Clays and Clay Minerals* 51, 252-263.
- Sears J.W., Ryan P.C. 2003, Cenozoic evolution of the Montana Cordillera: Evidence from paleovalleys. In *Cenozoic Systems of the Rocky Mountain Region* (Raynolds RG and Flores J, eds.): Special Publication, Rocky Mountain SEPM, 289-301.
- Ryan P.C., Wall A.J. *, Hillier S., Clark L., 2002, Insights into sequential chemical extraction from quantitative XRD: A study of trace metal partitioning in sediments related to frog malformities. *Chemical Geology* 184, 337-357.
- Ryan P.C., Hillier S., 2002, Facies relationships of Fe-rich clays in the Sundance Formation. *American Mineralogist* 87, 1607-1615.
- Hillier S., Ryan P.C., 2002, Identification of halloysite (7Å) by ethylene glycol solvation: The MacEwan effect. *Clay Minerals* 37, 395-404.
- Ryan P.C., Conrad M.E., Brown K. *, Chamberlain C.P., Reynolds, R.C. Jr., 1998, Oxygen isotopic compositions of serpentine/chlorite and illite/smectite in the Tuscaloosa Formation (US Gulf Coast): Implications for pore fluids and mineralogic reactions. *Clays and Clay Minerals* 46, 357-368.
- Ryan P.C., Buckley S.N., 1998, Sedimentation, stratabound Cu-Ag mineralization, and syndepositional tectonics in the Revett Formation, Flathead Indian Reservation, western Montana: *in* The Belt Supergroup, Proc. Belt Symposium III, Special Pub. 112, Mont. Bur. of Mines Geol., 278-289.
- Ryan P.C., Reynolds R.C., Jr., 1997, The chemical composition of serpentine/chlorite: SEM-EDX vs. XRD determinations, implications for mineralogic reactions, and the origin of anatase. *Clays and Clay Minerals* 45, 339-352.
- Ryan P.C., Reynolds R.C., Jr., 1996, The origin and diagenesis of grain-coating serpentine/chlorite in Tuscaloosa Formation sandstone, U.S. Gulf Coast. *American Mineralogist* 81, 213-225.
- Moe J.A., Ryan P.C., Elliott W.C., Reynolds R.C., Jr., 1996, Petrology, chemistry, and clay mineralogy of a K-bentonite in the Proterozoic Belt Supergroup of western Montana: *Journal of Sedimentary Research* 66, 95-99.
- Buckley S.N., Sears J.W., Ryan P.C., and Lauer D., 1994, Base-metal and PGE mineralization, sedimentation and mafic magmatism related to rifting of the Middle Proterozoic Belt Supergroup, western Montana: *Northwest Geology* 23 (Metallogeny of the Belt-Purcell Basin), 13-18.

Recent Abstracts, Conference Presentations (past 10 years, * = student co-author):

- Ryan, P.C., Pincus, L.*, Huertas, F.J., 2014. Cation exchange capacity of tropical soil clays as a function of time and precipitation. Geological Society of America Abstracts with Programs, 46 (6), p.150
- Ryan, P.C., Koenigsberger, S.*, Bachman, N.*, Kim, J., 2014. Uranium-rich phosphorite breccias in Cambrian dolostone as source of elevated uranium and alpha radiation in a

- bedrock aquifer, Vermont, USA. Geological Society of America Abstracts with Programs, 46 (6), p. 101.
- Van Hoesen, J., Grady, C.M.*, Ryan, P.C., Arriaza, B., 2014. reconstructing the Chinchorro palette: A possible origin for manganese-based paint. Geological Society of America Abstracts with Programs, 46 (6), p. 93.
- Ryan, P.C., Pincus, L.*, Falcones, K*, 2013, Mineralogical and geochemical evolution of tropical soils in a coastal terrace sequence. Geological Society of America Abstracts with Programs, 45 (7).
- Ryan, P.C., Kim, J., Mango, H., 2013, Roles of bedrock geochemistry, groundwater flow paths, redox and ion exchange on distribution of arsenic in a fractured slate aquifer system, New England, USA. Geological Society of America Abstracts with Programs, 45 (7).
- Ryan, P.C., Huertas, F.J., Hobbs, F.C.* , 2013, Halloysite and Fe-kaolinite in soils from dry tropical forest: Origin from pedogenic smectite and kaolin-smectite and implications for reaction mechanisms and rates. 50th Annual Meeting, Clay Minerals Society, Univ of Illinois, October, 2013.
- Studwell, S., Ryan, P.C., West, D.P., Jr, Kim, J., 2013, Examining the potential effect of metamorphism on arsenic concentration in metapelite bedrock aquifers: a case study of the Taconic sequence. Geological Society of America Abstracts with Programs, 45 (1).
- Mango, H., Ryan, P.C., 2013, Source of arsenic-bearing pyrite in southwestern Vermont: sulfur isotope evidence. Geological Society of America Abstracts with Programs, 45 (1).
- Ryan, P.C., 2012,.Integrating field work, laboratory techniques and instrumental analysis into a research component of an undergraduate environmental geochemistry course. Geological Society of America Abstracts with Programs, 44 (7), p. 446. *Invited lecture.*
- Ryan, P.C., Kim, J., Silverman, A.* , and Russell, D*, 2012, The effect of metamorphism on arsenic concentration in metapelite bedrock aquifers: a case study of the Connecticut Valley/Gaspé sequence (NE Vermont and SE Quebec). Geological Society of America Abstracts with Programs, 44 (7), p. 52. *Invited lecture.*
- Kim, J., Ryan, P.C., 2012, An across-strike survey of arsenic distribution in lithologies and groundwater in the Pre-Silurian Vermont Appalachians. Geological Society of America Abstracts with Programs, 44 (7), p. 52.
- Ryan, P.C., Hattori, K., Takahashi, Y, 2012, Arsenic in tetrahedral and octahedral sites in phyllosilicates. Program and Abstracts, 49th Annual Meeting of the Clay Minerals Society, Golden CO, June 2012.
- Hobbs, F.C*, Ryan, P.C., 2012, Mineral reaction pathways and rates in a tropical soil chronosequence, Nicoya Peninsula, Costa Rica. Geological Society of America Abstracts with Programs, 44 (2), p. 111.

- McDonald, E.C.*, Ryan, P.C., Kim, J., 2012, Relationship between bedrock geochemistry and uranium in groundwater in a carbonate aquifer, NW Vermont. Geological Society of America Abstracts with Programs, 44 (2), p. 48.
- Russell, D.*, Kim, J., Ryan, P.C., 2012, Evidence for the relationship between arsenic and metamorphic grade and implications for bedrock aquifer geochemistry. Geological Society of America Abstracts with Programs, 44(2), p. 47.
- Thompson, A. *, Ryan, P.C., Hattori, K.H., Kim, J., 2011, Geochemical and sulfur isotope analysis of Taconic slates: implications for arsenic source and mobility in a bedrock aquifer system. Geological Society of America Abstracts with Programs, Vol. 43, No. 1, p. 106.
- Rosenberg, B. *, Bigl, M.F. *, Munroe, J.S., Ryan, P.C., 2011, X-ray diffraction analysis of weathering patterns in high-elevation glacial, periglacial, and eolian sediments in northern Nevada and Utah. Geological Society of America Abstracts with Programs, Vol. 43, No. 1, p. 114.
- Rosenberg, B. *, Meyer, E.E., Ryan, P.C., Eberl, D.D., 2011, K-Ar dating of illite-rich rocks in the Champlain Valley, Vermont: an investigation of post-Taconian faulting and fluid flow. Geological Society of America Abstracts with Programs, Vol. 43, No. 1, p. 151.
- Brooks, E. *, Kim, J., Ryan, P.C., 2011, Geochemical analysis of groundwater quality in the fractured bedrock aquifer of the town of Craftsbury, NE Vermont. Geological Society of America Abstracts with Programs, Vol. 43, No. 1, p. 107.
- Mango, J., Ryan, P.C., 2011, Pyrite as the source of groundwater arsenic in Taconic slates, southwestern Vermont. Geological Society of America Abstracts with Programs, Vol. 43, No. 1, p. 135.
- Ryan, P.C., Moen, J.C. *, Corenthal, L.G. *, Chow, D.R. *, Kim, J., 2010, Tetrahedral arsenic (As⁺⁵) in antigorite: Geological origin and implications for groundwater quality: SEA-CSSJ-CMS Trilateral Meeting on Clays, Spain, June 2010, T2-P-25.
- Clark, Arthur*, Smith, Taylor*, Kim, Jon, Ryan, Peter C., Mango, Helen, 2010, Elevated arsenic in domestic wells from the Taconic allochthons in southern Vermont. Geological Society of America Abstracts with Programs, Vol. 42, No. 1, p. 185.
- Corenthal, Lilly*, Ryan, Peter C., Kim, Jon, 2010, Arsenic in groundwater wells in glacial drift, north-central Vermont. Geological Society of America Abstracts with Programs, Vol. 42, No. 1, p. 122.
- Moen, Jonathan*, Ryan, Peter C., Kim, Jon, 2010, Analysis of arsenic speciation in ultramafic rocks by sequential chemical extraction: implications for Taconian fluid source and modern aquifer contamination. Geological Society of America Abstracts with Programs, Vol. 42, No. 1, p. 122.

- Ryan, P.C., Kim, J., Clark, A.L. *, Smith, T.T. *, Chow, D. *, Sullivan, C. *, Bright, K. *, 2009, Ultramafic source of arsenic in a fractured bedrock aquifer. *Geological Society of America Abstracts with Programs*, Vol. 41, No. 7, p. 218.
- Ryan, P.C. and Huertas, F.J., 2009, The origin of Fe-kaolin from precursor beidellite and interstratified kaolin-smectite in moist tropical soils. *Programs and Abstracts, 14th International Clay Conference, Castellaneta, Italy, June 2009.*
- Ryan, P.C. and Huertas, F.J., 2009, Insights into the transformation of ferruginous beidellite to K-S and kaolin from synthesis experiments. *Programs and Abstracts, 14th International Clay Conference, Castellaneta, Italy, June 2009.*
- Kim, J., Ryan, P., North, K. *, Bean, J. *, and Davis, L. *, 2009, Radionuclides, groundwater geochemistry, and hydrogeology above, below, and through the Hinesburg thrust: NW Vermont. *Geological Society of America Abstracts with Programs*, V. 41, n. 3, p. 21.
- Ryan, P.C., Kim, J., Chow, D. *, Sullivan, C. *, and Bright, K. *, 2009, Connection between Ordovician mantle metasomatism and arsenic in Vermont groundwater. *Geological Society of America Abstracts with Programs*, V. 41, n. 3, p. 8.
- Brachfeld, S., Manley, P., Gorring, M., and Ryan, P., 2007, Contributions of Sediment Provenance and Sediment Diagenesis to Western Antarctic Peninsula Magnetic Proxy Records. *American Geophysical Union, Fall Meeting 2007, abstract #GP21B-04.*
- Gleason, Michael J. *, Kim, Jonathan, Coish, Raymond and Ryan, Peter C, 2007, Radionuclide-enriched groundwater, Knox Mountain pluton, Vermont: occurrence and lithologic controls, *Geological Society of America Abstracts with Programs*, v. 39, n. 1, p. 102.
- Ryan, Peter C., Coish, Ray, and Joseph, Kristiaan*, 2007, Ordovician K-Bentonites in western Vermont : mineralogic, stratigraphic and geochemical evidence for their occurrence and tectonic significance, *Geological Society of America Abstracts with Programs*, v. 39, n. 1, p. 50.
- Sullivan, Colleen*, Bright, Kevin*, Kim, Jonathan, and Ryan, Peter C., 2007, Potential ultramafic-derived arsenic contamination in bedrock water wells in north-central Vermont, *Geological Society of America Abstracts with Programs*, v. 39, n. 1, p. 71.
- Childs, C*, Manley, PL, Ryan, PC (2007) A fluvial record of historical land use change, Otter Creek Basin, Vermont: *Geological Society of America Abstracts with Programs*, Vol. 39, No. 1, p. 102.
- Berkman DA*, Zummo L*, Ryan PC. (2007) A comparison of chemical weathering in schist-dominated vs. granite-dominated watersheds: Implications for forest health in Vermont and New Hampshire. *Geological Society of America Abstracts with Programs*, Vol. 39, No. 1, p. 103.

- Ryan, Peter C., Coish, Ray, and Joseph, Kristiaan* (2006), Stratigraphic, mineralogic, and geochemical evidence for Ordovician K-Bentonites in western Vermont, Geological Society of America Abstracts with Programs, v. 38, n. 7, p. 370
- Munroe, J.S., Farrugia, G*, Ryan, PC. 2006. Parent material and chemical weathering in alpine soils on Mt. Mansfield, Vermont. Geological Society of America *Abstracts with Programs*, Vol. 38, No. 7, p. 69.
- Fisher GB*, Ryan PC. 2006. Late Quaternary tropical climate record from mineralogical, geochemical and stable isotopic analysis of fluvial terrace soils, Costa Rica. Programs and Abstracts, 43rd Annual Clay Minerals Society Meeting, Oleron, France, June 2006.
- North K*, Kim J, Ryan PC. 2005. Evaluation of geologic controls on elevated naturally-occurring radioactivity in bedrock ground water wells, NW Vermont. Northeastern Section Meeting, Geological Society of America 37 (1), 78.
- Fisher GB*, Ryan PC. 2005. The ferruginous beidellite to halloysite transition in a tropical soil chronosequence. *Clay Minerals Society 43rd Annual Meeting*, 41.
**Best student paper (including graduate students).
- Cowden S*, Ryan PC, Greenglass N*. 2004. Lead in groundwater derived from a fractured carbonate aquifer (Clarendon Springs Formation), northwestern Vermont. Northeastern-Southeastern Joint Meeting, Geological Society of America 36 (2), 66.
- Ryan PC, Hillier S, Wall AJ*, Wesolowski M*. 2004. Serpentinite weathering and trace metal mobility in dry tropical forest (NW Costa Rica) and cool temperate grassland (SW England). Geological Society of America 36 (5), 27.
- Fisher GB*, Ryan PC. 2004. Clay mineral weathering sequence in a tropical terrace progression, Costa Rica. Northeastern-Southeastern Joint Meeting, Geological Society of America 36 (2), 73.

Recent Invited Lectures and Presentations (External, non-conference)

- “Arsenic in Vermont’s Groundwater Resource and the Connection between Geology and Public Health”. Bennington College, 16 Nov 2012.
- “Geological Controls on Uranium in Private Bedrock Wells Associated with the Clarendon Springs Formation, Northeastern Vermont”. Vermont Department of Health Roundtable Discussion, Burlington, 16 May 2012.
- “Deciphering Elevated Arsenic Levels in Groundwater, Southwestern Vermont”. Ground Water Coordinating Committee, VT DEC, Waterbury, 26 May, 2011.
- “Geological Origin and Spatial Distribution of Arsenic in Private Bedrock Wells, Southwestern Vermont”. Vermont Department of Health Roundtable Discussion, Burlington, 24 May 2011.
- “The Science of Groundwater in Vermont”. Vermont Edition, Vermont Public Radio, 20 October, 2010 (with Larry Becker, VT Geological Survey).
- “Implications for Landscape Evolution and Tropical Soil Mineral Reactions from a Quaternary Fluvial Terrace Chronosequence, Costa Rica”. Departamento de Geología y Mineralogía, Univ. Granada, Spain, 16 May 2008.
- “Interdisciplinary Environmental Studies at Middlebury College: Reflections on 40 Years of Program Development and Growth”. Invited lecture and program review, Berea College, 3 May 2007.

Research Grants and Awards (See below for teaching-related grants)

- 2012 – 2015 **NSF-Geobiology-Low-Temperature Geochemistry**: RUI: Landscape-scale Implications of Mineral Reaction Rates and Mechanisms in Tropical Soils: Insights from Soil Chronosequences and Synthesis. \$127,880. PI.
- 2010 – 2013 **NSF-MRI-R²**: Acquisition of an XRD, FTIR, and WDS for Integrated Mineralogical and Geochemical Studies at Middlebury College. \$299,584. PI (Pat Manley and Jeff Munroe, co-PIs).
- 2009 – 2012 **NSF-MRI**: Acquisition of a Multi-Sensor Core Logger, Pycnometer, C:N Analyzer, and Freeze Dryer for use in Lake and Paleoclimate Studies at Middlebury College. \$270,557. Co-PI (Jeff Munroe, PI; Pat Manley, co-PI).
- 2008 **Lintilhac Foundation**: The Barnes Hill Project – installation of monitoring wells to assess arsenic sources in a bedrock aquifer. \$15,000, PI.
- 2005 – 2007 **Mellon Foundation**: Funded for research as part of two collaborative multi-institution projects, one with colleagues from Middlebury, Vassar and Furman titled *A Watershed Research Consortium for Undergraduate Institutions*— it funded field and laboratory research for Carrie Childs’ thesis (in collaboration with M Costanza-Robinson, P Manley, B Hegman).

The other project is *Interdisciplinary Ecological Research and Education at the Firestone Tropical Preserve, Costa Rica*, and it funded a research trip to Costa Rica in May 2007 to (1) work with the Claremont Colleges and colleagues on study abroad development in the field of tropical soil-geology-ecology, and (2) enable me to sample soils and bedrock for 2007-2008 sabbatical research.

2002 – 2005 **NSF-Hydrological Sciences-RUI**: Quantitative XRD-sequential extraction analyses of trace metal speciation in ultramafic soils and waters, \$116,369, PI.

2001 – 2004 **Ecosystems Research-USDA-USFS**: Analysis of soil buffering capacity by quantitative XRD and ICP-AES. Collaborator on large, multi-institutional project coordinated by Ecosystems Research Group, Norwich, VT, \$31,505.

1998 – 2000 **NSF-AMP**: Integrated study of surficial geology, Flathead Indian Reservation (1998 - 2000), \$85,159, PI.

1997 – 1998 **NASA-MSGC**: DEM-based study of surficial geology on the Flathead Indian Reservation, \$14,994, PI.

1996 – 1997 **NSF-AMP**: Undergraduate geology research at a Montana Tribal College (1996 - 97), \$58,040, PI.

1994 **Gary Malone Graduate Student Award**, Dartmouth College.

TEACHING

Courses Taught at Middlebury College

ENVS 112	Natural Science and the Environment	'98, '99, '03, '06, '08, '10, '11, '13
ENVS 360	Research Practicum in Environmental Science (Co-taught with Steve Trombulak)	'02, '04
ENVS 401	Environmental Studies Senior Seminar	'00, '10
FYSE 1169	Humans and their Geological Environment	'06
FYSE 1275	The Landscape of Native America	'09
GEOL 012	The Geological Record of Climate Change	January '03, '09
GEOL 104	Earthquakes and Volcanoes (3 discussion sections)	'00

GEOL 112	Environmental Geology (2 laboratory sections)	'99, '01, '06
GEOL 255	Surface and Ground Water (1 or 2 laboratory sections) (cross-listed with GEOG)	'98, '00, '02, '05, '09, '11, '12, '14
GEOL 257	Soils, Geology and the Environment (1 lab section) (cross-listed with GEOG)	'01, '03, '04, '07, '10, '14
GEOL 323	Environmental Geochemistry (1 laboratory section)	'99, '00, '02, '05, '11, '13
GEOL 400	Geology Research Seminar	'99, '02, '03, '08, '14
ID 082	Geology and Natural History of Costa Rica (Off-campus course— co-taught with Helen Young)	January '00
	Finalist for Perkins Teaching Award at Middlebury College.	'03, '11.
	Finalist, Campus Compact Engaged Scholar Award (ENVS 401)	2010-11

Courses Taught at Salish Kootenai College (1994-98)

Air Quality

Environmental Geochemistry

Environmental Geology

Introduction to Inorganic Chemistry

Introduction to Organic Chemistry

Physical Field Methods

Mineralogy

Introductory Physical Geology

Project Planning and Management

Scientific Research Papers

Science and Society

Soil Science

Water Quality

Water Resources

National Corp. for Service Learning Award for Excellence in Math/Science Service Learning, 1996.

Other Courses Taught

October 2000 *Acid Mine Drainage and the Elizabeth Mine*. Presented to the Elizabeth Mine Community Action Group and other interested community members as a 3-day course.

June 1999 *Acid Mine Drainage on Tribal Lands*. Presented to natural resource managers in two separate 3-day courses on the Flathead and Fort Belknap Indian Reservations, Montana.

Middlebury College Theses Directed, 1998-present

- Source, speciation and mobility of uranium derived from phosphate breccias in the Clarendon Springs Formation, NW Vermont.
Nicholas Bachman (GEOL '15)
- Geochemical and mineralogical assessment of alkali sulfate surface water and groundwater in eastern Montana.
Brent Nixon (GEOL '15)
- Cartographic analysis of watershed scale surface and groundwater interactions in Bristol, Vermont.
Kevin Chu (ES-GEOL '14)
- Rates of Soil Formation and Tectonic Uplift of Marine Terraces, Osa Peninsula, Costa Rica
Kris Falcones (GEOL '14)
- An analysis of the lithologic control on major elements, radionuclides, and other trace elements in groundwater south of Bristol, Vermont
Julia Favorito (GEOL '14)
- Variations in cation exchange capacity of tropical soils as a function of age and climate.
Lauren Pincus (GEOL-CHEM '14)
- Chemical and mineralogical evolution of arid tropical soils (Pacific Coast, Ecuador).
Daphnee Tuzlak (GEOL '14)
- A Model for Uranium Occurrence in the Late Cambrian Clarendon Springs Formation: Implications for Groundwater Quality in Northwestern Vermont
Emily McDonald (GEOL '12)
- A Hydrologic, Structural, and Cartographic Analysis of Groundwater in the Vicinity of the Hinesburg Thrust, West-Central Vermont
John Filoon (GEOL '12)
- Assessment of Metamorphic Grade on Arsenic in Metapelites in Vermont: Potential Implications for Bedrock Aquifers
Diego Russell (GEOL '12)
- Geochemistry of Groundwater and Bedrock in the Plainfield Quadrangle, Vermont
Robert Nicholas Daly (GEOL '12)
- Mineral Reaction Pathways and Rates in a Tropical Soil Sequence, Nicoya Peninsula, Costa Rica
Franklin Hobbs (GEOL '12)
- Geochemistry and Radionuclide Potential in a Fractured Bedrock Aquifer System, Craftsbury, Vermont.

- Erik Brooks (ES-GEOL '11)
- K-Ar Dating and Mineralogical Analysis of Illite-rich Rocks in the Champlain Valley: An Investigation of Post-Taconian Fluid-Driven Flow.
Braden Rosenberg (GEOL '11)
 - Geochemical and Sulfur Isotope Analysis of Taconic Slates: Implications for Arsenic Source and Mobility in a Bedrock Aquifer System.
Ali Thompson (ES-GEOL '11)
 - A Mineralogical, Geochemical and Geospatial Analysis of the Source of Elevated Arsenic in Glacial Aquifers of North Central Vermont.
Lilly Corenthal (ES-GEOL '10)
 - Analysis of Arsenic Speciation in Ultramafic Rocks by Sequential Chemical Extraction: Implications for Taconian Fluid Source and Modern Aquifer Contamination.
Jon Moen (GEOL '10)
 - Geochemistry of U-rich groundwater and bedrock of the aquifer in the lower plate of the Hinesburg Thrust Fault, Hinesburg, Vermont.
Jared Bean (GEOL '09)
 - Mineralogy and geochemistry Quaternary paleosols, Granada, Spain.
Tucker Levy (ES-GEOL '09)
 - Ground water and bedrock aquifer geochemistry of three monitoring wells, Stowe, Vermont.
Daniel Chow (ES-GEOL '09)
 - Bedrock geochemistry in arsenic-rich groundwater, northern Vermont.
Colleen Sullivan (ES-GEOL '07)
 - Otter Creek sediment record of post-1800 settlement.
Carrie Childs (GEOL-GEOG '07). Co-advised with Pat Manley.
 - Geochemistry of U-rich groundwater and bedrock of the Knox Mountain pluton, Vermont.
Mike Gleason (GEOL '07). Co-advised with Ray Coish.
 - An evaluation of soil chemistry for acid deposition, Bolton Mountain, Vermont
Dan Berkman (GEOL-GEOG '06.5)
 - Ultramafic bedrock source of arsenic in ground water, Stowe, Vermont.
Kevin Bright (ES-GEOL '06)
 - Geochemistry of Ordovician K-bentonites, western Vermont.
Kristiaan Joseph (GEOL '06)
 - An evaluation of soil geochemistry and forest health, Bartlett Forest, NH
Lynne Zummo (ES-GEOL '06)
 - Belvidere asbestos mine: site suitability for CO₂ sequestration through mineral carbonation.
Levi Doria (ES-GEOL '05). Co-advised with Ray Coish.
 - An evaluation of geologic controls on elevated naturally-occurring radioactivity in bedrock water wells, NW Vermont.
Katharine North (GEOL '05)

- Sequential Chemical Extraction of Costa Rican and Green Mountain Soils: A Quantitative and Qualitative Examination of the SCE Procedure.
J. Trevor Cloak (ES-CHEM '05)
- Sequential Chemical Extraction: Determination of Reagent Selectivity On Eight Mineral Standards
Nicole Grohoski (ES-CHEM '05)
- Acid Precipitation and Nutrient Cycling: Analysis of a Watershed in the Breadloaf Area of Ripton, VT.
Caitlyn Long (ES-CHEM '05)
- A tropical terrace progression and implications for fore-arc dynamics on the Pacific Coast, Costa Rica.
G. Burch Fisher (GEOL '04)
- Geochemical analysis of the Clarendon Springs Formation: Implications for naturally-derived lead in carbonate aquifer, NW Vermont.
Susannah Cowden (ES-GEOL '04)
- Chemical weathering of serpentinites and trace metal mobility in soils and streams on the Lizard Peninsula, Cornwall, England.
Marty Wesolowski (GEOL '03).
- Geochemical and mineralogical correlation of volcanic ash deposits, northern Chile.
Brian McCurdy (ES-GEOL '03).
- Evaluation of the Hazen's Notch Formation as a source of trace metals to streams and soils, northern Vermont.
Dana Chapin (ES-GEOL '03).
- Geochemical, stratigraphic and structural framework for natural sources of lead and uranium in groundwater in Addison County.
Nora Greenglass (ES-GEOL '03). Co-advised with David West.
- Paleoclimatic record of clay minerals in the John Day Formation, Oregon.
Christopher Kautz (GEOL '02).
- Application of clay mineralogy and chemical analysis to stratigraphic correlation of Quaternary lahars, Mt. Hood.
Robyn Cook (GEOL '02).
- Trace metal mobility in association with ultramafic rock, East Dover, Vermont.
Dana Drummond (ES-GEOL '02).
- Quantitative XRD analysis of glacial till origins and ice migration, Vermont.
Holly Carlson (GEOL '02). Co-advised with Jeff Munroe.
- Sediment chemistry downstream of the Elizabeth copper mine, S. Strafford, VT.
Maggie Sullivan (ES-GEOL '01).
- Mineralogy and origin of the Brandon Residual Formation/Brandon Lignite, Vermont.
Drew Nichols (GEOL '01).
- Analysis of soil mineral formation in the wake of the 1980 eruption of Mt. St. Helens.
Matt Whitcomb (GEOL '01).

- Modeling snow avalanche spatial and temporal distributions using snow-tel data, western US.
David Selkowitz (ES-GEOG '01).
- Heavy metal speciation and chemical weathering of ultramafic rock in Vermont.
Brooke Laundon (ES-GEOL '00). Co-advised with Ray Coish.
- Mineralogy and geochemistry of the Raasay Ironstone, Inner Hebrides, Scotland.
Elizabeth Hunter (ES-GEOL '00).
- Geochemical analysis of the logged and old growth forests, Middlebury Vermont.
Josh Nothwang (ES-GEOL '00).
- Geochemical and macrofossil analysis of a lake sediment core as a record of Holocene environmental change in the Ritterbush Pond basin, northern Vermont.
Amanda Ayres (ES-CHEM '00). Co-advised with Andrea Lloyd.
- Analysis of heavy metals in two Vermont wetlands associated with frog malformations.
Andrew Wall (ES-GEOL 99.5).
- Geochemistry and mineralogy of iron-oxide acid drainage coatings, Pike Hill Mine, Vermont.
Brian Totten (ES-GEOL '99).
- Geochemistry and mineralogy of sulfide-rich mine tailings, Pike Hill Mine, Vermont.
Scott Wiercinski (ES-GEOL '99).
- Geochemistry of lateritic sediments in western Montana.
Bryan Hopping (ES-GEOL '99).

Non-Geology Middlebury College Thesis Committee Member

- Ben Estabrook, ES-CHEM, 2009
- Ross Lieb-Lappen, ES-CHEM, 2007
- Nitrogen cycling in a transitional terrestrial-marine system, Cape Cod. EveLyn Hinkley ('01). ES-BIOL.
- Fire chronologies in peatland, Alaska. Cynthia Whittington ('00). ES-BIOL.
- Nutrients in precipitation and throughfall in a tropical forest, Chile. David Grass ('99). ES-CHEM.

Research Advising for Post-graduate Students at the University of Costa Rica

Project: Trace metal speciation in ultramafic soils and rocks, northwestern Costa Rica (NSF-funded).

Students: Paulo Hidalgo and Natalia Zamora

- Field work in the ultramafic belt of northwestern Costa Rica in January 2002.
- Laboratory work at Middlebury College Geology Department, June 2002.
- Continuing advising via e-mail through 2002 and 2003.

Education Grants

- 1998 – 2000 **NSF-CCLI**: Laser Particle Size Analysis in Geoscience Education, \$43,785, PI.
- 1999 – 2000 **EPA Mine Waste Program**: Acid Mine Drainage on Tribal Lands Short Course (1999), \$10,000, PI.
- 1998 – 1999 **NSF-DUE**: Montana Tribal College Faculty Enhancement Project, \$157,653, PI.
- 1996 – 1998 **NSF-DUE**: Environment and the curriculum, \$180,562, co-PI.
- 1996 – 1997 **USDA**: Indian at-distance learning grant, \$80,000, co-PI.

Professional Society Affiliations and Activities

- 1989 – present Clay Minerals Society (CMS).
Organizer and host of 2005 CMS annual meeting.
Chair, Program Committee for CMS (2011 – present)
Continuing Education Committee for CMS (2008 – 2011)
Associate Editor, *Clays and Clay Minerals* (2014 – present)
- 1988 – present Geological Society of America.
- 2003 – present Northeast Environmental Studies Group
- 2000 – present Vermont Geological Society.