



2014 - 2015 SCHOLARSHIP REPORT



ST. FRANCIS XAVIER
UNIVERSITY



L-R, DR. RICHARD ISNOR, ASSOCIATE VICE-PRESIDENT RESEARCH & GRADUATE STUDIES, MP SEAN FRASER '06, DR. DAVID RISK '02 AND DR. KEVIN WAMSLEY, ACADEMIC VICE-PRESIDENT & PROVOST

ENHANCING THE DETECTION AND MEASUREMENT OF FUGITIVE GAS EMISSIONS

StFX Earth Sciences professor **Dr. David Risk** was named in 2014 as one of The Royal Society of Canada's inaugural members of The College of New Scholars, Artists and Scientists. The 91 scholars named to the College, including Dr. Risk, represent the emerging generation of scholarly, scientific and artistic leadership in Canada. Dr. Risk is recognized for making significant contributions to the understanding of how greenhouse gases, such as carbon dioxide, are released from soils and how the sequestration of greenhouse gases can be monitored. Applications of his research have been used around the world and his research collaborations to date have involved individuals on four continents.

DR. DAVID RISK, ASSOCIATE PROFESSOR

[journal article] Bowling DR, Egan JE, Hall SJ & **Risk DA**. (2015) Environmental forcing does not induce diel or synoptic variation in the carbon isotope content of forest soil respiration. *Biogeosciences*, 12, 5143-5160.

[journal article] Lavoie M, Phillips CL & **Risk D**. (2015). A practical approach for uncertainty quantification of high-frequency soil respiration using forced diffusion chambers. *Journal of Geophysical Research: Biosciences*, 120(1), 128-146.

[journal article] **Risk D**, Lavoie M & Nickerson N. (2015). Using the Kerr investigations at Weyburn to screen geochemical tracers for near-surface detection and attribution of leakage at CCS/EOR sites. *International Journal of Greenhouse Gas Control*, 35, 13-17.

[journal article] Bhatia S & **Risk D**. (2015). Speciation in application environments for dissolved carbon dioxide sensors. *Water, Air, & Soil Pollution*, 226(5), 1-16.

[journal article] Latimer RNC & **Risk DA**. (2015). An inversion approach for determining production depth and temperature sensitivity of soil respiration. *Biogeosciences Discussions*, 12(13), 10137-10166.

[journal article] Bhatia S, **Risk D**, Pustam A, Smith-Palmer T, Burton G, Melo L & Wild P. (2014). Biofouling of an all-optical sensor for seafloor monitoring of marine carbon capture and storage sites. *Energy Procedia*, 63, 3848-3852.

[journal article] Egan J, Nickerson N, Phillips CL & **Risk D**. (2014). A numerical examination of ¹⁴C₂ chamber methodologies for sampling at the soil surface. *Radiocarbon*, 56(3), 1175-1188.

[journal article] Melo L, Burton G, Davies B, **Risk D** & Wild P. (2014). Highly sensitive coated long period grating sensor for CO₂ detection at atmospheric pressure. *Sensors and Actuators B: Chemical*, 202, 294- 300.

[journal article] Nickerson N, Egan J & **Risk D**. (2014). Subsurface approaches for measuring soil CO₂ isotopologue flux: Theory and application. *Journal of Geophysical Research – Biogeosciences*, 119(4), 614-629.

[journal article] O'Brien K, O'Beirne-Ryan AM, Rainham D & **Risk D**. (2014). Using field analogue soil column experiments to quantify radon-222 gas migration and transport through soils and bedrock of Halifax, Nova Scotia, Canada. *Environmental Earth Sciences*, 72(7), 2607–2620.

[research grant] **Risk D**. *Developing large-footprint leak detection strategies for enhances oil recovery*. Collaborative Research & Development Grant, Natural Sciences and Engineering Research Council of Canada 2015-2017 (\$87,000 + industry contributions).

[research grant] **Risk D**. *Emissions Attribution via Computational Techniques (ExACT)*. Early Stage Commercialization Fund, Innovacorp, 2015-2016 (\$50,000).

[research grant] **Risk D**. *Vehicle based measurement of fugitive and vented emissions on Apache's Midale enhanced oil recovery field*. Engage Grant, Natural Sciences and Engineering Research Council of Canada, 2015-2016 (\$25,000).

[research grant] **Risk D**. *Cost reduction for a new multi-scale fugitive gas detection tool*. Idea to Innovation Grant, Natural Sciences and Engineering Research Council of Canada, 2015-2016 (\$120,882).

[research grant] **Risk D**. *Addressing the problem of methane release from unconventional energy sites*. Discovery Grant, Natural Sciences and Engineering Research Council of Canada, 2014-2019 (\$185,000).

[research grant] **Risk D.** *Field and computational methods for estimating aerodynamic drag.* Engage Grant, Natural Sciences and Engineering Research Council of Canada, 2014-2015 (\$25,000).

[research grant] **Risk D.** *Differentiating between hydrocarbon-derived carbon dioxide from native soil-derived carbon dioxide in the development of a new metric of hydrocarbon degradation effectiveness.* Engage Grant, Natural Sciences and Engineering Research Council of Canada, 2014-2015 (\$25,000).

[research grant] **Risk D.** *Use of mobile leak detection technology for use in exploration and development of coal seams and gas deposits.* Engage Grant, Natural Sciences and Engineering Research Council of Canada, 2014-2015 (\$25,000).

[research grant] **Risk D.** *Fugitive gas detection technology and procedure for enhanced oil recovery (Leak Detection Technology-LDT).* Innovation Mobilization Fund, Springboard Atlantic, 2014-2015 (\$22,883).

[research grant] **Risk D.** *Engaging UK oil and gas industry, UK government regulators and academics in field demonstrations of gas detection equipment for shale gas, EOR, offshore O&G infrastructure applications in the UK.* Innovation Mobilization Fund, Springboard Atlantic, 2014-2015 (\$10,000).

[research grant] **Risk D.** *Surface containment monitoring for carbon capture and storage.* ecoENERGY Innovation Initiative, Natural Resources Canada 1, 2012-2015 (\$756,000).

[research grant] Ruda H (principal investigator), **Risk D** (co-investigator) et al. *Development of single-molecule level multi-species nanowire-based sensors for carbon emissions.* Carbon Management Canada, 2012-2015 (\$109,500 [Risk portion]).

[research grant] Beltrami H (principal investigator); Ferguson G, Kellman L, O'Driscoll N, **Risk D**, Sushama L, Tarasov L & Ziegler S (co-applicants). *NSERC CREATE Program in Training strategies to meet the challenges imposed by a changing climate: Preparing for societal impacts and adaptation.* Collaborative Research and Training Experience Grant, Natural Sciences and Engineering Research Council of Canada, 2010-2016 (\$1,400,000).

[research grant] Wild P (principal investigator), **Risk D** (co-investigator) et al. *Distributed all-optical CO₂ sensing for field-scale subsurface carbon management.* Carbon Management Canada, 2010-2015 (\$186,500 [Risk portion]).

[research contract] Woods N (principal investigator), **Risk D** (co-applicant) et al. *Winter respiration in the Arctic: Constraining current and future estimates of CO₂ emissions during the non-growing season.* NASA Arctic Boreal Vulnerability Experiment (ABOVE), 2015-2019 (\$100,000 [Risk portion]).

[research contract] **Risk D.** *New, innovative robust fiber-optic sensors for dissolved gas environmental and safety monitoring near the sea floor.* Encana / Offshore Energy Technology Research 2013-2015 (\$100,000).

[research contribution agreement] **Risk D.** *Atmospheric leak detection as a tool for bitumen steam chamber and well integrity risk analysis.* ecoENERGY Innovation Initiative, Natural Resources Canada, 2015-2016 (\$451,024).

[technical services agreement] **Risk D.** *Assess compositional variations in natural gas as fingerprints.* David Suzuki Foundation, 2015-2016 (\$48,418).

[technical services agreement] **Risk D** & Kellman L. *Surface measurement, monitoring, and verification research at the Aquistore Carbon Capture and Storage Site, Saskatchewan.* Petroleum Technology Research Centre, 2014-2016 (\$190,000).

[market analysis funding] **Risk D.** *Market analysis and commercialization plan.* Commercialization Consulting and Mentoring (CCM) Program, Learnsphere, 2015-2016 (\$16,750).

[conference paper] Lee CK, MacIntyre CM, Shanhun F, Almond PC, **Risk D** & Cary C. (2015, July). *Continuous measurement of CO₂ flux from dry valley soils: Determining its source and environmental controls*. Paper presented at the New Zealand Antarctic Research Institute, Christchurch NZ.

[conference paper] Klapstein S, O'Driscoll N, Ziegler S & **Risk D**. (2015, June). *Photodemethylation in temperate freshwater and the effect of dissolved organic matter*. Paper presented at the International Conference on Mercury as a Global Pollutant, Jeju, Korea.

[conference paper] Phillips C, Nickerson N & **Risk D**. (2015, April). *Can the gradient method improve our ability to predict soil respiration?* Paper presented at the European Geophysical Union Meeting, Vienna, Austria.

[conference paper] Bowling D, Egan J, Hall S & **Risk D**. (2015, April). *Environmental forcing does not lead to variation in carbon isotope content of forest soil respiration*. Paper presented at the European Geophysical Union Meeting, Vienna, Austria.

[conference paper] Nickerson N, Sereda-Meichel W, Creelman C, McArthur G & **Risk D**. (2015, April). *In-situ diffusivity measurements using solid-state CO₂ sensors*. Paper presented at the European Geophysical Union Meeting, Vienna, Austria.

[conference paper] Bowling D, Egan J, Hall S & **Risk D**. (2014, December). *Environmental forcing does not lead to diel or synoptic variability in carbon isotope content of forest soil respiration*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] Egan JE, Bowling DR & **Risk DA**. (2014, December). *Mass-dependent corrections and atmospheric invasion: Working with the radiocarbon content of CO₂ in the soil gas environment*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] Latimer R & **Risk DA**. (2014, December). *A physical inversion approach for determining true temperature sensitivity of respiration from high-frequency soil CO₂ datasets*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] Laybolt WD, O'Connell E & **Risk D**. (2014, December). *Understanding the relationship between soil processes and atmospheric methane concentrations*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] **Risk DA**, MacIntyre CM, Shanhun F, Almond PC, Lee C & Cary C. (2014, December). *CO₂ flux from Antarctic dry valley soils: Determining the source and environmental controls*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] Graham LM & **Risk DA**. (2014, December). *Explaining high frequency CO₂ fluctuations observed in snowpacks*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] Egan J, Nickerson N, Phillips C & **Risk DA**. (2014, December). *Numerical examination of ¹⁴CO₂ chamber methodologies for sampling at the soil surface*. Paper presented at the American Geophysical Union Meeting, San Francisco, CA.

[conference paper] Hurry J & **Risk D**. (2014, May). *Multi-gas detectability of fugitive emissions at an enhanced oil recovery site*. Paper presented at the Nova Scotia Energy R&D Conference, Halifax, NS.

[conference paper] O'Connell E & **Risk D**. (2014, May). *Mapping gas variability for energy development monitoring*. Paper presented at the Nova Scotia Energy R&D Conference, Halifax, NS.

[conference paper] Bhatia S & **Risk D**. (2014, May). *Biofouling of an all-optical sensor for measurement, monitoring and verification of marine carbon capture and storage sites*. Paper presented at the Carbon Management Canada Annual Conference, Banff, AB.

[conference paper] Bhatia S & Risk D. (2014, May). *Fibre optic sensing for monitoring in the offshore*. Paper presented at the Nova Scotia Energy R&D Conference, Halifax, NS.

[conference paper] Graham L & Risk D. (2014, March). *Gas transport through snowpacks*. Paper presented at the Science Atlantic Environment Conference, Antigonish, NS.

[conference paper] Klapstein S, O'Driscoll N, Risk D & Ziegler S. (2014, March). *Phototransformation of dissolved organic carbon within mercury sensitive lakes in Kejimikujik National Park, Nova Scotia, Canada*. Paper presented at the Science Atlantic Environment Conference, Antigonish, NS.

[conference paper] MacDonell H, Klapstein & Risk D. (2014, March). *Carbon fluxes and dissolved organic carbon concentrations of a lake in Kejimikujik National Park, Nova Scotia*. Paper presented at the Science Atlantic Environment Conference, Antigonish, NS.

[conference paper] MacIntyre C & Risk D. (2014, March). *Understanding source contributions to CO₂ flux in soils of the McMurdo Dry Valleys, Antarctica*. Paper presented at the Science Atlantic Environment Conference, Antigonish, NS.

[conference paper] O'Connell E, Laybolt W & Risk D. (2014, March). *Mapping gas variability for energy development monitoring*. Paper presented at the Science Atlantic Environment Conference, Antigonish, NS.

[conference paper] Viale A, Schumacher M & Risk D. (2014, March). *Near-surface aquifer mapping for Antigonish County*. Paper presented at the Science Atlantic Environment Conference, Antigonish, NS.

[award] President's Research Award, St. Francis Xavier University, Antigonish, NS, 2015.

[award] Member, The College of New Scholars, Artists and Scientists, Royal Society of Canada, 2015.

[award] Clean Air Leadership Award, Southeastern Saskatchewan Airshed Association, 2015. [Shared award with Cenovus Energy.]

[media release] *StFX students take off across Canada to hunt down toxic and climate-warming gases from energy developments*. St. Francis Xavier University, Antigonish, NS, 6 August 2015. Retrieved from <https://www.stfx.ca/about/news/stfx-students-take-across-canada-hunt-down-toxic-and-climate-warming-gases-energy>

[media release] *StFX master's student awarded prestigious \$17,500 NSERC Alexander Graham Bell Canada Graduate Scholarship*. St. Francis Xavier University, Antigonish, NS, 3 June 2015. Retrieved from <https://www.stfx.ca/about/news/stfx-masters-student-awarded-prestigious-17500-nserc-alexander-graham-bell-canada>

[media release] *Nine StFX master's students receive Nova Scotia Research and Innovation Graduate Scholarships*. St. Francis Xavier University, Antigonish, NS, 28 May 2015. Retrieved from <https://www.stfx.ca/about/news/nine-stfx-masters-students-receive-nova-scotia-research-and-innovation-graduate>

[media release] *NSERC awards 13 prestigious student research awards to StFX students*. St. Francis Xavier University, Antigonish, NS, 21 April 2015. Retrieved from <https://www.stfx.ca/about/news/nserc-awards-13-prestigious-student-research-awards-stfx-students>

[media release] *Company created by StFX professor and students goes global*. St. Francis Xavier University, Antigonish, NS, 9 December 2014. Retrieved from <https://www.stfx.ca/about/news/company-created-stfx-professor-and-students-goes-global>

[media release] *Earth sciences professor recognized as scientific leader in Canada*. St. Francis Xavier University, Antigonish, NS, 16 September 2014. Retrieved from <https://www.stfx.ca/about/news/earth-sciences-professor-recognized-scientific-leader-canada>

[spin-off company] Eosense (formerly Forerunner Research), Dartmouth, NS. [Advisor, Research and Innovation to StFX spinoff company specializing in environmental gas monitoring; founded by Risk, and now selling globally and employing twelve people (<http://www.eosense.com/>).

Engineering

DR. FRANK COMEAU, ASSISTANT PROFESSOR

[conference paper] Alomari A, Aslam N, Phillips W & **Comeau F.** (2014, November). *A scheme for using closest rendezvous points and mobile elements for data gathering in wireless sensor networks*. Paper presented at the Wireless Days Conference, Rio de Janeiro, Brazil.

[conference paper] **Comeau F.** (2014, October 18). *What do engineers do, anyway? Mentoring first-year students*. Paper presented at the Association of Atlantic Universities' Teaching Showcase Conference, Sydney NS.

[research grant] **Comeau F.** *Early development of wireless fitness device*. Research Assistance Program for Small and Medium Enterprise, National Research Council of Canada, 2015-2016 (\$5,000)

[research contract] **Comeau F.** Contract with SHM Canada Consulting Ltd. for development and implementation project for digital sensor interface (DSI) module designed specifically for structural health monitoring applications. Productivity and Innovation Voucher Program, Innovacorp, 2015-2016 (\$5,000).

[research contract] **Comeau F.** Drone bridge inspection system contract with SHM Canada Consulting Ltd. Productivity and Innovation Voucher Program, Innovacorp, 2014-2015 (\$15,000).

[external examiner] Pradhanang M. (2015, February). *Modelling and benchmark development for electrical energy use and efficiency on Nova Scotia dairy farms* (Unpublished MSc thesis). Faculty of Agriculture, Dalhousie University, Truro, NS.

[referee] Manuscript reviewer for the journal *Ad Hoc & Sensor Wireless Networks*.

[media release] *Local businesses get boost from StFX research*. St. Francis Xavier University, Antigonish, NS, 12 December 2014. Retrieved from <https://www.stfx.ca/about/news/local-businesses-get-boost-stfx-research>

Human Kinetics

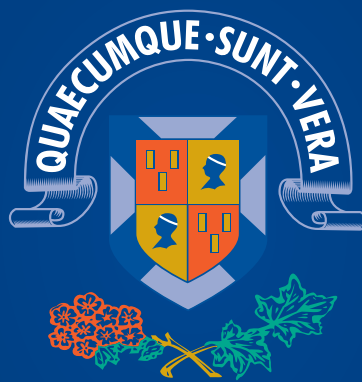
DR. AMANDA CASEY, ASSISTANT PROFESSOR

[invited book chapter] **Casey AF** & Rasmussen R. Obesity. 2015. In JL Matson & ML Matson (Eds.), *Co-morbid conditions in individuals with intellectual disabilities* (pp. 275-298). In JL Matson (Series Ed.), Autism and Child Psychopathology Series. New York, NY: Springer.

[journal article] **Casey AF**, Quenneville G, Normore A, Davis H & Martell SG. (2015). A therapeutic skating intervention for children with autism spectrum disorder. *Pediatric Physical Therapy*, 27(2), 170-177.

[abstract] Gibbons E & **Casey AF.** (2015). Bariatric surgery and intellectual disability: What we know and where we need to go? *Canadian Journal of Diabetes*, 39(Suppl. 1), S67.

[supervisor] Gibbons E. (2015). *Bariatric surgery and intellectual disability: Furthering evidence-based practice* (Unpublished BSc honours thesis). Department of Human Kinetics, St. Francis Xavier University, Antigonish, NS.



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