

**BARBARA SHERWOOD LOLLAR, F.R.S.C.**  
**CURRICULUM VITAE**

**A. BIOGRAPHICAL INFORMATION**

**1. PERSONAL INFORMATION**

22 Russell St. Department of Earth Sciences  
University of Toronto  
Toronto, Ont. M5S 3B1  
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email: bslollar@chem.utoronto.ca  
www.bsherwoodlollar.weebly.com

Citizenship: Canadian  
Languages: English, French

**2. DEGREES**

1985: B.A. (Honours - Geological Sciences) Summa cum laude  
Harvard University  
1990: Ph.D. (Earth Sciences)  
University of Waterloo

**THESES:**

Sherwood Lollar, B., 1990. Origins and Implications of Methane in the Crystalline Environment - the Canadian and Fennoscandian Shields, Ph.D. thesis, Dept. of Earth Sciences, University of Waterloo, Waterloo, Ontario, 402 p.  
Sherwood, B.A., 1985. Phosphorus in Foraminiferal Sediments from North Atlantic Ridge Cores, Bachelor's thesis, Dept. of Earth and Planetary Sciences, Harvard University, Cambridge, MA, 51 p.

**3. EMPLOYMENT HISTORY**

2010 to present University Professor, Dept. of Earth Sciences and Director, Stable Isotope Laboratory  
Canada Research Chair in Isotopes of the Earth and Environment  
2001-2010 Professor, Dept. of Geology and Director, Stable Isotope Laboratory  
1996-2001 Associate Professor, Dept. of Geology and Director, Stable Isotope Laboratory  
1996 Awarded Tenure  
1992-1996 Assistant Professor, Dept. of Geology and Director, Stable Isotope Laboratory  
University of Toronto  
1990-92 NSERC Postdoctoral Fellow  
Dept. of Earth Sciences, University of Cambridge, U.K.

**h index = 44. March 24, 2016.**

## EXECUTIVE SUMMARY

Director of the Stable Isotope Laboratory, and faculty member in Department of Geology (now Earth Sciences) since 1992, B. Sherwood Lollar is a leader in the innovative use of compound specific stable isotope techniques to track the source and fate of organic contaminants in groundwater, in geochemical cycling of methane and hydrogen in ancient “billion year old” groundwaters located 2-3 km deep in the oldest rocks on Earth, and biogeochemical cycling by deep subsurface microbial communities. Dr. Sherwood Lollar has published more than 135 peer-reviewed articles (two of which have been featured on the cover of *Nature*; 2002; 2009), and lectured worldwide in academic settings, public lectures and policy workshops for regulators and legislators. She was President of the Geochemical Society (2014-2015), and a member of the Eni Prize Commission (2013 to present). She is the Editor for one of the most successful volumes (Vol. 9 Environmental Geochemistry) in the award-winning major reference work *Treatise on Geochemistry* published by Elsevier in 2003; and from 2010-2013 served as an Editor-in-Chief for *Chemical Geology*. She has lectured at Harvard University, Stanford University, MIT, Carnegie Institute of Washington, Notre Dame, NASA, UNESCO, the International Atomic Energy Agency (IAEA), and the Bacon & Eggheads public lecture series for Members of Canadian Parliament and Senators. She has served as a Board member for the Natural Sciences and Engineering Research Council of Canada (NSERC) (2003-2013), as Chair of the NSERC Research Grants and Scholarships Committee (2008-2010); and on the Governing Council of the University of Toronto (on Executive Board for 2005-2007) as well as on advisory committees for the Canadian Space Agency (2006-2009), the Canadian Mining Industry Research Organization (CAMIRO) (2006-2010), and the Executive Committee for the Sloan Foundation Deep Carbon Observatory (2009-2013). She served the U.S. National Academy of Sciences Space Studies Committee on the Origin and Evolution of Life (COEL) (2005-2011) and the Space Studies Board Committee on Astrobiology and Planetary Science (2012-2014). She was a member of the Advisory Board for the Marie-Curie EU Training Network *CSI Environment* (a consortium representing the Helmholtz Institute, Leipzig; ETH Zurich and seven other research centers in Europe for CSIA) (2011-2016) and continues to advise the International Atomic Energy Agency on international water issues. She is a long standing member of the Board of Trustees for the Ontario Science Centre in Toronto – one of the world’s premiere centres for scientific public outreach (2007-2015).

Applications of Sherwood Lollar’s work include the development of new techniques for using stable isotope tracers to determine the fate and distribution of organic contaminants in near surface groundwaters and the effectiveness of groundwater remediation processes in cleaning up contaminated sites and drinking water remediation. In this area of her research Sherwood Lollar’s group has collaborated extensively with industrial partners, consultants and regulators in Canada, the United States and Europe. The impact of this work in water quality can be measured not only in terms of academic awards (Darcy Lecture, Steacie and Killam Awards, Royal Society Fellow), prestigious invited lectures and research grants, but in industrial partnerships and input on water quality issues, contamination of groundwater resources, and carbon capture and storage issues given to regulatory agencies in Canada, the United States (MOE, EPA, DOE), and abroad (International Atomic Energy Agency). Based on her research in environmental quality, *TIME Magazine* (see below) profiled her as one of 25 “Leaders for the 21<sup>st</sup> Century” in 2000. Most recently Sherwood Lollar was elected a **Fellow of the America Geophysical Union (2015)** and was the recipient of the **Eni Award in Protection of the Environment (2012)**. This prestigious international award recognizes revolutionary research in fields of energy and the environment. The Protection of the Environment award is presented for outstanding research and innovation in areas concerning the environmental impact of human activities, specifically protection and restoration of the environment, with a special focus on research and innovative technologies to eliminate pollutants and to improve environmental conditions. Past recipients include J. Craig Venter (2008); Gérard Férey (2009); Francois Morel of Princeton University (2010); Jean-Marie Tarascon (2011). The awards are chosen by a 24 member scientific review panel and previous winners of the award include several Nobel Prize winners (see: <http://www.eni.com/eni-award/eng/home.shtml> ). The award was presented on June 15<sup>th</sup> 2012 in Rome by the President of Italy, and the recognition includes a gold medal specially minted by the Italian state mint and a prize of 200,000 Euros.

Her recent discovery, with UK colleagues C.J. Ballentine and G. Holland, that groundwater in fractures 2-3 km deep in the rocks of the Canadian Shield have residence times in excess of a billion years, had an equally extraordinary impact, both in earth and planetary science and in the popular imagination, with coverage in over 200 major media outlets worldwide. The discovery was highlighted in **Macleans Magazine** “Stories to Watch in 2014” (Dec 2013 issue) and by three outlets (Fox News, Discovery and Geochemical News) as one of the **Top Ten Science Stories of 2013**. In Jan 2016 she was awarded the **Natural Sciences and Engineering Council’s John Polanyi Award** (\$250,000 research prize) – one of the top two prizes in Canadian science and engineering for outstanding research and discovery. This finding was the most recent in a body of work extending over the past two decades in which Sherwood Lollar and colleagues have radically expanded our understanding of the depth, provenance and age of groundwater in the Earth’s crust, of H<sub>2</sub> and CH<sub>4</sub> generation in these fracture waters, and of their role in sustaining chemoautotrophic microbial communities. This body of work on the subsurface hydrogeologic cycle was recently recognized by her selection for the **2012 Geological Society of America Geobiology and Geomicrobiology Division Award** and by **Canadian Geographic** magazine who included Sherwood Lollar in their **List of Top Ten Canadians** “Changing the World” (October 2013 issue). The implications of her discoveries on terrestrial subsurface groundwaters for the search for life elsewhere in the solar system is reflected in her roles in Advisory Groups for the Mars Exploration Program; US. National Academy of Sciences committees on astrobiology and planetary exploration, and as one of the team co-authoring the US National Academies of Science Report "**An Astrobiology Strategy for the**

Exploration of Mars" (2007).

#### 4. ACADEMIC AWARDS AND HONOURS

<b>NSERC John C. Polanyi Award</b>	2016
<b>Speaker of the House Recognition</b> by Canadian Parliament at Question Period Session Feb 16. 2016	2016
<b>Fellow</b> , American Geophysical Union	2015
<b>President</b> of the Geochemical Society (2014-2015) (Vice- President for 2012-2013)	2014-2015
<b>Canada Research Chair Tier I - Renewal</b> Isotopes of the Earth and Environment	2014-2021
<b>Helmholtz International Fellow Award</b> for research excellence (20,000 Euros)	2014
<b>Geoscience Information Society (GSIS) Mary B. Ansari Best Reference Work Award</b> for 2014 for the "Treatise on Geochemistry"	2014
<b>Top Ten Science Stories for 2013</b> Billion year old water Selected by Fox News, Discovery, and Geochemical News <b>Holland, Sherwood Lollar et al. Nature</b> 497: 367-360.	2013
<b>Macleans Magazine List of Top Stories to Follow for 2014</b>	Dec. 2013 issue
<b>Canadian Geographic</b> List of Top Canadians "The Changemakers" October issue Featured along with director/solo submersible diver James Cameron, Astronaut Chris Hadfield and 2004 Herzberg Award winner Dr. John Smol	2013
<b>Eni Award</b> in Protection of the Environment	2012
Geological Society of America <b>Geobiology and Geomicrobiology Division Award</b> for Outstanding Contributions to Research	2012
University Professor, University of Toronto	2010 to present
Senior Fellow, Massey College, University of Toronto	2010 to present
NSERC Accelerator Award	2013-2016
Liang et al. 2013 selected as one of <b>Faculty of 1000 Prime</b> for 2013	
<b>Geochimica Cosmochimica acta</b> one of Top 25 Most Highly Cited Papers for 2010	
<b>Chemical Geology</b> one of Top 10 Most Highly Cited Papers in 2005-2010	
SERDP Environmental Restoration Project-of-the-Year Award Presented to Dr. Barbara Sherwood Lollar (Toronto), E. Edwards (Toronto) J. Gossett (Cornell), J. Spain (Georgia Tech) and E. Cox (GeoSyntec Ltd) Partners in Environmental Technology Technical Symposium & Workshop	2010
NSERC Accelerator Award	2008-2011

<b>Canada Research Chair Tier I</b> Isotopes of the Earth and Environment		2007-2014
American Chemical Society Division of Environmental Certificate of Merit for Presentation at Annual Spring Meeting Elsner et al. (2007) Probing oxide surface reactivity using stable isotope fractionation"		2007
Science Council of Japan - Royal Society of Canada WISSET Lecturer to Japan		2007
Fellow of Royal Society of Canada		2004
Canada Council Killam Research Fellowship		2004-2006
<b>TIME</b> Magazine - Canada Edition - Profiled as one of 25 "Leaders for the 21 <sup>st</sup> Century"		2000
NSERC EW.R. Steacie Fellowship	University of Toronto	1999-2001
Henry Darcy Distinguished Lecturer in Hydrogeology	U.S. National Groundwater Association Association of Ground Water Scientists and Engineers (AGWSE)	1998
NSERC Postdoctoral Fellowship	University of Cambridge	1990-92
Governor-General's Gold Medal for PhD	University of Waterloo	1990-91
W.B. Pearson Medal in Earth Sciences for PhD	University of Waterloo	1990-91
J.H. Stewart Reid Memorial Fellowship	University of Waterloo	1989-90
Petro-Canada Inc. Graduate Research Award	University of Waterloo	1987-89
NSERC Postgraduate Scholarship	University of Waterloo	1985-89
University of Waterloo Graduate Scholarship	University of Waterloo	1985-86

## **5. PROFESSIONAL AFFILIATIONS AND ACTIVITIES**

### ***Work on Research Program Peer Review Panels, Prize Committees and Academic Organizations***

Member of the **Eni Scientific Prize Commission 2013-2016** (see: <http://www.eni.com/eni-award/eng/home.shtml>)

Technical Advisor for the United Nations **International Atomic Energy Agency** Water Resources Program (2016) Impacts of hydraulic fracturing on groundwaters identified using geochemical and isotopic tracers.

Board Member (2014-2016) **Zuckerberg Institute for Water Research**, Sede Boqer, Israel - dedicated to interdisciplinary research in water and resource development of the Middle East through sustained supply of usable water for all countries of the region who share the regional and trans-boundary water resources of this drylands region.

**Geological Society of America** Nominations Committee (2016-2018)

International Advisory Board Member **Earth-Life Science Institute Origins Network at the Tokyo Institute of Technology**

External Review Committee Origins Institute McMaster University 2015

Technical reviewer: Report of the Mars 2020 Organic Contamination Panel (2014) report of the Mars Exploration Program Analysis group (MEPAG)

Member Search committee for Vice-President Research Grants and Scholarships for NSERC (2013) Canada's national Natural Sciences and Engineering Research Council (the national funding agency for research and scholarships in science and engineering).

Royal Society of Canada Gender Equity Committee 2013-2018

U.S. National Academy of Sciences Space Studies Board Committee on Astrobiology and Planetary Sciences (2012-2015)

Space Exploration Planetary Consultation Committee (PCC) for Canadian Space Agency (2012)

Executive Committee - Sloan Foundation - Carnegie Institution of Washington Deep Carbon Observatory (2011-2013)

NASA/ESA Joint Science Working Group (JSWG) 2018 Joint Rover Mission to identify and prioritize scientific objectives for 2018 Joint Mars Rover Mission. (David Beaty NASA Mars Program Office -JPL and Gerhard Kminek, ESA-ESTEC) Co-chairs. (2011-2012)

NASA Mars Exploration Program Advisory Group (MEPAG) E2E-iSAG committee to identify and prioritize scientific objectives for 2018 Mars Rover Mission. Scott McLennan (Stonybrook, NY) and Mark Sephton, (Imperial College, UK) Co-chairs. (2010-2011)

Geochemical Society – The V.M. Goldschmidt Career Award Selection Committee 2010-2012

Advisory Board and Visiting Scientist for European Union Marie Curie Training Network in Isotope forensics and biogeochemistry - "CSI: Environment" 2010-2014.

NSERC Strategic Program Sub-Topic Focus Group Chair 2010

NASA Mid-Range Rover Science Analysis Group (MRR-SAG 2009) working under MEPAG (Mars Exploration Program Science Group) to identify and prioritize scientific objectives for 2018-2020 next generation Mars Rover

Canadian Space Agency (CSA) Mars Sample Return Analogue Mission Definition Team 2009

Ontario Science Centre Weston Youth Innovation Award Prize Committee 2009-2013

Royal Society of Canada - Committee for Selection of New Fellows 2008-2010

Geochemical Society - Organic Geochemical Division Treibs Award Selection Committee 2008-2011

Ontario Science Centre Board of Trustees 2007-2014; Chair of Long-term Experience Committee (2008-2010; 2012-2014)

Council of Canadian Academic Expert Panel on Groundwater 2007-2008

Executive Program Committee Co-Chair - Goldschmidt 2008 Vancouver, BC July 2008

Natural Sciences and Engineering Council of Canada (NSERC) Council 2003-2010

NSERC Executive Committee 2005-2006 and 2007-2010

NSERC Committee on Research Grants and Scholarships 2006-2010 (Chair 2008-2010)

NSERC Chair of Committee on Research Integrity (2008-2010)

Canadian Space Agency - Space Exploration Advisory Committee 2006-2009

Partnership Group for Science and Engineering (Royal Society of Canada) 2006-2007

Communications Committee correspondent-at-large for *Bacon and Eggheads* Lecture Series for Parliament

CAMIRO (Canadian Mining Industry Research Organization) Geochemistry Expert Committee 2006-2009

United States National Research Council National Academies of Science 2005-2012  
Committee on the Origin and Evolution of Life (Space Studies Board/Life Sciences Board)

Canadian Water Network Expert Panel Review - Jan. 2007

U.S. Strategic Environmental Research and Development Program (SERDP)/ Environmental Security Technology Certification Program (ESTCP) and the US EPA Summit on Future Research Directions on Biogeochemical Processes in the Degradation of Chlorinated Solvents.

San Antonio TX April 2007

Chair NSERC Prize Committee - Herzberg Gold Medal 2005

Chair NSERC Prize Committee - Brockhouse Prize 2005

NASA Astrobiology Review Panel for NAI Cooperative Agreement Notice (CAN-4)

Sub-Panel Chair 2005

International Atomic Energy Agency panelist (one of 5) on development of  
White Paper for the use of Compound Specific Isotope Analysis (CSIA) October 2005  
White paper to be published as joint publication from IAEA and U.S. Environmental Protection Agency

NSERC Strategic Program Sub-Topic Focus Group 2005

U.S. Strategic Environmental Research and Development Program (SERDP)/ Environmental Security Technology Certification Program (ESTCP) Workshop on Molecular Biological Tools  
Charlottesville VA Aug. 2005

Board of Directors - Centre for Environmental Science and Technology - University of Notre Dame 2003-2006

International Geochemical Society C.C. Patterson Medal Selection Committee 2002-2004

CRESTech - Land Resources Grant Review Panel 2002-2004

Natural Sciences and Engineering Council of Canada (NSERC) Circle  
Advisory Panel for NSERC 2001-2004

Nomination Committee for Henry Darcy Distinguished Lecture Series for 1999-2002

Selection Committee for Geological Society of America Meinzer Award 1999-2001

Nominations Committee for the Organic Geochemistry Division  
The Geochemical Society 1997-2000 (Chair for 1999); 2004-2006

IsoTrace Accelerator Mass Spectrometry Laboratory - University of Toronto  
Executive Committee - Board of Directors 1995-2002

Natural Sciences and Engineering Council of Canada (NSERC)  
Review Panel for NSERC Strategic Partnerships Program  
1997-1999

Natural Sciences and Engineering Council of Canada (NSERC)  
Review Panel for NSERC Multi-Facilities Access Program 1999

U.S. Department of Energy Stocktaking Panel - Natural Accelerated Bioremediation Research  
Oyster Stocktaking Meeting - Virginia Beach, VA - 1999

Organizing Committee for Geological Society of America Annual Meeting 1998 - Toronto

External Scientific Review 1995 - Environmental Protection Agency  
National Exposure Research Laboratory - Ecosystems Research Division - Internal Grants Program

Scientific Review Panel 1994 - U.S. Dept. of Energy - Subsurface Science Program  
Deep Microbiology and Microbial Ecology Subprogram

### ***Activities as Editor***

International Editorial Board **Origins of Life and Evolution of Biospheres** (April 2015 to April 2018)

Editor-in-Chief **Chemical Geology** (Jan 2010 to Jan. 2013) - One of the top most highly cited disciplinary journals in field of isotope geochemistry.

Editorial Board **Earth Planetary Science Letters** (2011 to 2015)

Member of Advisory Board for **ELEMENTS: International Magazine of Mineralogy, Geochemistry and Petrology.** (2010-2016)

Volume Editor for **Volume 9: Environmental Geochemistry** of 10 volume series *Treatise in Geochemistry* by Elsevier Scientific Publishing. Published 2003. Second Edition 2013.

Editors-in-Chief - Dr. H.D. Holland (Harvard University) and Dr. K. Turekian (Yale University)

May 2005 paperback Edition of *Treatise on Geochemistry Volume 9: Environmental Geochemistry* published and over 1200 copies sold. Revised second edition of web version work completed April 2006.

Editor of Special Volume 30 in **Organic Geochemistry**

"Compound-Specific Isotope Analysis: Tracing Organic Contaminant Sources and Processes in Geochemical Systems" October 1999.

Associate Editor (1998-2003) **Ground Water** - Scientific Journal with one of largest circulations of any of the hydrogeology, hydrogeochemistry journals. Subscription circulation of over 19,000, 20% of which is outside North America.

### ***Visiting Scientist***

2012 University of Stockholm, Sweden (2 weeks)

2012 Institut du Physique and Geochimie du Globe, Universite de Paris, Paris France (2 months)

2014 Helmholtz Institute Leipzig, Germany (3 months)

### ***Public Consultation and Technology Transfer***

M.J. Hendry, B. Sherwood Lollar Organizers – **International Atomic Energy Agency (IAEA)** Expert Panel on Identifying the occurrence, origin and migration of fugitive gases and fluids from Shale Gas development and Carbon Capture and Sequestration using Environmental Isotopes. Vienna, Austria. March 2016

B. Sherwood Lollar – Science on the Hill Event. **Research presentation/discussion on Parliament Hill** with MPs, Senators, Speaker of the House, Minister K. Duncan, Prime Minister J. Trudeau. Feb. 16 2016

B. Sherwood Lollar – Integration of CSIA for chlorinated aromatic hydrocarbons, CF and CFCs at field sites - **GeoSyntec Consultants** Ltd. Guelph Ontario. Sept. 2015

B. Sherwood Lollar – New lines of research in environmental remediation at contaminated field sites – **SiRem Ltd.** Guelph Ontario. March 2015

B. Sherwood Lollar and E. Passeport – Novel determining of rates of bioremediation for chlorinated aromatic hydrocarbons and CFCs – **Dupont Remediation Research Center**, Wilmington DE. Nov. 2014

S.A. Mancini, E. Passeport, B. Sherwood Lollar Application of CSIA to understand sources and Biodegradation of Chlorobenzenes-

Consortium on Groundwater Remediation. Denver, CO. Oct. 2014

B. Xu, B.E. Sleep, B. Sherwood Lollar- Modelling Isotope Fractionation Induced by Aqueous Phase Diffusion- SYNRRGS 2014 and 3<sup>rd</sup> Integrate Annual Meeting on Innovative Technology Combination for Groundwater Remediation. Toronto, ON. Sept. 2014

S. Mancini and B. Sherwood Lollar – Presentation on CSIA – **Ontario Ministry of Environment** October 2013.

B. Sherwood Lollar – Plenary. Challenges in Water reuse, recycling and remediation. Water-Energy Nexus – Industry Research Forum. **Eni Research Institute** Milan Italy. March 2013

On the Water Front: the Science of Canadian water research. NSERC Scientific Poster session for **Federal MP and Senators. Centre Block. Capital Hill** Ottawa. Oct 2012.

Sherwood Lollar, B. Compound Specific Isotope Analysis of Organic Contaminants in Water. **Eni Research Institute** Novara, Italy. June 2012.

Member External Advisory Committee Alberta – Canada Collaboratory in Cleaner Oil Sands Development (2011-2012)

B. Sherwood Lollar – Guest Speaker at DuPont Forum: Breaking the carbon-fluorine bond. DuPont Environmental Education Center. Wilmington DE. April 23-25, 2012.

B. Sherwood Lollar and T. Buscheck (Chevron) Co-Chairs and Organizers - Special session on **Compound Specific Isotope Investigations at Contaminated Field Sites**. Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV. June 2011.

B. Sherwood Lollar. Panelist. **Biogeochemical Transformation Processes**. Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV. June 2011.

B. Sherwood Lollar. **Extending the reach for monitoring microbial activity with CSIA**. REMTEC Remediation Technology Transfer Workshop. Keynote. Chicago. May 2011.

B. Sherwood Lollar. **CSIA for Forensic Investigations: Potential, Practicalities and Pitfalls**. Presentation to ENVIRON Corporation. Mississauga ON. April 2011

B. Sherwood Lollar. **Lessons from the Earth on Carbon Capture and Storage**. Presentation to CIBC Wood Gundy. April 2011. Toronto ON

**Groundwater Resources Association Conference on Environmental Forensics**. Presentation S. Mancini (Golder Associates), B. Sherwood Lollar and G. Lacrampe-Couloume (University of Toronto). Differentiating multiple sources of organic contaminants using compound specific carbon and hydrogen isotope analysis. April 2011. California.

B. Sherwood Lollar. **Emerging Research in Astrobiology in Canada**. Council of Ontario Universities. Canada Research Chairs 10<sup>th</sup> Year Anniversary Symposium. Toronto ON. Nov. 2010

**Natural Sciences and Engineering Research Council of Canada** “Maximizing Opportunities” Increasing Women’s Participation in Science and Engineering – A Summit. Ottawa ON. Nov. 2010

B. Sherwood Lollar and P. Philp. Compound Specific Isotope Analysis for Forensic Investigations and Environmental Clean-up. **United States Environmental Protection Agency (EPA) Technology Innovation and Field Services Division "Contaminated Site Clean-up Information" Web-based Internet Seminar**. October 2010.

B. Sherwood Lollar. **Isotopic constraints on chlorobenzene biodegradation and remediation at contaminated field sites**. **Presentation** to Chambers Works Science Advisory Board. DuPont. Wilmington DE. March 2010.

B. Sherwood Lollar. Compound Specific Analysis for Forensic Investigations: Potential, Practicalities and Pitfalls. Invited Presentation. **United States Air Force Restoration and Technology Transfer Workshop** on Groundwater Contamination. San Antonio TX. April 2010.



Minister of Natural Resources Honourable L. Raitt Invited Round Table on **Clean Energy Research and Development - Fossil Fuels**. Invited Panelist for discussion. Nov. 6, 2009. Calgary AB.

Canada Research Chairs Secretariat and University of Western Ontario Invitational Meeting and Round Table - **Canada's Energy Future**. Invited Panelist and Speaker on Long-term Viability/Sustainability of Conventional Energy Sources - Carbon Capture and Storage Options - October 20, 2009 - Ottawa ON.

Munk Centre of International Studies at the University of Toronto - Program on Water Issues - **Burying Carbon Dioxide in Underground Saline Aquifers: Political Folly or Climate Change Fix?** Invited Panelist for discussion. Sept. 23, 2009. Toronto ON.

Public Policy Forum - **Science Day in Canada** - Invited Panelist for discussion on release of the Science, Technology and innovation Council (STIC) of Canada report on the State of Science, Technology and innovation in Canada. May 27, 2009. Ottawa ON.

B. Sherwood Lollar and X. Liang - "Potential Role of Compound Specific Isotope Analysis (CSIA) and Other Tools in Measuring *In Situ* Biogeochemical Transformation". **In Situ Biogeochemical Transformation Workshop U.S.E.P.A.** Environmental Protection Agency Workshop. Dallas Texas. Nov. 2009.

M. Davidson (GeoSyntec International), D. Major (GeoSyntec International), B. Sherwood Lollar (U. of Toronto) and E.A. Edwards (U. of Toronto). Webinar for General Electric on "Compound Specific Isotope Analysis: A primer for applications to contaminant remediation". Sept. 2009.

B. Sherwood Lollar, and S. Hirschorn. "Compound Specific Isotope Analysis: A primer for applications to contaminant remediation". One day workshop for GeoSyntec Consultants Inc. and Sirem Ltd. Toronto Ontario. June 2006.

B. Sherwood Lollar and C.M. Aelion "Tools/Techniques for Chlorinated Solvent Sites". Half day workshop at Battelle 8<sup>th</sup> International In Situ and On Site Bioremediation Symposium Baltimore, MD. June 2005.

B. Sherwood Lollar. "Use of stable isotopes to evaluate contaminant degradation". One day workshop for Central New York Association of Professional Geologists Symposium on Isotopic Geochemistry. Skeneatales NY. April 2005.

B. Sherwood Lollar, R. Meckenstock, T. Schmidt, J. Wilson and D. Hunkeler. Applications of Compound Specific Isotope Analysis (CSIA) to contaminant biodegradation. Workshop and white paper development for IAEA International Atomic Energy Agency and U.S. Environmental Protection Agency. Vienna Austria. October 2005.

B. Sherwood Lollar. "Use of Compound Specific Stable Isotope Techniques for Quantification of Biodegradation Rates". UNESCO Workshop on Transport and Fate of Diffuse Organic Contaminants in Catchments. GSF-Research Centre for Environment and Health, Munich Germany. Dec. 2004

B. Sherwood Lollar. "Stable Isotope Forensics: Promise and Pitfalls". Golder Associates Inc. Symposium on Innovative Strategies for Management of Contaminated Sites. Toronto, ON. Nov. 2004.

## **B. RESEARCH AWARDS**

*Held as Principal Investigator*

	TOTAL AMOUNT	DATE/DURATION
<b>NSERC John C. Polanyi Award</b>	\$250,000	2016-2019
<b>Germany-Europe Fund for Student International Research</b> PI: B. Sherwood Lollar (Toronto)	\$5,650	2016
<b>NSERC Collaborative Research Development Grant</b> <b>Title:</b> Optimization of sampling, detection and characterization of subsurface microbial life in systems with low permeability and low biomass-sedimentary and crystalline settings. (Industry partner: Nuclear Waste Management Organization) PI: B. Sherwood Lollar (Toronto)	\$237,350	2015-2017

Co-PI: G.F. Slater (McMaster), J. McKelvie (NWMO), P. Keech (NWMO), S. Hirchorn (NWMO)

\* match to industry partner funding below

**Chemours Canada** \$175,000 2015-2017

**Title:** Determination of rates of degradation of halogenated hydrocarbons (chlorinated benzenes and CFCs) via an integrated field and experimental program

PI: B. Sherwood Lollar (Toronto)

Co-PI: E. Passeport (Civ Eng U Toronto)

**Deep Life Directorate of Sloan Foundation Deep Carbon Observatory** \$15,680 USD 2015

**Title:** Temporal suite of microbiology samples from ancient Canadian Shield fracture fluids

PI: B. Sherwood Lollar (Toronto)

Co-PIs: T.C. Onstott (Princeton) and T. Kieft (NMT)

**\*Nuclear Waste Management Organization Research Grant** \$185,000 2014-2017

**Title:** Microbiological and Geochemical investigation of fluids and core from the Grimsel Underground Research Laboratory

PI: B. Sherwood Lollar (Toronto) and G.F. Slater (McMaster)

Co-PI: G.F. Slater (McMaster), J. McKelvie (NWMO), P. Keech (NWMO), S. Hirchorn (NWMO)

**Keck Institute for Space Studies** \$40,000 USD 2015-2016

**Title:** Methane on Mars Study Program

PIs: Y. Yung (CalTech), P. Chen (Jet Propulsion Labs), K. Nealon (USC)

Co-PI: B. Sherwood Lollar and 19 others

**NSERC Collaborative Research Development Grant** \$248,853 2014-2017

**Title:** Use of stable isotopes to evaluate in situ attenuation of aromatics and chlorinated aromatics in anaerobic and aerobic field locations:

Laboratory and field studies (Industry Partner DuPont Canada see \* below)

PI: B. Sherwood Lollar (Toronto)

**Sloan Foundation Deep Carbon Observatory** \$50,000 USD 2014-2017

**Title:** Field Investigations in Deep Carbon

PI: B. Sherwood Lollar (Toronto)

**NSERC Discovery Grant** \$490,000 2013-2017

**Title:** Isotopic and geochemical tracers of fracture fluids in Precambrian cratons: Time capsules for the deep biosphere

PI: B. Sherwood Lollar

**NSERC Accelerator Award** \$120,000 2013-2015

**Title:** Isotopic and geochemical tracers of fracture fluids in Precambrian cratons: Time capsules for the deep biosphere

PI: B. Sherwood Lollar

**Cenovus Energy** \$150,000 2012-2014

**Title:** Characterization of Gases from Mississippian to Surface Western Canadian Sedimentary Basin

PI: B. Sherwood Lollar

**DuPont Canada Research Grant\*** \$424,000 2011-2017

**Title:** CSIA to determine conceptual model and evaluate potential for bioremediation of chlorinated aromatic hydrocarbons

PI: B. Sherwood Lollar

**Canadian Space Agency** \$69,800 2012-2013

Title: Constraints on Trace Gas and Reduced Gas Flux  
 from Analog Environments  
 PI: B. Sherwood Lollar

**NWMO (Nuclear Waste Management Organization) Research Grant** \$420,000 2011-2014

**Title:** Characterization of Subsurface Biogeochemical Processes relevant to a Deep Geologic Repository  
 PI: B. Sherwood Lollar  
 Co-PIs: G.F. Slater (McMaster) and D. Moser (Desert Research Institute)

**NWMO (Nuclear Waste Management Organization) Research Grant** \$75,000 2009-2010

**Title:** State of Science: Far-field Microbiological Considerations relevant to a Deep Geological Repository for used nuclear fuel  
 PI: B. Sherwood Lollar

**GeoSyntec Ltd.** \$7,200 2010-2011

**Title:** Investigations for Potential for in situ biodegradation at a contaminated field sites using CSIA  
 PI: B. Sherwood Lollar

**NSERC Strategic Grant** \$450,000 2009-2012

**Title:** Investigation of CSIA as an Innovative Quantitative Tool for Performance Assessment of Groundwater Remediation at Contaminated Sites  
 PI: B. Sherwood Lollar

Co-PIs: E. Edwards (Chem. Eng) and B. Sleep (Civ Eng)  
 S. Desrocher (ENVIRON Canada Inc.) and S. Dworatzek (SiREM Inc.)

Industry Partner Matching funds:

ENVIRON Canada Inc. \$10,000 2009-2011

SiRem Ltd. \$18,000 2009-2011

**NSERC Discovery Accelerator Grant** \$120,000 2008-2011

**Title:** H<sub>2</sub> and CH<sub>4</sub> from Precambrian Shield Rocks and Microbiological Sinks for Gases produced by Water-Rock Interactions: Energy for the Deep Biosphere

**NSERC Discovery Grant** \$257,750 2008-2013

**Title:** H<sub>2</sub> and CH<sub>4</sub> from Precambrian Shield Rocks and Microbiological Sinks for Gases produced by Water-Rock Interactions: Energy for the Deep Biosphere (\$51,550 pa)

**NSERC Special Research Opportunities Grant** \$350,000 2006-2008

**Title:** Tracers in the Deep: Testing for chemoautotrophic microbial communities in the Precambrian Shield deep subsurface

PI: B. Sherwood Lollar

Co-PIs: G.F. Slater (McMaster), E. Edwards (Chem-Eng, Toronto)

**GeoSyntec Consultants International Ltd. Research Grant** \$21,000 2007-2008

**Title:** Use of stable carbon isotope analysis to evaluate in situ biodegradation of chlorobenzenes under aerobic and anaerobic conditions

PI: B. Sherwood Lollar

Co-PI: E.A. Edwards (Univ. of Toronto)

**NSERC CRD Grant** \$26,000 2007-2008

**Title:** Application of stable isotope analysis as a quantitative tracer

of bioremediation of aromatic hydrocarbons in heterogeneous aquifers  
 Co-investigator: E.A. Edwards (Univ. of Toronto)  
 Industry partner: NOVA Chemicals (see below)

<b>NOVA Chemicals Research Grant</b>	\$36,720	2006-2008
Title: Use of stable carbon and hydrogen isotope analysis to evaluate the performance of biostimulation of benzene PI: B. Sherwood Lollar		
<b>NSERC Research Tools and Instruments</b>	\$39,515	2006
Title: Purge and Trap Concentrator for detection of hydrogen and oxygen compound specific isotope analysis Co-PIs: M. Simpson (UTSC), A. Simpson (UTSC), Edwards (Chem-Eng)		
<b>Canadian Space Agency Analogue Site Studies</b>	\$39,750	2006-2008
Title: Deep crustal fluids in the Canadian Shield: analogues for deep subsurface habitats on Mars Co-PIs: G.F. Slater (McMaster); E. Edwards (Toronto)		
<b>NSERC Research Tools and Instruments</b>	\$129,422	2005
Title: Dedicated nuclear magnetic resonance probe for the detection of site-specific natural isotopic fractionation (SNIF) Co-PIs: M. Simpson (UTSC), A. Simpson (UTSC)		
<b>NSERC Collaborative Research Development Grant</b>	\$52,000	2005-2007
Title: Use of Stable Isotopes to Evaluate the Performance of Nanoparticulate Iron in Remediation of Chlorinated Hydrocarbon Contamination: Field and Laboratory Studies *Matching funds to Golder Associates Ltd. Grant		
<b>*Golder Associates Ltd. Research Grant</b>	\$30,000	2005-2007
Title: Use of Stable Isotopes to Evaluate the Performance of Nanoparticulate Iron in Remediation of Chlorinated Hydrocarbon Contamination: Field and Laboratory Studies		
<b>Canadian Space Agency Advanced Studies</b>	\$350,000	2003-2008
Title: Biosustainable Energy and Nutrient Cycles in the Deep Subsurface of Earth and Mars PI: B. Sherwood Lollar		
<b>NSERC Discovery Grant</b>	\$262,750	2003-2008
Title: Hydrocarbons in transition zones in dynamic field settings includes \$10,000 Northern Supplement for 2006-2008		
<b>FNX Mining Inc.</b>	\$17,000	2003-2005
Title: Investigation of isotopic analysis of fluid inclusions		
<b>GeoSyntec Consultants International - Boston, MA</b>	\$11,520	2003-2004
Title: MTBE biodegradation investigated through the use of stable carbon isotopes		
<b>GeoSyntec Consultants International - Boston, MA</b>	\$16,000	2002-2003
Title: Environmental isotopes as tracers of contaminant degradation - VC		
<b>NSERC Collaborative Research Development Grant</b>	\$ 50,660	2001-2003
Title: Applications of stable carbon isotopes to monitoring		

intrinsic bioremediation of aromatic hydrocarbons  
 Co-investigators: B. Sleep (Civ. Eng. U. of Toronto)  
 E. Edwards (Chem. Eng. U of Toronto)

**American Association of Petroleum Geologists** \$2,000 2002-2003  
 Grants-in-Aid of Field Research Support to J. Gray

**NSERC Strategic Grant** \$459,150 2001-2005  
 Title: Environmental Isotope as Tracers of Contaminant  
 Degradation - Integration of an Innovative New Technology,  
 Compound Specific Hydrogen Isotope Analysis  
 Co-investigators: B. Sleep (Civ. Eng. - U. of Toronto)  
 E. Edwards (Chem. Eng. - U of Toronto)  
 S. Mabury (Chemistry - U. of Toronto)  
 \* Grants indicated \* below are the industry matching funds for  
 this Strategic Project

**Geosyntec Consultants International Ltd.** \$ 24,000 2001-2005  
 \*Industry research matching funds for  
 NSERC Strategic Project 2001-2005

**United Technologies Corporation** \$ 18,000 2001-2003  
 \*Industry research matching funds for  
 NSERC Strategic Project 2001-2005

**Environmental Science and Technology Alliance Canada** \$111,460 2000-2002  
 Title: Use of carbon isotope signatures as tracers of  
 intrinsic remediation of aromatic hydrocarbons  
 Co-investigators: B. Sleep (Civ. Eng. U. of Toronto)  
 E. Edwards (Chem. Eng. U of Toronto)

**Applied Groundwater Research Ltd.** \$ 5,000 2001-2002  
 \*Industry research matching funds for  
 NSERC Strategic Project 2001-2005

**Envirometal Inc.** \$ 12,000 2001-2002  
 \*Industry research matching funds for  
 NSERC Strategic Project 2001-2005

**TAUW Research and Development Department** \$31,000 2000-2001  
**The Netherlands**  
 Title: Application of isotope analysis for soil pollution research

**NSERC Individual Research Grant** \$160,000 1999-2003  
 Title: Isotopic constraints on the source, transport and transformation  
 of natural and contaminated compounds in shallow and deep groundwaters

**NSERC EWR Steacie Fellowship Supplement** \$193,900 1999-2001  
 Title: New developments in hydrogen isotope geochemistry applied to  
 shallow and deep groundwater systems

**NSERC Major Equipment Grant** \$257,015 1999-2000  
 Title: Gas Chromatograph Isotope Ratio Mass Spectrometer (GC/C/IRMS)  
 for continuous flow high sensitivity analysis of H and N isotopes  
 PI: B. Sherwood Lollar  
 Co-investigators: B. Sleep (Civ. Eng. U. of Toronto)  
 E. Edwards (Chem. Eng. U of Toronto)

S. Mabury (Chemistry, U. of Toronto)  
 J. Brenan (Geology, U. of Toronto)  
 J. Stix (Geologie, U. of Montreal)  
 D. Muir (Canadian Centre for Inland Waters)  
 R. Therrien (Geologie, Laval)

<b>NSERC Equipment Grant</b>	\$34,456	1999-2000
Title: Gas Chromatograph for low level H <sub>2</sub> compositional analysis		
<b>Imperial Oil University Research Grant</b>	\$30,200	1998-2001
Title: Stable Carbon Isotopes: Tracers of Intrinsic Bioremediation of Aromatic Hydrocarbons		
<b>NSERC Strategic Grant - University Industry Partnerships</b>	\$290,000	1997-2000
Title: Tracing Organic Contaminants in Groundwater - A New Environmental Methodology using Compound Specific Isotope Analysis Co-investigator: B. Sleep (Civil Engineering, Univ. of Toronto) * Grants indicated * below are the industry matching funds for the 1997-2000 Strategic Project		
<b>NSERC Industrially Oriented Research Grant</b>	\$8,000	1998-99
Title: Natural hydrocarbon gas concentrations in near-surface groundwaters Industrial Partner: Imperial Oil Ltd.		
<b>RTDF Consortium on Groundwater Contamination</b>	\$18,000	1998-99
Title: Isotopic constraints on chlorinated hydrocarbon contamination at Dover Air Force Base, USA.		
<b>*United Technologies Research Grant</b>	\$13,000	1997-98
Title: Collaborative research on fractionation associated with degradation of toluene in field settings		
<b>*General Electric Research Grant</b>	\$36,000	1997-99
Title: Collaborative research on fractionation associated with degradation of TCE Co-investigator: J. Spivack (General Electric Research Division, Schenectady, NY)		
<b>NSERC Operating Grant</b>	\$118,800	1995-99
Title: Inorganic/organic controls on production and flux of carbon gases from deep and shallow groundwaters and wetlands - Isotopic and geochemical characterization.		
<b>*Centre for Groundwater Research - U. of Waterloo</b>	\$50,000	1995-99
<b>Solvents-in-Groundwater Research Funding</b>		
Title: Evaluation of GC-IRMS techniques to identify multi-sources of organic contaminants in groundwater systems		
<b>Imperial Oil University Research Grants</b>	\$28,000	1995-98
Title: Natural hydrocarbon gas concentrations in near-surface groundwaters Implications for assessment of contamination due to gas migration and leakage		
<b>Ontario-Quebec Academic Exchange Program</b>	\$ 3,700	1997-98
Title: Environmental implications of methane gas and brine occurrences in mines on the Canadian Shield. Co-Investigator: J. Guha, Dept. des Sciences de la Terre, Univ. du Quebec à Chicoutimi.		
<b>NSERC Equipment Grant</b>	\$42,334	1994-95
Title: Automated Multiport Manifold for Mass Spectrometer Co-investigators: F.G. Ferris (Geology, Toronto); D. Wedin; R. Jefferies and J. Coleman (Botany, Toronto); J. Gerits (Geography, Toronto); N. Roulet (Geography, McGill); J. Stix (Geologie, Montreal), R. Knowles		

(Microbiology, McGill).

<b>Falconbridge Ltd. Research Grant</b>	\$30,000	1994-96
Title: Occurrences of explosive gas and saline groundwater in Kidd Creek Mine, Timmins, Ont.		
<b>American Association of Petroleum Geologists</b>	\$2,000	1995-96
Grants-in-Aid of Field Research Support to S. Taylor		
Title: Natural hydrocarbon gas concentrations in near-surface groundwaters		
Implications for assessment of contamination due to gas migration and leakage		
<b>Ontario-Quebec Academic Exchange Program</b>	\$ 2,420	1995-96
Title: Environmental implications of methane gas and brine occurrences in mines on the Canadian Shield.		
Co-Investigator: J. Guha, Dept. des Sciences de la Terre, Univ. du Quebec à Chicoutimi.		
<b>Research Contract</b>		
<b>Atmospheric Environment Service</b>	\$10,000	1994-95
Title: Geochemical controls on production mechanism and isotopic signature of CH <sub>4</sub> from low boreal wetlands.		
<b>NSERC Operating Grant</b>	\$71,220	1992-95
Title: Geochemical and isotopic controls on the origin and migration of gases in the hydrogeological environment		
<b>Ontario Geoscience Research Grant</b>	\$56,000	1992-94
<b>Ministry of Northern Development and Mines</b>		
Title: The role of N <sub>2</sub> and H <sub>2</sub> in inorganic methanogenesis in the crystalline rocks of the Canadian Shield		
<b>AES/NSERC Science Subvention Program</b>	\$10,000	1993-94
<b>Atmospheric Environment Service - Environment Canada</b>		
Title: CH <sub>4</sub> inputs to the atmosphere from bogs in the Great Lakes Basin		
Possible geochemical controls on production mechanisms and isotopic signature		
<b>Research Agreements Program</b>	\$6000	1992-93
<b>Energy Mines and Resources</b>		
Title: Migration and mixing of helium within the Southwest Ontario Sedimentary Basin		
Implications for hydrocarbon gas reservoirs		
Co-Investigators: S.M. Weise (Institut fuer Hydrologie, Munich, Germany);		
S.K. Frappe (Univ. of Waterloo); J.F. Barker (Univ. of Waterloo)		
<b>Connaught Phase I New Staff Grant</b>	\$10,000	1992-93
<b>Connaught New Staff Matching Grant</b>	\$11,000	1993-95
<b>University of Toronto</b>		
Title: Environmental applications of GC-IRMS - Production and transport of carbon-bearing compounds in the hydrological environment		
<b>Operating Grant</b>	\$35,000	1992-93
<b>University of Toronto</b>		
<b>Equipment Grant - Stable Isotope Laboratory</b>	\$400,000	1992-93
<b>University of Toronto</b>		
<b>As co-investigator:</b>		
<b>Sloan Foundation Deep Carbon Observatory</b>	\$1,200,000 USD	2015-2017
Title: Reduced Carbon in Earth:		
(BSL portion \$75,000 USD)		
III. Origins, Forms, Quantities and Movement		

PI: E. Young (UCLA) and I. Danielle (Lyons)  
Subteam PI: B. Sherwood Lollar (Toronto)

**Sloan Foundation Deep Carbon Observatory** \$1,200,000 2013-2015  
Title: Reduced Carbon in Earth's Crust and Mantle: (BSL portion \$285,000)  
II. Deep Energy and Reduced Gas Flux  
PI: D. Cole and I. Danielle  
Subteam PI: B. Sherwood Lollar (Toronto) and C.J. Ballentine (Oxford)

**NSERC CREATE Grant** \$1,650,000 2014-2020  
Title: Remediation Education Network (RENEW)  
PI: B. Sleep  
Co-PIs: E. Acosta (Toronto), E. Edwards (Toronto), J. Gerhard (Western),  
J. Herrera (Western), D. O'Carroll (Western), C. Robinson (Western),  
N. Thomson (Waterloo), K. Mumford (Queen's), K. Novakowski (Queen's)  
Collaborator: B. Sherwood Lollar (Toronto)

**Sloan Foundation Deep Carbon Observatory** \$1,500,000 2011-2013  
Title: Reduced Carbon in Earth's Crust and Mantle: (BSL portion \$320,000)  
I. Abiogenic versus Biogenic Origins  
PI: D. Cole and C.J. Ballentine  
Subteam PI: B. Sherwood Lollar (Toronto)  
Co-PIs: E. van Heerden (Univ. of Free State, SA); T.C. Onstott (Princeton); M. Itavaara (VTT, Finland)

**NSERC CREATE Grant** 2011-2016  
Title: Multidisciplinary Applied Geochemistry Network (MAGNET)  
PI: D. Weis (Univ. of British Columbia)  
Co-PIs: S. J. Barnes (Univ. du Quebec), B. Bergquist (Univ. of Toronto), I. Clark (Univ. of Ottawa),  
R. Francois (Univ. of British Columbia), C. Hillaire-Marcel (UQAM), B. Sherwood Lollar (Univ. of Toronto),  
J. Stix (Univ. of McGill)

**NSERC Networks of Centers for Excellence** \$5 million 2010-2013  
Title: Carbon Management Canada BSL portion \$209,800 over 3 years  
PI: S. Larter (U. Calgary)  
Co-PI: B. Mayer (Calgary), J. Grace (UBC), B. Rostron (Alberta), J. Shaw (Alberta), G. Dipple (UBC)  
D. Lawton (Calgary), J. Meadowcraft (Calgary), B. Sherwood Lollar (Toronto), C. Mims (Toronto)

**National Science Foundation** \$700,000 2010-2012  
Title: Collaborative Research ETBC – Deep Crustal Biosphere BSL portion: \$57,576 over three years  
Microbial Cycling of Carbon  
PI: T.C. Onstott (Princeton)  
Co-PIs: T. Kieft (NMT); B. Sherwood Lollar (Toronto); G.F. Slater (McMaster); K. Hinrichs (Bremen)

**CFI Leaders Opportunity Fund** \$218,143  
**Canadian Foundation for Innovation**  
Title: Biozone: A Modern Collaborative Bioengineering Research Facility  
PI: E. Edwards (Chem. Eng.)  
Co-PIs: E. Masters and R. Mahadevan (Chem Eng)  
Co-Investigators: B. Sherwood Lollar, B. Sleep, M. Shoichet and others

**NSERC CREATE Program** \$1.6 million 2009-2014  
**Canadian Astrobiology Training Program**  
PI: L. Whyte (McGill)  
Co-investigators: B. Sherwood Lollar (Toronto)  
N. Banerjee, G. Osinski (UWO)  
R. Pudritz, G. Slater (McMaster)  
W. Pollard, H. Vali, J. Nadeau, B. Wing (McGill)



E. Cloutis (Winnipeg)  
Collaborators: NASA Ames, NASA JPL, Canadian Space Agency,  
MDA Space Missions, MPA Communications

**Canadian Space Agency Canadian Analogue Research Network** \$50,000 2010-2011  
**CARN 08-01** BSL portion: \$5000

Title: Life in Ice: The detection of microbial activity at Mars analogue sites (cold  
Saline springs, permafrost/ground ice in the high Arctic

PI: L. Whyte (McGill)

Co-investigators: B. Sherwood Lollar (Toronto)

T.C. Onstott (Princeton)

**Genome Canada and Ontario Genomics Institute** \$10 million 2009-2018  
**BEEM: Bioproducts and Enzymes from Environmental Metagenomics** BSL unfunded collaborator

PI: E.A. Edwards (Dept of Chemical Engineering Toronto) and D.W. Major (GeoSyntec Inc).

Co-pi: B. Sherwood Lollar and others

**Canadian Space Agency Canadian Analogue Research Network** \$30,000 2007-2008  
**CARN 07-01** BSL portion: \$2000

Title: Life in Ice: The detection of microbial activity via in situ measurements of CH<sub>4</sub> and CO<sub>2</sub>:

High Arctic field testing of a Cavity Ring Down Spectrometer (CRDS) for future use on the Martian surface

PI: L. Whyte (McGill)

Co-investigators: B. Sherwood Lollar (Toronto)

T.C. Onstott (Princeton)

**Canadian Space Agency Canadian Analogue Research Network** \$20,000 2007-2008  
**CARN 07-02** BSL portion: \$2000

Title: Planetary protection - The survivability of Earth microbes from Canadian High Arctic

Mars analogue sites under Martian environmental conditions

PI: L. Whyte (McGill)

Co-investigators: B. Sherwood Lollar (Toronto)

T.C. Onstott (Princeton)

#### **U.S. Strategic Environmental Research and Development Program**

Title: Elucidation of the mechanisms and environmental relevance \$1,250,000 2007-2011  
of cis-DCE and VC biodegradation (BSL portion \$35,000 per year)

PI: E. Cox(GeoSyntec)

Co-PIs: C. Aziz (GoeSyntec), J. Gossett (Cornell), J. Spain (Georgia Tech)

E.A. Edwards (Toronto), B. Sherwood Lollar (Toronto)

#### **NASA ASTID (Astrobiology Science and Technology Development And Mission Concept Studies)**

\$1.5 million USD 2008-2011  
BSL unfunded collaborator

Title: A CRDS for isotopic measurement of Martian CH<sub>4</sub>

PI: T.C. Onstott, Dept. of Geosciences, Princeton University

Co-investigators: K.K. Lehmann (U. of Virginia)

P. Mahaffy (Mars Science Lab PI - NASA Goddard Space Flight Center)

H. Riris, I. Kate, J. Burris (all of NASA Goddard Space Flight Center)

Collaborator: B. Sherwood Lollar (Toronto)

#### **NASA Astrobiology Institute (NAI) - DDF Fund**

\$253,075 USD 2007-2008  
(no direct funds to BSL as major portion of funds  
for mounting a Mars Simulator workshop)

Title: Mars Environmental Simulator Studies of Forward

Contamination and Biogeochemical Processes

PI: T.C. Onstott (Princeton)

L.M. Pratt, D. Bish, A. Schimmelmann (Indiana Univ.)

S.M. Piffner (Tennessee)

B. Sherwood Lollar (Toronto)

T.C. Hazen (Lawrence Berkeley National Lab; )R. Mancinelli, L. Rothschild (SETI); J. Bishop (NASA Ames); P. Todd (SHOT Inc.)

P. Kounaves (Tufts); K. Zacny (Honeybee Robotics); P. Mahaffy (NASA MSL PI); A. Schuerger (U of Florida); J. Bada (UCSD); L. Becker (UCSB); C. Omelon, W. Pollard (McGill)

**NASA Astrobiology Research Institute (NAI)** \$5,000,000 USD 2003-2008  
 Detection of Biosustainable Energy and Nutrient Cycles  
 in the Deep Subsurface of Earth and Mars (BSL portion after overhead approximately  
 (\$60,000 Canadian per year)  
 PI: L. Pratt (Chemistry, Indiana U.)  
 Co-PI's: T.C. Onstott (Princeton), B. Sherwood Lollar (Toronto)  
 J.K. Fredrickson (PNNL); S. Pfiffner (U. Tennessee);  
 T. Phelps (ORNL); F. Brockman (PNNL); T. Hazen (LBNL);  
 S. Clifford (Lunar Planetary Institute)

**NSERC Research Tools and Instruments** \$86,204 2006  
 Title: Microarray Equipment to detect differential gene expression in  
 biodegrading microbial communities  
 PI: Edwards (Chem-Eng) Co-PIs: Sherwood Lollar (Geology), M. Simpson (UTSC)

**Canadian Space Agency Analogue Site Studies** \$20,000 2006  
 Title: High Arctic Springs as Mars analogue sites  
 PI: L. Whyte (McGill)  
 Co-PIs: W. Pollard (McGill); N. Perreault (McGill);  
 B. Sherwood Lollar (Toronto); D. Andersen (SETI)

**NSERC Research Tools & Instruments - Category I** \$72,995 2003  
 Title: Application of Quantitative Molecular Techniques in Subsurface Bioremediation  
 PI: E. Edwards (Chemical Engineering and Applied Chemistry)  
 Co-PIs: B. Sherwood Lollar (Geology); B. Sleep (Civil)

**NSERC Collaborative Research Development Grant** \$266,244 2000-2003  
 Title: Biogeochemical Mechanisms for Chlorinated  
 Ethane Transformation in Groundwater  
 PI: E. Edwards (Chem. Eng. U of Toronto)  
 Co-investigators: B. Sherwood Lollar (Geology - U. of Toronto)  
 B. Sleep (Civ. Eng. U. of Toronto)

**Canadian Chlorine Coordinating Council** \$75,000 1999-2001  
 Title: Source Identification of Chloroacetic Acids (CAA)  
 in the Environment by GC-C-IRMS  
 PI: S.A. Mabury (Chemistry, University of Toronto)  
B. Sherwood Lollar (Geology, University of Toronto)  
 D.Muir (CCIW, Environment Canada)

**National Science Foundation** \$1,275,000 1999-2003  
 Title: South African Ultradeep Mines - Long Term Sites  
 for Interdisciplinary Studies (LSLIS) into the Extreme  
 Environment of the Deep Subsurface  
 PI: T.C. Onstott, Dept. of Geosciences, Princeton University  
 Co-investigators: D. Balkwill (FSU); D. Boone (PSU); Brockman (PNNL);  
 J.K. Fredrickson (PNNL); Kieft (MIT); Pfiffner (UTenn);  
 T.Phelps (ORNL); L. Pratt (IU); B. Sherwood Lollar (Toronto);  
 G. Southam (NAU); M. Stute (Lamont-Doherty);  
 G. Wallfaardt (Univ. Stellenbosch); D. White (UTenn)

**National Geographic Society** \$17,707 1998-99  
 Title: A Window into the Extreme Environment of Deep  
 Subsurface Microbial Communities: The Witwatersrand  
 Deep Microbiology Project

PI: T.C. Onstott, Dept. of Geosciences, Princeton University  
Co-investigators: J.K. Fredrickson (PNNL); K. Pedersen (Goteborg Univ.);  
B. Sherwood Lollar

**U.S. Dept of Energy - Office of Energy Research** \$200,000 1995-1998  
Title: Combined Noble Gas and Stable Isotope Constraints on Nitrogen Gas Source within Sedimentary Basins  
PI: C.J. Ballentine, Dept. of Geological Sciences, Univ. of Michigan  
Co-investigators: B. Sherwood Lollar; A.N. Halliday, Dept. of Geological Sciences, Univ. of Michigan

**Special University Linkage Consolidation Program** \$750,000 1996-2001  
**AUCC-CIDA**  
Title: Geo-environment and its impact on socio-economic development -  
Guizhou Province, in alliance with the Pearl River Delta, P.R. of China  
PI: J. Guha (Univ. du Quebec a Chicoutimi)

**Faculty of Arts and Sciences - One Time Only Funds** \$10,000 1992-93  
**Field Gas Chromatograph for Environmental Geosciences Teaching Initiative**  
Co:investigator: F.G. Ferris (Univ. of Toronto)

**NSERC Equipment Grant** \$90,301 1991-92  
Title: Phase contrast-fluorescence microscope, spectrophotometer, and anaerobic  
chamber needed to undertake microbial geochemistry research  
PI: F.G. Ferris (Univ. of Toronto)

## C. SCHOLARLY AND PROFESSIONAL WORK

All co-authors who are students, postdoctoral fellows or research associates directly under my supervision are noted in italics in the publication list below. **My name is underlined on those papers for which I am senior author. This is because different disciplines have different assumptions concerning where the senior author's name should be listed (i.e. second, or last).** Journals are selected for breadth of readership, the quality of the submission and review process and the impact. The majority of my publications are in journals such as *Geochimica Cosmochimica acta*, *Chemical Geology*, and *Environmental Science and Technology*. These three journals have among the highest rated impact factors in earth sciences and environmental geochemistry. My team publishes regularly in the highest citation journals *Science* and *Nature*.

### PEER-REVIEWED REPORTS

1. National Research Council of the National Academies of Science Report "**An Astrobiology Strategy for the Exploration of Mars**" Committee for Astrobiology Strategy report for Space Studies and Life Sciences boards of the National Academy. National Academy Press (2007) ISBN 978-0-309-10851-5.

2. Hunkeler, D., Meckenstock, R., Sherwood Lollar, B., Schmidt, T. and J.A. Wilson. A consensus guide for assessing biodegradation and source identification of organic contaminants in groundwater using compound specific stable isotope analysis (CSIA). Commissioned by the IAEA (International Atomic Energy Agency - Vienna) and jointly published by the IAEA and the US EPA (Environmental Protection Agency) as a white paper (best practice guide) to the application of compound specific isotope analysis to contaminant hydrogeology. Publication date: Dec. 2008. **EPA Guidance Document EPA 600/R-08/148**

3. Council of Canadian Academies Report "**The Sustainable Management of Groundwater Resources in Canada**" Expert Panel on Groundwater Report (April 2009). J.P. Bruce, W. Cunningham, A. Freeze, R. Gillham, S. Gordon, S. Holysh, S. Hrudely, W. Logan, K. MacQuarrie, P. Muldoon, L. Nowlan, J. Pomeroy, S. Renzetti, B. Sherwood Lollar, and R. Therrien.

4. **Mars Astrobiology Explorer Cacher (MAX-C): A Potential Rover Mission for 2018. Final Report** of the Mars Mid-Range Rover Science Analysis Group (MRR-SAG). Pratt, L.M., C. Allen, A.C. Allwood, A. Anbar, S.K. Atreya, D.W. Beaty, M.H. Carr, J.A. Crisp, D.J. Des Marais, J.A. Grant, D.P. Glavin, V.E. Hamilton, K. Herkenhoff, V. Hipkin, B. Sherwood Lollar, T.M. McCollom, A.S. McEwen, S.M. McLennan, R.E. Milliken, D.W. Ming, G.G. Ori, J. Parnell, F. Poulet, C.G. Salvo, F. Westall, C.W. Whetsel, and M.G. Wilson (2009) 94 pp., posted October 29, 2009, by the Mars Exploration Program Analysis Group (MEPAG) at <http://mepag.jpl.nasa.gov/reports/>.

5. B. Sherwood Lollar. **Far-Field Microbiology Considerations Relevant to a Deep Geologic Repository - State of Science Review**. NWMO-TR-2010-23. Nuclear Waste Management Organization. Dec. 2010. 65 p.

6. **2018 Joint Mars Rover Mission Joint Science Working Group Report (JSWG)** Beaty, D.W., Kminek, G., Allwood, A.C., Arvidson, R., Borg, L.E., Farmer, J. D., Goesmann, F., Grant, J. A., Hauber, E., Murchie, S.L., Ori, G.G., Ruff, S. W., Rull, F., Sephton, M. A., Sherwood Lollar, B., Smith, C. L., Westall, F., Pacros, A.E., Wilson, M.G., Meyer, M.A., Vago, J.L., Bass, D.S., Joudrier, L., Laubach, S., Feldman, S., Trautner, R., Milkovich, S.M. (2012) 93 pp., posted March, 2012, by the Mars Exploration Analysis Group (MEPAG) at <http://mepag.jpl.nasa.gov/reports/>.

7. G.F. Slater, D. Moser and B. Sherwood Lollar. **Development of Microbial Characterization Techniques for Low Permeability Sedimentary Rock**. NWMO-TR-2013-17. Nuclear Waste Management Organization. 2014. 75 p.

8. **Mars Exploration Program Analysis Group for Special Regions-Science Analysis Group 2 (MEPAG SR-SAG2) Report** Beaty, D.W., Rummel, J.D., Jones, M.A., Bakermans, C., Barlow, N., Boston, P., Chevrier, V., Clark, B., de Vera, J-P., Gough, R., Hallsworth, J.E., Head, J., Hipkin, V., Kieft, T., McEwen, A., Mellon, M., Mikucki, J., Nicholson, W., Omelon, C., Peterson, R., Roden, E., Sherwood Lollar, B., Tanaka, K., Viola, D., and Wray, J. 2014.

## NON-PEER-REVIEWED REPORTS

1. Report of the Joint NASA Astrobiology Institute/ Mars Exploration Planning Advisory Group Science Laboratory Caching Working Group (NAI/MEPAG).A, Steele, L. Beegle, D. DesMarais, B. Sherwood Lollar, C. Neal, P. Conrad, D. Glavin, T. McCollom, K. Karcz, C. Allen, E. Vincenzi, S. Cady, J. Eigenbrode, D., Papineau, V. Starke, M. Glamoclija, M. Fogel, L. Kerr, J. Maule, G. Cody, I. TenKate, K. Buxbaum, I. Borg, S. Symes, D. Beaty, C. Pilcher, M. Meyer, C. Conley, J. Rummel, R. Zurek and J. Crisp. (2007). Posted Jan. 2008 at <http://mepag.jpl.nasa.gov/reports/index.html>.

2. White Paper on Groundwater Control Systems for Italian MOE (in Italian) B. Sherwood Lollar, T.D. Stark, A. Valocchi (2008)

3. Technical Guidance Report to the **International Atomic Energy Agency Water Resources Program** (2016) Impacts of hydraulic fracturing on groundwaters identified using geochemical and isotopic tracers. C. Ballentine, S. Haszeldine, M.J. Hendry, J. McIntosh, B. Sherwood Lollar

## 7. PUBLICATIONS REFEREED AND IN REVIEW

### EDITED BOOKS

Environmental Geochemistry Vol. 9 (Vol. editor B. Sherwood Lollar) Treatise on Geochemistry (eds. H.D. Holland and K.K. Turekian), Elsevier, Oxford (2003). This work won the Geoscience Information Society (GSIS) Mary B. Ansari Best Reference Work Award for 2003. This Volume edited by Sherwood Lollar was one of the two highest selling volumes in this award winning series. The *Treatise on Geochemistry* presents a comprehensive, integrated summary of the present state of the field for a full range of disciplines and topics in geochemistry. All chapters are peer reviewed and contributed by the leading experts in the field of research. K. Turekian (Yale University) and H.D. Holland (Harvard University) were the executive editors of the series. Volumes editors are Andrew Davis, Rick Carlson, Roberta Rudnick, Ralph Keeling, Tim Drever, Harry Elderfield, Fred MacKenzie, Bill Schlesinger and Barbara Sherwood Lollar. Paperback edition of Volume 9 published in May 2005 sold to date over 1400 copies. **Second Edition more than 50% updated and revised was published in 2014 and was recently awarded the Geoscience Information Society (GSIS) Mary B. Ansari Best Reference Work Award for 2014** at the Geological Society of America Annual Meeting (Oct. 2014).

### PEER REVIEWED SCHOLARLY PUBLICATIONS

140. Xu, B.S., Sherwood Lollar, B., *Passeport*, E. and Sleep, B. Aqueous phase Diffusion Related Isotopic Fractionation (DRIF) in aquifer and aquifer-aquitard Systems. submitted **Journal of Contaminant Hydrology**.

139. Li, Long, Wing, B.A., Bui, T.H., Slater, G.F. *Lacrampe-Couloume*, G., and Sherwood Lollar, B. Archean atmospheric sulfur in deep subsurface fracture waters in Precambrian cratons. submitted **Nature Communications**.

138. Chen, Y., Lehmann, K.K., Peng, Y., Pratt, L.M., White, J., Cadieux, S.B., Sherwood Lollar, B., *Lacrampe-Couloume, G.*, and Onstott, T.C. Hydrogen isotopic composition of Arctic and atmospheric CH<sub>4</sub> determined by a portable near-IR Cavity Ring-Down Spectroscopy with a cryogenic pre-concentrator. *Astrobiology* in review.
137. Xu, B.S., Sherwood Lollar, B., *Passeport, E.* and Sleep, B. (2016) Diffusion Related Isotopic Fractionation Effects with One-Dimensional Advective-Dispersive Transport. *Science of the Total Environment* **550**: 200-208.
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135. Magnabosco, C., Ryan, K., Lau, M.C.Y., Kuloyo, O., Sherwood Lollar, B., Kieft, T.L., van Heerden, E. and Onstott, T.C. (2016) A Metagenomic window into Prokaryotic carbon metabolism at 3km depth in Precambrian continental crust. *ISME* **10**: 730-741.
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133. Borgonie, G., Linage-Alvarez, B., Ojo, A. O. *Mundle, S.O.C.*, Freese, L.B., Van Rooyen, C., Kuloyo, O., Albertyn, J., Pohl, C., Cason, E.D., Vermeulen, J., Pienaar, C., Litthauer, D., Van Niekerk, H., Van Eeden, J., Sherwood Lollar, B., Onstott, T.C., van Heerden, E. (2015) Eukaryotic opportunists rule the deep subsurface biosphere in South Africa. *Nature Communications* **6**, article number: 8952.
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**10. PAPERS PRESENTED AT MEETINGS AND SYMPOSIA** (Invited talks listed separately below)

- Watt, P., McDermott, J., and Sherwood Lollar, B.* Using stable isotopes and cell enumeration to assess the origin of subsurface methane in Southwestern Ontario: applications to deep geologic repositories. WATIF Conference (Water Initiative for the Future). Queen's University, Kingston ON Canada. July 2016.
- Sica, C.S., Sutcliffe, N.C., McDermott, J. and Sherwood Lollar, B.* Fluid paragenesis and isotopic evolution of ancient deep crustal fluids using fracture-fill quartz carbonate veins in the Precambrian shield, Abitibi greenstone belt. GACMAC Annual General Meeting 2016. Whitehorse, YK. June 2016.
- McDermott, J.M., Li, L., Sutcliffe, C.N., Ono, S., Wing, B. and Sherwood Lollar, B.* Sulfur cycling in ancient terrestrial fracture waters transports Archean signatures. Goldschmidt 2016, Yokohama, Japan, June 26-July 1, 2016.
- Warr, O., Sherwood Lollar, B., Fellowes, J., Sutcliffe, C.N., McDermott, J., Sica, C., Holland, G., Mabry, J.C. and Ballentine, C.J.* Defining the residence times of fluids with Precambrian-aged systems. Goldschmidt 2016, Yokohama, Japan, June 26-July 1, 2016.
- McKelvie, Korber, D., Slater, G.F., Sherwood Lollar, B. and Wolfaardt, G.* Microbial Assessment of deep geological repository for Canada's used nuclear fuel. Goldschmidt 2016, Yokohama, Japan, June 26-July 1, 2016.
- Young, E.D., Kohl, I.E., Sherwood Lollar, B., Etiope, G., Rumble III, D., Shuning Li, Haghnegahdar, M., Schauble, E.A., McCain, K.A., Foustoukos, D.I., Sutcliffe, C.N., Warr, O., Ballentine, C.J., Onstott, T.C., Hosgormez, H. and Neubeck, A.* A survey of methane  $\Delta$  CH<sub>2</sub>D<sub>2</sub> vs.  $\Delta$  <sup>13</sup>CH<sub>3</sub>D in nature and in the laboratory. Goldschmidt 2016, Yokohama, Japan, June 26-July 1, 2016.
- McDermott, J.M., Heuer, V.B., Tille, S., Moran, J.J., Slater, G.F., Glein, C., Watt, P., Uwe-Hinrichs, K. and Sherwood Lollar, B.* Distinguishing abiotic from biological carbon sources in the deep biosphere. The Geological Society of America Northeastern, Albany, NY, March 21-23, 2016.
- Passeport, E., Zhang, N., Wu, L., Herrmann, H., Sherwood Lollar, B., and Richnow, H.* Compound specific isotope analysis of the aqueous photodegradation of substituted chlorobenzenes. AGU Fall Meeting, San Francisco, CA, Dec. 14-18, 2015.
- Horst, A., Lacrampe-Couloume, G., and Sherwood Lollar, B.* Degradation and Volatilization of Chlorofluorocarbons in Contaminated Groundwater Explored by Stable Carbon Isotope Analysis. AGU Fall Meeting, San Francisco, CA, Dec. 14-18, 2015.

- McDermott, J.M., Heuer, V.B., Tille, S., Moran, J.J., Slater, G.F., Sutcliffe, C.N., Glein, C.R., K.-Uwe Hinrichs, and Sherwood Lollar, B.* Abiogenic and Microbial Controls on Volatile Fatty Acids in Precambrian Crustal Fracture Waters. AGU Fall Meeting, San Francisco, CA, Dec. 14-18, 2015. (poster)
- Onstott, T.C., Lau, C.Y., Magnabosco, C., Harris, R., Chen, Y., Slater, G., Sherwood Lollar, B., Kieft, T., van Heerden, E., Borgonie, G., and Dong, H. Biogenic carbon on Mars: A subsurface chauvinistic viewpoint. AGU Fall Meeting, San Francisco, CA, Dec. 14-18, 2015.
- Warr, O., Sherwood Lollar, B., Fellowes, J., *Sutcliffe, C.N., McDermott, J.M., Holland, G., Mabry, J.C., and Ballentine, C.J.* The role of noble gases in defining the mean residence times of fluids within Precambrian crustal systems. AGU Fall Meeting, San Francisco, CA, Dec. 14-18, 2015. (poster)
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- Glein, C.R., Zhu, X., Sutcliffe, C.N., McDermott, J.M., and Sherwood Lollar, B.* The potential for abiotic organic synthesis in an ancient ore deposit: Echoes of an iron-sulfur world? Goldschmidt 2015. Prague, CZ. Aug. 16-21, 2015.
- Sutcliffe, C.N., Burton, K.W., Nowell, G., Parkinson, I.J., Glein, C.R., McDermott, J.M., Li, L., and Sherwood Lollar, B.* Tracing  $\delta^{18}\text{O}$  –  $\delta^2\text{H}$  isotopic evolution of ancient fracture fluids: A novel approach using Sr stable isotopes. Goldschmidt 2015. Prague, CZ. Aug. 16-21, 2015.
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- Mancini, S., and Sherwood Lollar, B. Understanding sources and biodegradation of benzene and chlorobenzenes using compound specific isotope analysis. International Network of Environmental Forensics Conference (INEF). Toronto, ON. Aug. 3-6, 2015
- Horst, A., Lacrampe-Couloume, G., and Sherwood Lollar, B.* Stable carbon isotope analysis of chlorofluorocarbons in contaminated groundwater- a method to explore degradation. International Network of Environmental Forensics Conference (INEF). Toronto, ON. Aug. 3-6, 2015.
- Payler, S. J., Cockell, C., Paling, S., Biddle, J., Sherwood Lollar, B., Trivedi, U., Telling, J., Hudson-Edwards, K., McLuckie, D., Edwards, T., and Genis, J. Life and biogeochemical cycling in deep subsurface brines. AbSciCon 2015 (Astrobiology Science Conference) Chicago, Illinois, June 15-19, 2015. (oral)
- Sutcliffe, C.N., Lacrampe-Couloume, G., Ballentine, C. and Sherwood Lollar, B.* New estimates of global  $\text{CH}_4$  and  $\text{C}_2\text{H}_6$  production in the Precambrian crust. European Geosciences Union General Assembly 2015. Vienna, Austria, April 12-17, 2015. (poster)
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- Sherwood Lollar, B., Onstott, T.C., *Lacrampe-Couloume, G., and Ballentine, C.J.* The contribution of the Precambrian continental lithosphere to global  $\text{H}_2$  production. Deep Life Community Meeting. Lisbon, Portugal, May 7-9, 2015. (oral)
- Lau, M.C.Y., Magnabosco, C., *Simkus, D., Slater, G.F., Kieft, T.L., Sherwood Lollar, B., van Heerden, E., and Onstott, T.C.* Microbial  $\text{CH}_4$  production and oxidation at a 1.34-km deep subterranean site in South Africa. Deep Life Community Meeting. Lisbon, Portugal, May 7-9, 2015. (Oral)
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Ballentine, C.J. and Sherwood Lollar, B. Nitrogen and helium in natural gases: Identifying the risk factors from a noble gas study of the Hugoton Panhandle Giant gas field. American Association of Petroleum Geologists Annual Meeting. June 2001, Denver CO

Gray, J.R., Lacrampe-Couloume, G., Sherwood Lollar, B., Scow, K.M., MacKay, D., Wilson, R. and Gandhi, D. Carbon and hydrogen isotopic fractionation - A new assessment tool for biodegradation of MTBE. 6<sup>th</sup> International Symposium on In Situ and On-Site Bioremediation. June 4-7, 2001, San Diego CA.

Volkering, F., Jonker, H., van Breukelen, B., Groen, J., Meijer, H.A.J., Sherwood Lollar, B. and Kramers, J.D. Isotope analysis: A promising tool in soil pollution research. 6<sup>th</sup> International Symposium on In Situ and On-Site Bioremediation. June 4-7, 2001, San Diego CA.

Van Breukelen, B.M., Jonker, H., Mancini, S., Volkering, F., Meijer, H.A.J., Sherwood Lollar, B. and Groen, J. Evaluating anaerobic natural attenuation of benzene/ethylbenzene using natural isotopes. 6<sup>th</sup> International Symposium on In Situ and On-Site Bioremediation. June 4-7, 2001, San Diego CA.

Morrill, P.L., Slater, G.F., Lacrampe-Couloume, G., Sleep, B., Edwards, E., Sherwood Lollar, B., McMaster, M. and Major, D. Isotopic evidence of reductive dechlorination, a field demonstration of bioaugmentation, Kelly AFB. 6<sup>th</sup> International Symposium on In Situ and On-Site Bioremediation. June 4-7, 2001, San Diego CA.

Mancini, S.A., Stelfox, A.C., Ward, J.A.M., Ahad, J., Lacrampe-Couloume, G., Sleep, B., Edwards, E. and Sherwood Lollar B. Stable carbon and hydrogen isotope fractionation during anaerobic degradation of aromatic hydrocarbons. 6<sup>th</sup> International Symposium on In Situ and On-Site Bioremediation. June 4-7, 2001, San Diego CA.

Graves, D., Hecox, G.R., Kirschenmann, K. and Sherwood Lollar, B. In situ vinyl chloride biodegradation revealed through carbon isotope composition. 6<sup>th</sup> International Symposium on In Situ and On-Site Bioremediation. June 4-7, 2001, San Diego CA.

Onstott, T.C., Moser, D.P., DeFlaun, M., Pratt, L.M., and Sherwood Lollar, B. Geohydrological and biogeochemical subsurface environments within the Witwatersrand Basin, South Africa. ASM Annual Meeting. May 2001. Orlando FL.

Sherwood Lollar, B., Lacrampe-Couloume, G., Ward, J.A. and Slater, G.F. Compound specific hydrogen isotope analysis: New insights into geochemical and biogeochemical reaction mechanisms. American Chemical Society Annual Meeting. April 1-5, 2001, San Diego CA.

Lacrampe-Couloume, G., Ward, J.A.M., Mancini, S., Slater, G.F., Edwards, E. and Sherwood Lollar, B. Hydrogen and carbon isotope fractionation during anaerobic biodegradation of BTEX: Potential for field verification of bioremediation. Biotechnological Remediation of Water Pollution by Acid Inorganic and Aromatic Chlorinated Compounds. March 21-23, 2001. Leipzig, Germany.

Slater, G.F., Sherwood Lollar, B., Sleep, B. and Edwards, E. Variation in stable carbon isotopic fractionation during reductive dechlorination of PCE. Geological Society of America Annual Meeting, Nov. 12-16, 2000, Reno, NV.

Ward, J.A.M., Ahad, J.M.E., Lacrampe-Couloume, G., Slater, G.F., Edwards, E.A. and Sherwood Lollar, B. Hydrogen isotope fractionation during methanogenic degradation of toluene: Potential for direct verification of bioremediation. Geological Society of America Annual Meeting, Nov. 12-16, 2000, Reno, NV.

Westgate, T. and Sherwood Lollar, B. Evidence for abiogenic synthesis of C1-C4 hydrocarbons in crystalline rock environments. Geological Society of America Annual Meeting, Nov. 12-16, 2000, Reno, NV.

Wong, C.S., Mabury, S.A., Sherwood Lollar, B., Lacrampe-Couloume, G., Muir, D.C.G. Isotopic analysis of haloacetic acids using gas chromatography/combustion/isotope ratio mass spectrometry (GC/C/IRMS). Society of Environmental Toxicology and Chemistry 21st Annual Meeting, Nov. 12-16 2000, Nashville, TN.

Ward, J.A.M., Ahad, J.M.E., Lacrampe-Couloume, G., Slater, G.F., Edwards, E.A. and Sherwood Lollar, B. Hydrogen isotope



fractionation during methanogenic degradation of toluene: Potential for direct verification of bioremediation. Goldschmidt 2000 - International Conference for Geochemistry. Oxford, UK, Sept. 2000.

Slater, G.F., B. Sherwood Lollar, R. Allen-King and S. O'Hannesin. Carbon isotopic fractionation by zero-valent iron: Influence of surface pre-treatment. Goldschmidt 2000 - International Conference for Geochemistry. Oxford, UK, Sept. 2000.

Wong, C.S., Mabury, S.A., Sherwood Lollar, B., Lacrampe-Couloume, G., and Muir, D. Stable isotope as a marker of environmental sources and processes of haloacetic acids. International Symposium on Haloacetic Acids and Shortchain Halocarbons: Sources and Fate in the Environment. Toronto, Ont. Aug. 27-29. 2000.

Slater, G.F., B. Sherwood Lollar, E. Edwards, B. Sleep, M. Witt, G.M. Klecka, M. Harkness, J. Spivack. Carbon isotopic fractionation of chlorinated ethenes during biodegradation: Field applications. Second International Battelle Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, CA. May 2000.

Slater, G.F., B. Sherwood Lollar, E. Edwards, B. Sleep. Stable isotope tracers of intrinsic biodegradation. Second International Battelle Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, CA. May 2000.

Ahad, J., B. Sherwood Lollar, E. Edwards, Slater, G.F. and B. Sleep. Carbon isotopic fractionation during anaerobic biodegradation of BTEX: Implications for intrinsic bioremediation. Geological Society of America Annual Meeting. Denver, CO, Oct. 1999.

Slater, G.F., B. Sherwood Lollar, B. Sleep, E. Edwards, and R.W. Lee. Isotopic Characterization of the Subsurface Fate of Chlorinated Ethenes. Geological Society of America Annual Meeting. Denver, CO, Oct. 1999.

Ahad, J.M.E., Sherwood Lollar, B., Edwards, E.A., Slater, G.F. and Sleep, B.E. (1999) Monitoring the biodegradation of toluene using stable carbon isotopes: Implications for contaminated site assessment. 14th International Symposium on Environmental Biogeochemistry. Sept. 26-30, 1999. Deerhurst, Ontario, Canada.

Slater, G.F., Sherwood Lollar, B., Edwards, E., Sleep, B.E. and Brown, A. (1999) Isotopic fractionation during reductive dechlorination by several microbial consortia. 14th International Symposium on Environmental Biogeochemistry. Sept. 26-30, 1999. Deerhurst, Ontario, Canada.

Onstott, T.C., Moser, D.P., Sherwood Lollar, B., Slater, G.F., Deflaun, M.F., Hoek, J., and Pratt, L.M. (1999) The Witwatersrand Deep Microbiology Project: Groundwater geochemistry and potential biogeochemical processes. International Society for Subsurface Microbiology. Aug. 22-27, 1999. Vail, Colorado.

Moser, D.P., Onstott, T.C., Pfflner, S., White, D.C., Peacock, A., Phelps, T., Deflaun, M.F., Hoek, J., Ghiorse, W.C., Colwell, F., Kieft, T., Reysenbach, A.-L., Fredrickson, J.K., Southam, G., Kotelnikova, S., Omar, G., Slater, G.F., Pratt, L.M., Boone, D., Pedersen, K. and Sherwood Lollar, B. (1999). The Witwatersrand Deep Microbiology Project: A Window Into The Extreme Environment Of Deep Subsurface Microbial Communities. International Society for Subsurface Microbiology. Aug. 22-27, 1999. Vail, Colorado.

Sherwood Lollar, B. and Ballentine, C.J. (1999) Nitrogen in the Hugoton/Panhandle Gas Field: Understanding its Origin and Isotopic Character by Combining Stable and Noble Gas Isotopes. American Association of Petroleum Geologists Hedburg Research Conference "Natural Gas Formation and Occurrence" June 6-11, 1999 Durango, Colorado.

Ballentine, C.J. and Sherwood Lollar, B. The origin of helium associated nitrogen in mid-continent U.S. natural gases: The Hugoton/Panhandle Giant gas field. Geological Society of America Annual Meeting. Toronto. (Oct. 1998)

Westgate, T. and Sherwood Lollar, B. Carbon isotopic and compositional evidence for inorganic synthesis of hydrocarbon gases. American Geophysical Union Spring Meeting, Boston, MA (May 1998).

Slater, G.F., Dempster, H.D., Sherwood Lollar, B., Spivack, J., Brennan, M. and MacKenzie, P. (1998) Isotopic tracers of degradation of dissolved chlorinated solvents. First International Battelle Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, CA (May 1998).

Sherwood Lollar, B., Ballentine, C., and O'Nions, R.K. (1998) Non-hydrocarbon gases in sedimentary systems - Evidence for mantle-derived CO<sub>2</sub> in the Pannonian Basin based on stable isotope signatures and C/He ratios. American Chemical Society

Spring Meeting. Dallas, Tx. (March 1998).

Ballentine, C., Sherwood Lollar, B., and Halliday, A. (1998) Non-hydrocarbon gases in sedimentary systems - Nitrogen gas sources in sedimentary basins of the western U.S. American Chemical Society Spring Meeting. Dallas, Tx. (March 1998).

Taylor, S., Sherwood Lollar, B., Wassenaar, L. and J.M. Hendry. Bacterial hydrocarbon production in shallow bedrock aquifers and surficial till aquitards, Saskatchewan, Canada. Geological Society of America Annual Meeting. Salt Lake City (Oct. 1997).

Slater, G.F., Dempster, H., Sherwood Lollar, B., Spivack, J., Brennan, M. and P. Mackenzie. Isotopic investigation of TCE degradation using GC/C/IRMS coupled with headspace analysis. Geological Society of America Annual Meeting. Salt Lake City (Oct. 1997).

Ferris, F.G., Gerits, J.P., Sherwood Lollar, B., Schultze-Lam, S. Carbonate and silicate mineral deposition in a saline-alkaline lake microbial mat. XIII International Symposium on Environmental Biogeochemistry, Monopoli (Bari) Italy. (Sept. 1997).

Slater, G. F., Dempster, H. and Sherwood Lollar, B. Technical developments in applications of GC/C/IRMS to  $^{13}\text{C}$  analysis of low level dissolved chlorinated compounds. University of Waterloo Continuous Flow Isotopic Analysis (CFIRMS) Workshop, Waterloo (Aug. 1997).

## 11. INVITED LECTURES

### Invited Lectures for 1998 Henry Darcy Distinguished Lecture Series

*Stable Carbon Isotopes: Tools for detection of the origin  
and fate of environmental contaminants*

University of Texas at Austin	Thurs. Jan 22
Texas A&M	Fri. Jan. 23
University of Virginia	Thurs Feb. 5
University of California Santa Cruz	Weds. Feb 18
University of California Davis	Thurs Feb 19
United States Geological Survey Menlo Park	Fri. Feb 20
Colorado School of Mines	Mon. Feb 23
University of Florida	Weds. Mar 4
Florida State University	Thurs Mar 5
Princeton University	Mon. Mar 9
University of Toronto	Thurs March 12
University of Tennessee	Thurs. Mar 19
Queens University, Canada	Tues. Mar 24
University of Michigan	Tues Apr. 7
Laval University	Mon May 18
Johns Hopkins University	Fri Oct 2
United States Geological Survey Reston	Mon. Oct. 5
Portland State University	Thurs. Oct. 15
Washington State University	Fri Oct. 16
Michigan State University	Thurs Nov 12
University of Waterloo	Thurs Nov. 19
University of Western Ontario	Weds Nov. 25
NGWA National Meeting, Las Vegas	Tues. Dec 14

### *International Darcy Lectures*

University of Brest, France	Thurs April 23
University of Rennes, France	Friday April 24
Queens University - Belfast	Mon. April 27
University College London	Tues April 28
Hebrew University of Jerusalem	Sun June 14

### *Additional Invited Lectures*

- Onstott, T.C., Magnabosco, C., Lau, C.Y.M., Kieft, T.L., van Heerden, E., Dong, H., Lin, L-H, Pedersen, K., Ghiorse, W. and Sherwood Lollar, B. The biomass and biodiversity of the Continental subsurface biosphere. **Invited.** Goldschmidt 2016, Yokohama, Japan, June 26-July 1, 2016.
- Musa, M. Sherwood Lollar, B., Onstott, T.C. and van Heerden, E. Seismic detection to map potential conduits for methane in deep gold mines in the Witwatersrand basin, South Africa **Invited.** European Association of Geoscientists and Engineers. Vienna Austria May 2016.
- Ballentine, C.J., Warr, O., Sutcliffe, C.N., McDermott, J.M., Fellowes, J., Holland, G., Mabry, J.C., and Sherwood Lollar, B. **Invited.** Deep ancient fluids in the continental crust and their impact on near-surface economic, environmental and biological systems. European Geosciences Union (EGU) General Assembly 2016, Vienna, Austria April 17-22, 2016.
- Sherwood Lollar, B., Wang, D., Gruen, D., Ono, S., Young, E., Rumble, D., McDermott, J., Sutcliffe, C., Ballentine, C.J., Warr, O., Holland, G. **Invited.** New developments in stable isotope investigations of fugitive gases. International Atomic Energy Agency Technical Consultants Meeting. Vienna, Austria. March 2016.
- Sherwood Lollar, B., Sutcliffe, C., Glein, C., McDermott, J., Ballentine, C.J., Warr, O., Onstott, T.C., Moser, D. and Fisher, J. **Invited.** Understanding the global distribution of ancient groundwater: Implications for subsurface life on Earth and Mars. Departmental Seminar. Dept of Chemical Engineering and Applied Chemistry. University of Toronto. March 2016.
- Sherwood Lollar, B., Sutcliffe, C., Glein, C., McDermott, J., Ballentine, C.J., Warr, O., Onstott, T.C., Moser, D. and Fisher, J. **Invited.** Exploration of the deep hydrosphere and subsurface life. Departmental Seminar. Dept of Chemistry. University of Toronto. January 2016.
- Sherwood Lollar, B. Quantifying the depth and volume of the Earth's deep hydrosphere. **Invited.** Royal Society (United Kingdom) Discussion Meeting "The origin, history and role of water in the evolution of the inner solar system" Royal Society Kavli Hall, Buckinghamshire, UK. Feb. 2016.
- Sherwood Lollar, B. Deep subsurface habitability of the Precambrian continents. **Invited Seminar.** Imperial College London, UK. Jan. 2016.
- Sherwood Lollar, B. Exploration of the deep hydrosphere and subsurface life in Precambrian continents. **Invited Seminar.** Oxford University, UK. Nov. 2015.
- Onstott, T.C. Lau, C.Y.M., Magnabosco, C., Slater, G.F., Sherwood Lollar, B., Kieft, T.L., Stepanauskas, R., van Heerden, E., Borgonie G. The deep continental biosphere: Abundance, diversity and activity. **Invited.** Geological Society of America Annual Meeting. Baltimore MD. Nov. 2015.
- Kieft, T.L., Onstott, T.C. Lau, C.Y.M., Magnabosco, C., Slater, G.F., Sherwood Lollar, B., Stepanauskas, R., van Heerden, E. Microbial carbon cycling in the deep biosphere of the Kaapval Craton, South Africa. **Invited.** Geological Society of America Annual Meeting. Baltimore MD. Nov. 2015.
- Sherwood Lollar, B. Recent advances in clumped isotopes for elucidating the origin of methane. **Invited.** INTRA Workshop on Position Specific Isotope Techniques. Aix-en-Provence, France. Oct. 2015
- Sherwood Lollar, B. Exploration of the Earth's Deep Hydrosphere and Biosphere. **Invited.** Departmental Lecture Series. SUNY Buffalo, NY. Sept. 2015.
- Sherwood Lollar, B., *Sutcliffe, C.N., McDermott, J.M., Glein, C.R., Warr, O., Onstott, T.C., Ballentine, C.J.* Contributions to abiotic and biological deep carbon cycling from H<sub>2</sub> sources in the Precambrian continental lithosphere. **Keynote.** Goldschmidt 2015. Prague, CZ. Aug. 16-21, 2015.
- Sherwood Lollar, B. *Sutcliffe, C., McDermott, J. Glein, C., Ballentine, C.J., Warr, O., Onstott, T.C., Lau, C.Y.M., Magnabosco, C., and Moser, D.P.* The Other Deep Biosphere: Deep fracture fluids of the Precambrian. Helmholtz Institute Potsdam Germany. June 23 2015

- Sherwood Lollar, B. *Sutcliffe, C., McDermott, J. Glein, C., Ballentine, C.J., Warr, O., Onstott, T.C., Lau, C.Y.M., Magnabosco, C., and Moser, D.P.* The Other Deep Biosphere: Deep fracture fluids of the Precambrian. MARUM Seminar Hinrichs Lab Bremen Germany. June 2 2015
- Sherwood Lollar, B. *Passeport, E., Horst, A. and Lacrampe-Couloume, G.* New developments in CSIA for halogenated organic hydrocarbons: from groundwater to surface water to atmosphere. Helmholtz Institute UFZ Leipzig, Germany. May 2015.
- Sherwood Lollar, B., *Sutcliffe, C., Ballentine, C.J., Onstott, T.C., Lau, C.Y.M., Magnabosco, C., Slater, G.F., and Moser, D.P.* Search for life in deep time and space: The role of Precambrian rocks in analogue research. **Invited.** American Geophysical Union Fall Meeting. San Francisco, CA. Dec. 14-19, 2014.
- Sherwood Lollar, B., *Sutcliffe, C., Ballentine, C.J. Warr, O., Li, L., Ono, S., and Wang, D.T.* Deep carbon cycling in the deep hydrosphere: Abiotic organic synthesis and biogeochemical cycling. **Invited.** American Geophysical Union Fall Meeting. San Francisco, CA. Dec. 14-19, 2014.
- Morrill, P.L., Rietze, A., Kohl, L., Miles, S., Cox, A., Cumming, E., Brazelton, W.J., Suzuki, S., Sherwood Lollar, B., Schrenk, M.O., Neilson, K.H., Ziegler, S, Lang, S.Q. Microbial substrate utilization at sites of continental serpentinization: The Tablelands, NL, CAN and the Cedars, CA, USA. **Invited.** American *Geophysical* Union Fall Meeting. San Francisco, CA. Dec. 14-19, 2014.
- Sherwood Lollar, B. Twenty Year Legacy of CSIA in the Environment. **Invited.** European Union Marie-Curie Integrated Training Network CSI Environment Final Meeting. Obernai, France. Oct. 2014
- Ballentine, C.J., Sherwood Lollar, B, *Lacrampe-Couloume, G., Sutcliffe, C., Holland, G., Zhou, Z., Li, L., Fellowes, J., Warr, O.* Determining the role of water in hydrocarbon-rich crustal systems. **Invited.** Pardee Keynote Symposia (GSA). Vancouver, B.C. October, 19-22, 2014.
- Sherwood Lollar, B. Carbon-bearing Fluids in Precambrian Rocks: Deep Energy for Deep Life. **Invited.** Deep Carbon Short Course. Vancouver, B.C. October, 19-22, 2014.
- Mancini, S.A., *Passeport, E.* and Sherwood Lollar, B. The Use of CSIA to investigate sources and degradation of chlorobenzenes. Consortium on Groundwater Remediation. **Invited.** Denver, CO. Oct. 2014
- Onstott, T.C., Lau, M.C.Y., Magnabosco, C., Lindsay, M., Alleva, R., Tetteh, G., Kieft, T.L., Pullin, M.J., Hendrickson, S., Cameron, C., Schilkey, F.D., Grim, S., Morrison, H., Sogin, M., Kuloyo, O., Linage-Alvarez, B., Cason, E., Erasmus, M., van Heerden, E., Borgonie, Slater, G.F., *Simkus, D., Lacrampe-Couloume, G., Sherwood Lollar, B., Labonté, J. and Stepanauskas, R.* Does Your Deep Biosphere differ from My Deep Biosphere? What Comparative Genomics Tells Us. **Invited.** 10<sup>th</sup> International Congress on Extremophiles. Saint Petersburg, Russia. Sept. 7-11, 2014.
- Sherwood Lollar, B., Holland, G., *Li, L., Lacrampe-Couloume, G., Slater, G.F., Onstott, T.C.* and Ballentine, C.J. Tracers in the Deep: Ancient waters and subsurface microbiology of the Precambrian Shields. **Invited.** Helmholtz Institute, Leipzig, Germany. Sept. 2014.
- Ono, S., Wang, D., Gruen, D., Sherwood Lollar, B., McManus, B., Zahniser, M., Nelson, D. Measurements of clumped methane isotopologue (<sup>13</sup>CH<sub>3</sub>D) by tunable mid-infrared laser direct absorption spectroscopy. **Invited.** The 7<sup>th</sup> International Symposium on Isotopomers. Tokyo, Japan. July 1-4, 2014.
- Ono, S., Wang, D., *Gruen, D., Sherwood Lollar, B., McManus, B., Zahniser, M.* and Nelson, D. Measurements of clumped methane isotopologue (<sup>13</sup>CH<sub>3</sub>D) by tunable mid-infrared laser spectroscopy. **Keynote.** 24<sup>th</sup> Annual V.M. Goldschmidt Conference. Sacramento, CA. June 8-13, 2014.
- Sherwood Lollar, B., Holland, G., *Li, L., Lacrampe-Couloume, G., Slater, G.F., Onstott, T. C., and Ballentine, C.J.* Ancient waters of the Precambrian Shields: Implications for subsurface life and astrobiology. **Invited.** NSERC CREATE Canadian Astrobiology Training Program (CATP) Annual Meeting, Montreal, QC. June 2-4, 2014.
- Sherwood Lollar, B. Exploring the Biotic/Abiotic Fringe: Integration of Deep Life and Deep Energy. **Keynote.** Deep Energy- Deep

Life Joint Workshop Deep Carbon Observatory and Sloan Foundation, Lyon, France April 8, 2014

Sherwood Lollar, B. Insights into enzymatic transformation of organic contaminants using CSIA. **Invited.** Gordon Research Conferences on Isotopes in Chemical and Biological Sciences, Galveston, TX. Feb. 2-7, 2014.

Sherwood Lollar, B., Holland, G., *Li, L., Lacrampe-Couloume, G., Slater, G.F., Onstott, T. C., and Ballentine, C.J.* **Invited.** Deep mining exploration reveals ancient waters of the Precambrian Shield. The Toronto Geological Discussion Group (TGDG), Toronto, ON. Jan 21, 2014.

Sherwood Lollar, B., Ballentine, C.J., Holland, G., *Li, L., Slater, G.F. and Moser, D.P.* The deep cool Terrestrial Biosphere: Habitability of ancient fracture waters of the Canadian Shield. **Invited.** American Geophysical Union Annual Fall Meeting, San Francisco, CA. Dec. 9-13, 2013.

Sherwood Lollar, B. Continental lithosphere doubles global hydrogen flux estimates for the deep biosphere. Massachusetts Institute of Technology **Invited** Seminar. Nov. 2013

Sherwood Lollar, B. Ancient water of the Precambrian Shield: Implications for subsurface life and Astrobiology. **Invited.** NASA Astrobiology Institute Directors Seminar Series, Mountain View, CA. Nov. 25, 2013.

Sherwood Lollar, B. New view of reduced gas flux from the Precambrian Continental Lithosphere. Centre for Global Change Science Distinguished Lecturer Series. **Invited.** University of Toronto, Toronto, Canada. Oct. 1, 2013.

Sherwood Lollar, B. Ancient water of the Precambrian Shield: Implications for subsurface life and Astrobiology. **Invited.** Origins Institute Lecture Series, McMaster University, Hamilton, Canada. Sept. 30, 2013.

Sherwood Lollar, B., *Brisco, T., Esen, B. and Lacrampe-Couloume, G.* Billion year old cratons provide clues for habitability of subsurface waters and reduced gases on Mars. **Keynote.** NASA Workshop on Analog Sites for Mars Missions II. Washington DC. Aug. 2013

Sherwood Lollar, B., Onstott, T.C., van Heerden, E., Kieft, T. and Ballentine, C.J. Serpentinization in space and time; Hydrogen flux and energy budget from the terrestrial deep subsurface. Deep Carbon Observatory International Science Meeting– Sloan Foundation Symposium. National Academy of Sciences, Washington D.C., March 3-5, 2013

Sherwood Lollar, B., Onstott, T.C., van Heerden, E., Kieft, T. and Ballentine, C.J. Serpentinization in space and time; A hydrogen energy budget for methane production. DCO Deep Energy Workshop– Sloan Foundation. University of Manchester, United Kingdom. Jan.31-Feb. 1, 2013

Sherwood Lollar, B., Onstott, T.C., van Heerden, E., Kieft, T. and Ballentine, C.J. Life in Inner Space – Subsurface Microbiology Investigations in Underground Research Laboratories and Deep Mines **Invited.** American Geophysical Union Annual Fall Meeting, San Francisco, CA. Dec. 3-7, 2012.

Sherwood Lollar, B. Emerging Trends in CSIA for Environmental Forensics and Bioremediation. University of Toronto, School of the Environment Seminar Series. Toronto Canada Nov. 21, 2012.

Sherwood Lollar, B. Follow the Water - Exploration of the Deep Terrestrial Biosphere. Joint Seminar for the Dept. of Geosciences and Institute for Environmental and Engineering Sciences. University of Stockholm. Sweden. Oct. 2012

Sherwood Lollar, B., Onstott, T.C., Kieft, T.L., *Li, L., van Heerden, E., Slater, G.F., Moser, D.P., Lacrampe-Couloume, G., Holland, G. and Ballentine, C.J.* **Invited.** Network of terrestrial subsurface sites in Precambrian Shields: Insights for early Earth and Mars. 22<sup>nd</sup> Annual V.M. Goldschmidt Conference, Montreal, Quebec, June 24-29, 2012.

Sherwood Lollar, B. Compound Specific Isotope Analysis of Organic Contaminants in Water. Polytechnic University of Milan. Milan Italy. June 2012.

Sherwood Lollar, B. Serpentinization in space ... and time. University of Lyon, France Departmental Seminar Series. May 2012.

Sherwood Lollar, B. Tracers in the Deep. Isotopic insights into subsurface energy for life and microbial metabolism. **Invited.** Seattle,

WA. Nov. 2011.

- Sherwood Lollar, B., van Heerden, E., Onstott, T.C., Kieft, T.M., Itavaara, M. (2011) Follow the water – an search strategy for exploration of the Earth's deep biosphere. **Keynote.** Pardee Symposium, Geological Society of America Annual Meeting. Minneapolis, MN. Oct. 2011.
- Sherwood Lollar, B., van Heerden, E., Onstott, T.C., Kieft, T.M. (2011) Underground research laboratories and deep mines as a window into subsurface microbiology. **Keynote.** 12<sup>th</sup> International Conference on Topics in Astroparticle and Underground Physics. Munich, Germany. Sept. 5-9, 2011
- Sherwood Lollar, B. Tracers in the Deep. Isotopic insights into subsurface energy for life and microbial metabolism. **Keynote.** International Symposium on Subsurface Microbiology. Garmisch-Partenkirchen, Germany. Sept. 11-16, 2011.
- Sherwood Lollar, B. Emerging trends in contaminants research from CSIA. **Invited.** CSI-Environment Meeting. Prague CZ. Aug. 19-20, 2011
- Sherwood Lollar, B. Biosignatures and Clues to Life: Implications for Origins of Life and Bioastronomy. **Invited** Introductory Talk. Origins 2011 Joint Meeting of the ISSOL (International Astrobiology and Origins of Life Society) and Bioastronomy Society. Montpellier, FR. July 3-8, 2011.
- Sherwood Lollar, B. **Invited Panel Presentation** CSIA: Monitoring and Assessing Biogeochemical Processes. Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV. June 27-30, 2011.
- Mundle, S.O.C., Johnson, T., Lacrampe-Couloume, G., Duhamel, M., Perez-de-Mora, A., Edwards, E.A., Kluger, R., Sherwood Lollar, B., Tiedeman, C. R., Revesz, K., Imbrigiotta, T. E., Cox, E.* Using <sup>13</sup>C isotope signatures of ethene as a direct indicator to assess the accumulation of toxic daughter products of trichloroethene. **Invited.** Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV. June 27-30, 2011.
- Chan, C.H., Tang, S., Eckert, T., Lacrampe-Couloume, G., Edwards, E.A., Sherwood Lollar, B.* Compound specific isotope analysis on biotic degradation of chloroform and implication for monitoring anthropogenic-sourced trichlorinated carbon compounds. **Invited.** Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV. June 27-30, 2011.
- Elsner, M., Lacrampe-Couloume, G., Mancini, S., Burns, L. and Sherwood Lollar, B.* The use of compound specific isotope analysis (CSIA) to distinguish between biotic and abiotic degradation of chlorinated hydrocarbons in the field. **Invited.** Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies, Reno, NV. June 27-30, 2011.
- Sherwood Lollar, B. Far Field Microbiological considerations relevant to a deep geological repository: Nuclear Waste Management Organization **Invited.** The 9th Annual NWMO Geoscience Seminar. Hockley Valley, ON. June 6-8, 2011.
- Sherwood Lollar, B. Insights into deep carbon and subsurface microbial life derived from noble gases. **Invited Departmental Seminar.** Institute de Physique du Globe (IPGP), Universite de Paris, Paris France. April 2011.
- Sherwood Lollar, B., Ballentine, C.J., and Shock, E. Deep Horizons: Research themes within the Deep Carbon Observatory and links to astrobiology. **Invited.** Webinar for Canadian Astrobiology Training Program (NSERC Create). March 2011.
- Sherwood Lollar, B., Ballentine, C.J., and Shock, E. Deep Horizons - Implications of the deep carbon cycle for life, energy and the environment. **Invited.** American Geophysical Union Annual Fall Meeting, San Francisco, CA. Dec. 13-17, 2010.
- Sherwood Lollar, B. and Ballentine, C.J. Moving beyond tracers: <sup>13</sup>C insights into carbon sequestration. **Keynote.** Geological Society of America Annual Meeting Denver, CO. Oct. 31-Nov. 3, 2010.
- Sherwood Lollar, B. Noble gas-derived insights into carbon cycling into the deep biosphere. **Invited.** Washington University at St. Louis, Departmental Seminar St. Louis, Oct. 2010.
- Sherwood Lollar, B. Beyond the Deep Hot Biosphere: Subsurface Microbiology of the Deep Continents. **Invited.** Gordon Research Conference in Organic Geochemistry. Holderness NH. Aug. 1-6, 2010

- Sherwood Lollar, B. and Ballentine, C.J. Moving beyond tracers: 13C insights into carbon sequestration. **Keynote-1** 20<sup>th</sup> Annual V. M. Goldschmidt Conference, Knoxville TN June 21-25, 2010.
- Ballentine, C.J. and Sherwood Lollar, B. Noble gas isotope insights into the geological storage of carbon. **Keynote-2** 20<sup>th</sup> Annual V. M. Goldschmidt Conference, Knoxville TN June 21-25, 2010.
- Sherwood Lollar, B., McKelvie, J., *Elsner, M., Mancini, S., Johnson, T.*, Simpson, M., Simpson, A., Edwards, E., Gossett, J., Jennings, L., Spain, J. and Cox, E. **Invited**. New developments in forensic evaluation of contaminant sources and microbial degradation pathways using CSIA. Seventh International Battelle Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, CA. May 2010.
- Sherwood Lollar, B. Noble gas-derived insights into carbon cycling into the deep biosphere. **Invited**. Penn State Departmental Colloquium. April 2010. State College, PA.
- Sherwood Lollar, B., Morrill, P.L., Cody, G.D., Fogel, M.L., Lacrampe-Couloume, G., McCollom, T.M., Seewald, J.S., Weinberger, D. **Invited**. Bridging the gap between experimental and field investigations of abiotic hydrocarbon synthesis. ABSCICON 2010. Astrobiology Science Conference. League City Tx. April 26-29, 2010.
- McCollom, T.M., Sherwood Lollar, B., *Lacrampe-Couloume, G.*, and Seewald, J.S. **Invited**. The role of carbon source in abiotic hydrocarbon synthesis and isotope fractionation under hydrothermal conditions. ABSCICON 2010. Astrobiology Science Conference. League City Tx. April 26-29, 2010.
- Sherwood Lollar, B. **Invited**. Astrobiology: The Search for Signs of Life in Outer and Inner Space. Presentation to Canadian Institute for Advanced Research (CIFAR) Board. Petroleum Club. Calgary AB. Oct 2009.
- Sherwood Lollar, B. **Invited**. Astrobiology - the Study of Life in the Universe. Presentation to Canadian Institute for Advanced Research (CIFAR) Board. Toronto ON. June 2009.
- Ballentine, C.J., Gilfillan, S.M.V., Sherwood Lollar, B., Holland, G., Blagburn, D., Stevens, S., Schoell, M., Cassidy, M., Ding, Z., Zhou Z. and *Lacrampe-Couloume G.* **Invited**. Carbon dioxide gas fields: A science gold mine. The 10<sup>th</sup> International Conference on Gas Geochemistry (ICGG). Cluj-Napoca, Romania. Sept. 14-21, 2009.
- Sherwood Lollar, B., *Tille, S., Moran, J., Voglesonger, K., Lacrampe-Couloume, G.*, Onstott, T.C. and Slater, G.F. (2009) The deep cool terrestrial biosphere: Fracture waters and dissolved gases at > 2.5 km in the Canadian Shield. **Invited**. 19<sup>th</sup> Annual V. M. Goldschmidt Conference, Davos, Switzerland. June 21-26, 2009.
- Gilfillan, S.M.V., Sherwood Lollar, B., Holland, G., Blagburn, D., Stevens, S., Schoell, M., Cassidy, M., Ding, Z. *Lacrampe-Couloume, G., Zhou, Z.* and Ballentine, C.J. CO<sub>2</sub> dissolution in formation water dominant sink in natural gas fields. **Invited**. 19<sup>th</sup> Annual V. M. Goldschmidt Conference, Davos, Switzerland. June 21-26, 2009.
- Sherwood Lollar, B., Tille, S., Moran, J., Voglesonger, K., Lacrampe-Couloume, G., Onstott, T.C., Pratt, L.M. and Slater, G.F. (2009). **Invited**. Hydrogeologic Controls on the Deep Terrestrial Biosphere - Chemolithotrophic Energy for Subsurface Life on Earth and Mars. American Geophysical Union Spring Meeting. May 24-27, 2009. Toronto, ON Canada.
- Sherwood Lollar, B. Earth subsurface analogues and relevance for Martian methane. **Invited Lecture** to CIFAR Astrobiology Workshop. Toronto ON. April 2009.
- Sherwood Lollar, B., Edwards, E., Hirschorn, S., Mancini, S., and Devine, C. Compound Specific Stable Isotope Fractionation to Distinguish Metabolic Pathways in Microbial Systems. **Invited Lecture. REMTEC 09**. Atlanta GA. March 3-5, 2009.
- Edwards, E. and Sherwood Lollar, B. Compound Specific Isotope Analysis as a natural reaction probe for delineation of microbial degradation pathways. **Invited**. REMTEC 09. Atlanta GA. March 3-5, 2009.
- Sherwood Lollar, B. Tracers in the deep: Isotopic and geochemical evidence for H<sub>2</sub> autotrophy and methanogenesis in the deep subsurface. **Invited Lecture**. Arizona State University. Tempe AZ March 2009.

- Sherwood Lollar, B. Tracing contaminant source and fate in groundwater using compound specific isotope analysis. University of Florida Hubbell **Distinguished Lecture**. Feb. 2009. Gainesville, FL.
- Sherwood Lollar, B. Stable isotopes to determine the origin of hydrocarbon gases. **Invited Lecture** to NWMO (Nuclear Waste Management Organization) Toronto ON. Jan. 2009
- Sherwood Lollar, B., McCollom, T., Seewald, J.S. and *Lacrampe-Couloume, G.* Abiotic Organic Hydrocarbon Chemistry of the Terrestrial Deep Subsurface: Isotopic Constraints on Reaction Mechanisms. **Invited**. American Geophysical Union Fall Meeting. San Francisco, CA. Dec. 15-19, 2008.
- McKelvie, J.*, Mackay, D., Scow, K., Kaiser, P. and Sherwood Lollar, B. 2008. Quantification of *in situ* biodegradation rates of groundwater contaminants using laboratory-derived isotopic enrichment factors. **Invited**. Geological Society of America Annual Meeting. Houston TX. Oct. 5-9, 2008.
- Ballentine, C.J., Gilfillan, S., Holland, G., Zhou, Z., Sherwood Lollar, B. And Cassidy, M. 2008. The geological storage of CO<sub>2</sub>: Quantification of natural gas/groundwater interaction. **Keynote**. 18<sup>th</sup> Annual V. M. Goldschmidt Conference, Vancouver BC July 13-18, 2008.
- Sherwood Lollar, B. Deep abiotic synthesis of organic molecules, and the abiotic-biotic controversy. **Keynote**. Deep Carbon Cycle Sloan Foundation Workshop. Carnegie Institute of Washington. May 15-17, 2008.
- Sherwood Lollar, B. Using stable carbon and hydrogen isotope analysis to characterize microbial degradation of organic contaminants in groundwater. Electron Transfer Processes at Biogeochemical Gradients Workshop. **Invited Keynote**. UFZ Leipzig, Germany. March 4-7, 2008.
- Sherwood Lollar, B. Compound Specific Isotope Geochemistry for Assessment and Quantification of Remedial Performance. **Invited**. Partners in Environmental Technology Technical Symposium and Workshop. SERDP-ESTCP. Washington DC. Dec. 4-7, 2007.
- Sherwood Lollar, B. *Mancini, S., Morrill, P., Elsner, M.E., VanStone, N., Chartrand, M.M.G., Hirschorn, S., McKelvie, J., Lacrampe-Couloume, G.,* Edwards, E. The role of vital effects on stable carbon isotope fractionation during transformation of hydrocarbon contaminants in groundwater: Implications for identification of reaction pathways and quantification. **Keynote** International Workshop on Stable Isotope Tools for the Assessment of Chemical and Microbial Transformation Reactions in Complex Natural and Contaminated Environments. Swiss Federal Institute of Technology (ETH) Zurich Mt. Verita CH Nov. 18-23, 2007.
- Sherwood Lollar, B., *Chartrand, M.M.G., Hirschorn, S., Howlett, M.,* Bidleman, T., Jantunen, L., *Mancini, S., McKelvie, J., Lacrampe-Couloume, G.* and Edwards, E.A. Compound Specific Stable Isotope Analysis: Research Frontiers in Isotope Hydrology and Water Resources Management. **Invited Keynote**. International Symposium on Advances in Isotope Hydrology and its Role in Sustainable Water Resources Management. Vienna Austria. May 21-25, 2007.
- Sherwood Lollar, B. Tracers in the Deep: Hydrogeologic controls on release of H<sub>2</sub> energy for deep subsurface life. **Invited**. Stanford University Oceans Seminar Series. Palo Alto, CA. April 2007.
- Elsner, M., Cwiertny, D.M., *Chartrand, M.M.G., Lacrampe-Couloume, G.,* Roberts, A.L. and Sherwood Lollar, B. Probing oxide surface reactivity with organic contaminants: From kinetic and product studies to stable isotope fractionation. **Invited**. American Chemical Society Annual Spring Meeting. Chicago, IL. March 25-29, 2007. Awarded **American Chemical Society Division of Environmental Chemistry Certificate of Merit**
- Sherwood Lollar, B. Life's Chemical Kitchen: Support of deep terrestrial subsurface life by abiogenic hydrogen and hydrocarbons. **Invited**. United States Geological Survey Western Region Colloquium Seminar Series. Menlo Park, CA. March 19, 2007.
- Sherwood Lollar, B. Hydrogen-rich fluids in the deep earth: Potential for chemoautotrophy. **Royal Society of Canada - Science Council of Japan WISSET Invited Lecture**. Tokyo Institute of Technology, Tokyo, Japan. Jan. 2007.
- Sherwood Lollar, B. Stable Isotope Geochemistry and Groundwater Remediation. **Royal Society of Canada - Science Council of Japan WISSET Invited Lecture**. Ochanomizu University, Tokyo, Japan. Jan. 2007.



- Sherwood Lollar, B. Hydrogen-rich fluids in the deep earth: Potential for chemoautotrophy. **Royal Society of Canada - Science Council of Japan WISER Invited Lecture.** Japan Agency for Marine-Earth Science & Technology (JAMSTEC) Yokohama, Japan. Jan. 2007.
- Sherwood Lollar, B. Challenges for Women in Science and Engineering in Canada. **Royal Society of Canada - Science Council of Japan WISER Invited Lecture.** National Womens' Education Centre (NVEC) Saitama, Japan. Jan. 2007.
- Sherwood Lollar, B., Lacrampe-Couloume, G., Slater, G.F., Telling, J. and Voglesonger, K. H<sub>2</sub>-rich fluids in the deep Earth: Potential for chemoautotrophic microbial ecosystems. Origins Institute **Invited Seminar.** McMaster University, Hamilton, ON. October 2006.
- Sherwood Lollar, B. Lacrampe-Couloume, G., Telling, J., Slater, G.F. and McCollom, T.M. Compound specific isotope analysis and the challenge for identifying life: the role of biosignatures and abiosignatures. **Invited.** 16<sup>th</sup> Annual V. M. Goldschmidt Conference, Melbourne Australia. Aug. 2006.
- Onstott, T.C., Pratt, L.M., Clifford, S.M., Sherwood Lollar, B. and Phelps, T.J. Martian subsurface biomes: How important is radiolysis? **Invited.** 16<sup>th</sup> Annual V. M. Goldschmidt Conference, Melbourne Australia. Aug. 2006.
- Sherwood Lollar, B. H<sub>2</sub>-rich fluids in the deep earth - Role of abiogenic water-rock interactions and potential for chemolithoautotrophy. **Invited.** Gordon Research Conference on Organic Geochemistry Holderness School, NH. Aug. 2006.
- Sherwood Lollar, B. Isotopic constraints on habitability and activity of the deep biosphere - tales from 2-3.5 km in the deep Precambrian Shield groundwaters. **Invited.** University of Southern California International Geobiology Symposium on the Deep Biosphere. June 2006. Santa Catalina CA.
- Sherwood Lollar, B. Telling, J., Lacrampe-Couloume, G., Slater, G.F., Onstott, T.C. and Pratt, L.M. Distinguishing abiogenic versus biogenic sources of methane and implications for Mars exploration. **Invited Keynote.** American Geophysical Union Spring Meeting. Baltimore MD May 2006.
- Sherwood Lollar, B. Using stable carbon isotope analysis to identify source and degradation of chlorinated solvents in groundwater. **Invited talk.** Buckley Lecture in Environmental Geology. University of Illinois. Urbana, IL. April 2006
- Sherwood Lollar, B. Tracing contaminant source and fate in groundwater using stable carbon isotope analysis. **Invited talk.** Division of Earth and Ocean Sciences. Duke University. Durham NC. April 2006
- Sherwood Lollar, B. Tracers in the Deep: Isotopic and geochemical evidence for H<sub>2</sub> autotrophy and methanogenesis in the deep subsurface. **Invited talk.** University of Toronto at Mississauga. Feb. 2006
- Sherwood Lollar, B. Tracers in the Deep: Isotopic and geochemical evidence for H<sub>2</sub> autotrophy and methanogenesis in the deep subsurface. **Invited talk.** Centre for Applied Geosciences. University of Tuebingen. Tuebingen, Germany. Jan. 2006
- Sherwood Lollar, B. Contaminant source and fate in groundwater using stable carbon isotopes. **Invited talk.** Centre for Applied Geosciences. University of Tuebingen. Tuebingen, Germany. Jan. 2006
- Sherwood Lollar, B. Threats to Canadian Groundwater: Microbial Clean-up and the Challenge of Invisible Technology. **Special Invited Lecture on Technology.** Queen's University. Kingston, Ontario. Nov. 2005.
- Sherwood Lollar, B. Carbon and hydrogen isotope measurements in abiogenic hydrocarbon synthesis. **Invited talk.** Carnegie Institute of Washington, Washington DC. June 2005.
- Sherwood Lollar, B., Telling, J., Lacrampe-Couloume, G., Slater, G.F., Onstott, T.C. and Pratt, L.M. Resolving abiogenic versus biogenic sources of methane and implications for Mars exploration. **Invited Talk.** Methane on Mars NASA Astrobiology Institute Distributed Workshop. NASA Goddard Space Flight Centre, Greenbelt MD. May 18, 2005.
- Sherwood Lollar, B. Use of stable isotopes to evaluate contaminant degradation. **Invited.** 2005 CNYAPG Symposium on Isotopic Geochemistry. Skeneatales NY. April 2005.

- McKelvie, J., Sherwood Lollar, B., *Lacrampe-Couloume, G.*, (University of Toronto), Mackay, D., de Sieyes N.R. and M.D. Einarson. Assessing the impact of ethanol on MTBE and BTEX biodegradation using compound specific isotope analysis. **Invited Student Poster**. 2005 CNYAPG Symposium on Isotopic Geochemistry. Skeneatales NY. April 2005.
- Mancini, S., Ulrich, A. Sherwood Lollar, B., *Lacrampe-Couloume, G.*, and E. Edwards. Elucidating Pathways of Benzene Biodegradation In Subsurface Environments Using Carbon and Hydrogen Isotope Analysis. **Invited Student Poster**. 2005 CNYAPG Symposium on Isotopic Geochemistry. Skeneatales NY. April 2005.
- Sherwood Lollar, B., *Telling, J.P.*, *Lacrampe-Couloume, G.*, Fu, Q., Seyfried, Jr., W., Horita, J. and T.M. McCollom. Carbon and hydrogen isotope measurements in abiogenic hydrocarbon synthesis. **Invited**. 15<sup>th</sup> Annual V. M. Goldschmidt Conference, Moscow, ID. May 2005.
- Sherwood Lollar, B. Threats to Canadian Groundwater: Canadian Solutions for Hydrocarbon Pollution. **Invited**. Bacon & Eggheads lecture series to Members of Parliament. Ottawa ON. May 2005.
- Sherwood Lollar, B. Slater, G.F., Moser, D.P., Gihring, T.M., Telling, J., *Lacrampe-Couloume, G.*, Lin, L.-H., and T.C. Onstott. Abiogenic gases, H<sub>2</sub>-based autotrophy and methanogens in the deep subsurface. **Keynote** for session on "Biogeochemistry at the Limits of Habitability", American Chemical Society Annual Meeting, San Diego CA. March 2005.
- Sherwood Lollar, B. Unravelling abiogenic and biogenic sources of methane - Implications for the Earth's deep biosphere and astrobiology. **Invited** Departmental Lecture. School of Geology and Geography. McMaster University. Hamilton ON. Feb. 2005
- Sherwood Lollar, B. Novel geochemical and isotopic techniques for delineating abiotic versus biotic sources of hydrocarbons in the subsurface. **Invited**. Canadian Mining Industry Research Organization (CAMIRO) - Exploration Division, Soil Gas Hydrocarbons Meeting. Toronto, ON. Dec. 2004
- Sherwood Lollar, B. Use of Compound Specific Stable Isotope Techniques for Quantification of Biodegradation Rates. **Keynote**. UNESCO Workshop on Transport and Fate of Diffuse Organic Contaminants in Catchments. GSF-Research Centre for Environment and Health, Munich Germany. Dec. 2004
- Sherwood Lollar, B. Stable Isotope Forensics: Promise and Pitfalls. **Invited**. Golder Associates Inc. Symposium on Innovative Strategies for Management of Contaminated Sites. Toronto, ON. Nov. 2004.
- Sherwood Lollar, B. Stable Isotope Environmental Geochemistry - Recent Advances. **Invited**. Fields Institute - Research in Mathematical Sciences Annual Conference for Fellows of the Royal Society Canada. Toronto, Ont. Oct. 2004.
- Sherwood Lollar, B. Geological and Geochemical Controls on the Earth's Deep Biosphere. **Invited**. Canadian Institute for Advanced Research (CIAR) - Earth Systems Evolution Program Annual Meeting. Toronto, Ont. Sept. 2004.
- Sherwood Lollar, B. Stable Isotope Environmental Geochemistry - Recent Advances. **Keynote**. Notre Dame Environmental Education and Research Symposium. Dept. of Civil Engineering and Geological Sciences. University of Notre Dame, Notre Dame IN. Nov. 12, 2003.
- VanStone, N.*, *Prezprora, A.*, *Vogan, J.*, *Hart, S.* *Lacrampe-Couloume, G.*, *Mabury, S.* and B. Sherwood Lollar. Using stable carbon isotope analysis to assess the performance of an iron PRB for the remediation of TCE. **Invited**. Remediation Technology Development Forum. Niagara Falls, NY. Oct. 2003
- Sherwood Lollar, B. The origin of hydrocarbon gases in Precambrian environments. **Invited**. Dept. of Geological Sciences Departmental lecture series, Harvard University, Cambridge MA. Nov. 25, 2002.
- Sherwood Lollar, B. *G.F. Slater, Ward, J., Westgate, T. and G. Lacrampe-Couloume.* **Invited**. Canadian Institute of Mining Ore Deposits at Depth 2003 - Challenges and Opportunities. Gases and Fluids in the Precambrian Shield: Implications for Deep Mining. Timmins, ON Sept. 2003

- Sherwood Lollar, B. Deep Crustal gases and Fluids: Interactions with the Deep Biosphere. Hubbert Quorum on Hydrogeology. **Invited.** United States Geological Survey, Menlo Park, CA. Dec. 5, 2002.
- Sherwood Lollar, B. Compound Specific Isotope Analysis: A Novel Method of Assessment and Quantification of In Situ Remediation Potential. **Invited.** American Geophysical Union Fall Meeting. San Francisco CA. Dec. 6-10, 2002.
- Onstott, T.C., Lin, L.-H., Fredrickson, J.K., Moser, D.P., Gihrig, T.M., Brockman, F.J., Phelps, T.J., Pfiffner, S., Peacock, A., White, D.C., Kieft, T., McCuddy, S., Sherwood Lollar, B., Ward, J., Slater, G., Pratt, L.M., Boice, E., Fong, J. The Witwatersand Deep Microbiology project: Observations pertaining to hypothetical microbial ecosystems beneath the surface of Mars. **Invited.** American Geophysical Union Fall Meeting. San Francisco CA. Dec. 6-10, 2002.
- Sherwood Lollar, B., Ward, J., Slater, G., Lacrampe-Couloume, G., Hall, J., Lin, L., Moser, D. and Onstott, T.C. Hydrogen and hydrocarbon gases in crystalline rocks: Implications for the deep biosphere. **Invited.** National Science Foundation Neutrinos and Subterranean Science Symposium, Washington D.C. Sept. 19-21, 2002.
- Sherwood Lollar, B. Deep crustal gases and fluids: Implications for the Deep Biosphere. **Invited.** Canadian Geoscience Council - Standing Committee on the International Continental Scientific Drilling Program - Scientific Drilling of the Sudbury Structure. Sept. 11-12, 2002.
- Sherwood Lollar, B. The origin of hydrocarbon gases in Precambrian environments. **Invited.** National Underground Science Laboratory Geomicrobiology Meeting. Lead, S.D. Nov. 29-30, 2001.
- Sherwood Lollar, B. **Key Note** New developments in isotopic tracers on contaminant degradation. **Key note.** The 3<sup>rd</sup> Asia-Pacific Symposium on Environmental Geochemistry. Guangzhou, China. Nov. 7-9, 2001.
- Sherwood Lollar, B. Applications of stable isotopes to investigate biodegradation of chlorinated ethenes. **Invited.** Department of Chemical Engineering and Chemistry. University of Toronto. Departmental Lecture Series. Oct. 2001
- Onstott, T.C., Moser, D.P., Pfiffner, S., White, D.C., Peacock, A., Phelps, T., DeFlaun, M.F., Hoek, J., Ghiorse, W.C., Colwell, F., Kieft, T., Reysenbach, A.-L., Fredrickson, J.K., Southam, G., Kotelnikova, S., Omar, G., Slater, G.F., Pratt, L.M., Boone, D. and Sherwood Lollar, B. **Invited.** Do superplumes select for hyperthermophiles in the deep subsurface. Earth Systems Processes - Global Meeting. Edinburgh. June 24-28, 2001.
- Sherwood Lollar, B. and *Westgate, T.* **Invited.** Carbon isotopic evidence for abiogenic synthesis of C1-C4 hydrocarbons in crystalline rock environments. Symposium on "Abiotic formation of organic species in hydrothermal systems: Catalytic and mineral-fluid equilibria" 11<sup>th</sup> Annual V. M. Goldschmidt Conference. Roanoke, Virginia, May 20-24, 2001.
- Sherwood Lollar, B. **Key Note** New developments in isotopic tracers on contaminant degradation. Symposium on "The Geochemistry of Contaminated Aquifers" 11<sup>th</sup> Annual V. M. Goldschmidt Conference. Roanoke, Virginia, May 20-24, 2001.
- Sherwood Lollar, B. Stable isotopic tracers for contaminant biodegradation. **Invited lecture** at Meteorological Service of Canada. Downsview, Ontario. Feb. 2001
- Slater, G.F.*, Sherwood Lollar, B., Sleep, B. and Edwards, E. Variability in carbon isotopic fractionation during biodegradation of chlorinated ethenes. **Invited.** American Geophysical Union Annual Meeting. San Francisco, CA. Dec 15-19, 2000.
- Sherwood Lollar, B. Earth surface processes and environmental science: A geologist's perspective. **Invited.** Geo Canada 2000 Summit Session. Annual Meeting of Geological Association of Canada. Calgary Alberta, May 2000.
- TC Onstott, DP Moser, H Dong, J.Fredrickson, FJ Brockman, TJ Phelps, SM Pfiffner, A Peacock, DC White, S Macnaughton, FS Colwell, DL Balkwill, MF DeFlaun, T Kieft, DR Boone, AL Reysenbach, J Hoek, GI Omar, WC Ghiorse, G Southam, G Slater, B Sherwood Lollar, S Kotelnikova, K Pedersen, L Pratt, J Fong, B Baker, C Wimpee, B MacGregor, S Fishbain, DA Stahl, M Stute, and R Hoover. (1999) The Witwatersand Deep Microbiology Project: A Window Into the Extreme Environment of Deep Subsurface Microbial Communities. **Invited.** American Geophysical Union Fall Meeting. San Francisco CA. Dec.1999.

Sherwood Lollar, B., Slater, G.F., Ahad, J., Sleep, B. and Edwards, E. (1999) Use of stable carbon isotope to trace bioremediation of organic contaminants. **Invited Plenary**. 14th International Symposium on Environmental Biogeochemistry. Sept. 26-30, 1999. Deerhurst, Ontario, Canada.

Sherwood Lollar, B., Slater, G.F., Ahad, J., Sleep, B. M. Witt, G. Klecka, M. Harkness, J. Spivack (1999) Stable carbon isotope evidence for intrinsic bioremediation of tetrachloroethene (PCE) and trichloroethene (TCE) at Area 6, Dover Air Force Base. University Consortium on Solvents-in-Groundwater Fall Meeting. Hocley Valley Resort, Ontario (Sept. 1999). **Invited**.

Slater, G.F., Sherwood Lollar, B. Sleep, B. Edwards, E. and Lee, R.W. Isotopic fractionation associated with biodegradation of chlorinated hydrocarbons: laboratory and field results. University Consortium on Solvents-in-Groundwater Fall Meeting. Portland, Oregon (Oct. 1998). **Invited**.

Sherwood Lollar, B. Stable carbon isotopes - Tools for detection of the origin and fate of environmental contaminants. Geological Society of America Annual Meeting. Toronto. (Oct. 1998). **Invited**. (Oct. 1998)

Ballentine, C.J. and Sherwood Lollar, B. Origins of non-hydrocarbon gases in the Texas Panhandle and Hugoton gas fields. 8th Annual V.M. Goldschmidt Conference. **Invited**. Toulouse, France (Aug. 1998).

Sherwood Lollar, B. Tracing organic contaminants in groundwater using compound specific isotope ratio mass spectrometry (GC/C/IRMS). University Consortium on Solvents-in-Groundwater Fall Meeting. Toronto, Ont. **Invited**. (Oct. 1997).

Slater, G.F., Dempster, H. and Sherwood Lollar, B. Headspace equilibration applied to isotopic analysis of low level dissolved organic contaminants. University Consortium on Solvents-in-Groundwater Fall Meeting. Toronto, Ont. **Invited**. (Oct. 1997).

Plus 44 more invited and other lectures in the previous 10 years.

## **12. THESES SUPERVISED** (I am primary supervisor for all those listed except where indicated with \*, indicating joint supervision)

### **High School Co-op Education Students**

**Mark Janelle** Jan-June 2005

**Logan Germain** Summer 2015

### **NSERC USRA Summer Students**

**S. Desrocher** (Geology) (1994 and 1995)

**C. Norcross** (Geology) (1995)

**J. Gray** (Geology) (2000)

**C. Hunter** (Geology) (2000)

**S. Hirschorn** (Geology) (2001)

**A. Pierce** (Geology) (2002)

**M. Chartrand** (Chemistry) (2002)

**J. Liu** (Chemistry) (2008)

**C. Chan** (2009 and 2010)

**S. Yang** (2011) NSERC Create Scholarship via Canadian Astrobiology Training Program (CATP)

**G. Lollar** (Earth Science and Microbiology) (2015)

**P. Watt** (Earth Science) (2015)

**G. Lollar** (Earth Science and Microbiology) (2016)

### **Undergraduate Students**

**Crystal Beaudoin** (2010)

**Xia Zhu** (2014-2015)

**C. Sica** (2015)

**J. Manna** (2016)

### **4th Year Research Theses:**

Isotopic and geochemical constraints on the migration of CH<sub>4</sub> from Beare Rd Landfill Toronto, Ontario

**S. Desrocher** (1994-1995) Dept. of Geology

Isotopic and compositional effects of bacterial oxidation of volatile n-alkanes

**C. Norcross** (1994-1995) Dept. of Geology

Hydrogen isotope fractionation during anaerobic biodegradation of toluene

**J. Ward** (1999-2000) Dept. of Geology

Stable carbon isotopes as an indicator of natural attenuation of EDC

**S. Mancini** (1999-2000) Dept. of Geology

Analysis of surface and subsurface borehole sampled gases by a refined GC method able to detect low concentrations of hydrocarbons

**P. Kral** (2003-2004) Dept. of Geology

Development of GC-IRMS techniques for CSIA analysis of pesticides

**C. Rose** (2007-2008) Dept. of Chemistry

Diffusion Membrane Sampler for CSIA of Dissolved Methane in Porewaters

**Adam Virani** (2012-2013) Dept. of Earth Sciences

#### ***Masters Students:***

Bacterial methanogenesis in Canadian Shield groundwaters

**F. Doig** (1994)

An isotopic study of CH<sub>4</sub> and associated N<sub>2</sub> and H<sub>2</sub> gases in Canadian Shield mining environments

**J. Montgomery** (1994)

Carbon cycling in the microbial mats and bottom accumulations of selected lakes of the Cariboo Plateau: Isotopic constraints and implications for interpretation of the geologic record

**G. Slater** (1996) Holder of:

**University of Toronto Open Scholarship 1994-95**

**Ontario Graduate Scholarship 1995-97.**

**NSERC PGS Scholarship 1997-99.**

Bacterial hydrocarbon gases in surficial aquitards and shallow bedrock aquifers in the Western Canadian Sedimentary Basin

**S. Taylor** (1996) Holder of:

**University of Toronto Open Scholarship 1995-96**

**American Association of Petroleum Geologists Grants in Aid of Field Work (\$2000)**

Isotopic applications to contaminant hydrogeology: Using  $\delta^{13}\text{C}$  analysis to investigate the origin and fate of dissolved organic contaminants

**H. Dempster** (1997) Holder of:

**NSERC PGS Scholarship 1995-97**

**Travel Scholarship from American Geophysical Union Spring Meeting, Baltimore 1996.**

CH<sub>4</sub> gas and associated groundwaters at Kidd Creek Mine, Timmins, Ont.

**T. Westgate** (1998) Holder of:

**University of Toronto Open Scholarship 1997-98**

Monitoring stable carbon isotopes during biodegradation of toluene: Implications for contaminated site assessment

**J. Ahad** (2000) Holder of:

**NSERC PGS Scholarship 1998-2000**

Endogenous decay sustaining PCE degradation and associated stable isotope effects

\***A. Brown** (2000) Holder of:

**OGSST Scholarship 1999-2000**

Jointly supervised with Dr. B. Sleep of Dept. of Civil Engineering, University of Toronto

Hydrogen isotopic fractionation: Potential as an indicator of MTBE biodegradation at contaminated field sites

**J. Gray** (2002)

**University of Toronto Open Graduate Scholarship 2000-2001**

**NSERC PGS Scholarship 2001-2002**

Monitoring biodegradation of benzene in groundwater systems using carbon and hydrogen compound specific isotope analysis  
**S. Mancini (2002)**  
**University of Toronto Open Graduate Scholarship 2000-2002**

Identifying subsurface gas origins within the Witwatersrand Basin, South Africa  
**J. Ward (2002)**

Stable carbon isotope fractionation during aerobic and anaerobic biodegradation of ethene  
**Tiffany Johnson (2009)**  
**University of Toronto Entrance Scholarship 2007**  
**NSERC PGS Scholarship 2008**

Application of compound specific stable carbon and hydrogen isotope analysis to monitor biodegradation of monoaromatic compounds  
**Micheal Howlett (2008)**  
**OGSST Scholarship 2007-2008**

**Stephanie Tille 2006-2008 (all thesis work completed but student has not written up thesis)**  
**Holder of Connaught International Student Scholarship for 2006-2007**

Investigation of the anaerobic biodegradation of trichloroethane by the microbial consortium KB-1 using compound specific carbon isotope analysis  
**Lisa Douglas (2010)**

Carbon isotope fractionation during biodegradation of chloroform  
**Calvin Chan (2012)**  
**Explorer's Fund Scholarship**  
**Ontario Graduate Scholarship**  
**Massey College Junior Fellow**

Development of two novel sampling techniques for compound specific isotope analysis of organic contaminants in the environment  
**Mathieu Morin (2012)**

Isotopic composition of methane in fluid inclusions from the Sudbury basin  
**Trevor Brisco (2013)**  
**NSERC Postgraduate Scholarship**

Gas and fluid geochemistry of groundwater in kimberlite-hosted **deposits**  
**Berivan Esen (2013)**  
**Canadian Astrobiology Training Program CREATE Scholarship**

Hydrogen isotope fingerprinting of South West Ontario hydrocarbons  
**Patrick Watt (2015)**  
**Multidisciplinary Applied Geochemistry Network NSERC CREATE Undergraduate Scholarship**

Isotopic signatures of hydrocarbon containing fluid inclusions  
**Cheyenne Sica (2015)**  
**Multidisciplinary Applied Geochemistry Network NSERC CREATE Graduate Scholarship**

Biodegradation and transport of chlorofluorohydrocarbons in the subsurface  
**Jesse Manna (2016)**

Variable fractionation of CF and DCM in the environment  
**Elizabeth Philips (2016)**

***PhD Students:***

Constraining the fate of chlorinated ethenes in groundwater systems using stable carbon compound specific isotope analysis

**G. Slater** (2000)

**NSERC PGS Scholarship 1996-98**

**University of Toronto Open Graduate Scholarship 1998-2000**

G. Slater won the **D.N. Chorafas Foundation Prize** for his PhD. He also won an **NSERC Postdoctoral Fellowship** and a prestigious **Woods Hole Oceanographic Institution Fellowship**. He is currently the **Canada Research Chair** in Environmental Isotope Geochemistry at McMaster University.

Investigation of stable carbon compound specific isotope analysis to monitor and quantify the biodegradation of chlorinated ethanes in groundwater systems

**P. Morrill** (2004)

**University of Toronto Open Graduate Scholarship 1999-2001**

**OGSST Scholarship 2002-2004**

Won the prestigious Carnegie Institute (Washington) DC Postdoctoral Fellowship and NSERC Postdoctoral Fellowship. Currently Assistant Prof. Memorial University of Newfoundland

Investigation of reductive dechlorination reactions of chlorinated ethenes and ethanes on zero-valent metals using compound specific isotopic analysis

**\*N. van Stone** (2005)

**University of Toronto Open Graduate Scholarship 1999-2000**

**CresTECH Industrial Scholarship 2001-2003**

Jointly supervised with Dr. S.A. Mabury of Dept. of Chemistry, University of Toronto

Investigating mechanisms of chlorinated ethane biotransformation using compound specific carbon isotope analysis

**S. Hirschorn** (2007)

**University of Toronto Open Graduate Scholarship 2001-2002**

**NSERC PGS Scholarship 2003-2005**

**Canadian Society for Petroleum Geology Regional Graduate Award 2004-2005**

**Ontario Graduate Scholarship 2005-2006**

Assessing mechanisms of isotopic fractionation during petroleum hydrocarbon biodegradation- Implications for evaluation of in-situ biodegradation

**S. Mancini** (2007)

**NSERC PGS Scholarship 2002-2004**

**Mary H. Beatty Award 2003-2004** (Faculty of Arts & Science, University of Toronto)

**American Petroleum Institute/National Ground Water Association Scholarship 2003-2004**

**Canadian Society for Petroleum Geology Regional Graduate Award 2003-2004**

**Ontario Graduate Scholarship 2005-2006**

**American Association of Petroleum Geologists Student Research Grant 2005**

**GSA Graduate Research Grant** (Awarded Outstanding mention for the top 19 of 800 applications)

Assessing biodegradation pathways and in-situ biodegradation of gasoline constituents using stable isotopes and metabolic intermediates

**J. Gray McKelvie** (2006)

**NSERC PGS 1 Scholarship 2002-2003**

**American Petroleum Institute/National Ground Water Association Scholarship 2002-2003**

**NSERC Canada Graduate Scholarship 2003-2005**

**2003 Institute for Environmental Studies Labatt Award for Excellence**

**American Petroleum Institute/National Ground Water Association Scholarship 2006**

**OGSST J.J. Fawcett Graduate Scholarship 2005-2006**

Held 2007-2008 Ontario Post-Doctoral fellowship at UTSC, NSERC Postdoctoral Fellowship 2008-2010 and L'Oreal Postdoctoral Fellowship 2009-2010.

Verification of biodegradation, delineation of biodegradation mechanisms, and differentiation of sources of chlorinated contaminants using compound specific isotope analysis

**M. Chartrand** (2007)

**NSERC PGS Scholarship 2002-2004**

**American Petroleum Institute/National Ground Water Association Scholarship 2004-2005**

Current position Research Associate University of Ottawa

Co-inhibition effects of TCE and TCA biodegradation investigated using CSIA

**Lisa Douglas** (2015)

**OGSST Scholarship 2010-2011**

**QE II Scholarship 2011-2012**

Noble gas constraints on diffusion controlled transport of hydrocarbons in sedimentary basins

**Annie Cheng** (co-supervised with Dr. C.J. Ballentine Chair of Geochemistry (Oxford University UK)

PhD 2015 to present

Fate and transport of emerging environmental pollutants

**Shirley Lam** (co-supervised with Dr. Elodie Passepourt Dept. of Civil Eng. U of Toronto)

PhD 2014 to present

2015 International Society of Automation Water and Wastewater Scholarship.

Modelling carbon isotope fractionation associated with diffusive transport of contaminants in aquifers and aquitards

**Bruce Xu** (co-supervised with Dr. Brent Sleep Dept. of Civil Eng. U of Toronto)

PhD 2010 to present

**Postdoctoral Fellows:**

**Dr. J.M. Lansdown** – 1992-1995.

Current position - Research Associate, University of Texas, Austin TX

**Dr. Grace Aye** - 1994.

Current position - Chemist - City of London, Ontario, Canada

**\*Dr. C. Wong** – 1999-2002

**U.S. Environmental Protection Agency Bronze Medal for Commendable Service (2000).**

Jointly supervised with Dr. S.A. Mabury of Dept. of Chemistry, University of Toronto

Current position - Dept. of Chemistry, Assist. Professor, University of Alberta

**Dr. G.F. Slater** - 2001

Radiocarbon dating of hydrocarbon gases from Witswatersrand Basin, South Africa

**NSERC Postdoctoral Fellow** and Woods Hole Oceanographic Institution Fellow, Woods Hole Oceanographic Institution Falmouth, MA USA

**Current position - Canada Research Chair** in Environmental Isotope Geochemistry - McMaster University, Hamilton, ON

**Dr. M. Elsner** – 2004-2006

Modeling primary and secondary isotope effects during degradation of CT

**Swiss National Science Foundation Postdoctoral Fellowship 2004-2006**

Present Position Helmholtz Association Professorial Position

GSF National Research Center for Environment and Health, Munich Germany

**Dr. J. Telling** – 2004-2006

NASA Astrobiology Institute - Biosustainable Energy and Nutrient Cycles in the Deep Subsurface of Earth and Mars

**Dr. K. Voglesanger** – 2006-2008

NASA Astrobiology Institute - Biosustainable Energy and Nutrient Cycles in the Deep Subsurface of Earth and Mars

**Dr. I. Jabeen** – 2007-2008

Isotopic analysis of carbon isotopes in methane from fluid inclusions - analytical development



**Dr. J. Moran**- 2007-2009 (co-supervised with Dr. G.F. Slater McMaster University)  
NASA Astrobiology Institute - Biosustainable Energy and Nutrient Cycles  
in the Deep Subsurface of Earth and Mars

**Dr. X. Liang** – 2009-2011  
Abiotic and biotic fractionation comparison to reveal mechanisms of PCE degradation

**Dr. Scott Mundle** – 2010-2014  
Compound specific isotopes as natural probe for reaction chemistry  
Assistant Professor, University of Windsor

**Dr. Long Li** 2009-2012  
Nitrogen and sulfur cycling in the deep subsurface biosphere  
NSERC CREATE PDF Fellowship through CATP (Canadian Astrobiology Training Program)  
**CRC Chair Tier II University of Alberta**

**Dr. Kenna Wilkie** – 2012-2013  
**Sloan Foundation deep Carbon Observatory Fellow**  
Fate of volatile fatty acids in deep subsurface microbial cycling

**Dr. Elodie Passeport** – 2012-2014  
Biodegradation of aromatic hydrocarbons  
**Assistant Professor** and **CRC Tier II** Dept. of Civil Engineering, and Dept. of Chemical Engineering  
University of Toronto

**Dr. Axel Horst** (PhD Stockholm) – 2013-2016  
Compound specific isotope analysis of CFCs  
Won and will take up Marie-Curie Postdoctoral Fellow at Helmholtz Institute Leipzig Germany Fall 2016

**Dr. Nadine Chelsea Sutcliffe** (PhD Oxford) – 2013-2015  
Origin and residence time of deep crustal fluids in Precambrian Shield

**Dr. Jill McDermott** (PhD MIT-WHOI Joint Program) – start date Oct. 2014  
**NSERC CREATE (MAGNET) Postdoctoral Fellow**  
Carbon sources and geochemical cycling of volatile organic acids in deep subsurface microbial communities

**Dr. Chris Glein** (PhD Arizona) – 2014-2015  
Experimental program in abiotic organic synthesis  
**University of Toronto Deane Fellowship**  
**Current Position: SWRI Enceladus Mission Scientist**

**Dr. Lisa Douglas** (PhD U of T) – 2015  
CSIA pathway differentiation during TCE biodegradation

**Dr. Thomas Guinta** (PhD IGP Univ. de Paris) – started Feb 2016

**Dr. T. Gilevska** (PhD Leipzig) – started Jan 2016

**Dr. Oliver Warr** (PhD Oxford) – started May 2016

*Co-supervised Graduate Students under NSERC CREATE Programs:*

**Carol Cheyne** (co-supervised with Dr. Bridget Bergquist under NSERC Create MAGNET program)  
University of Toronto MSc 2013-2015  
Lead isotopes as chronological markers and particulate contaminant tracers in lakes

**Danielle Simkus** (co-supervised with Dr. Greg Slater under NSERC CREATE-CATP)  
McMaster University MSc 2011-2013  
Characterization of PLFA in deep groundwaters

**Raven Comery** (co-supervised with Dr. Lyle Whyte under NSERC CREATE-CATP)  
McGill University MSc. 2012 -2014  
CH<sup>4</sup> generation and flux from high Arctic springs generation and flux from high Arctic springs

**Guillaume Lamarche-Gagnon** (co-supervised with Dr. Lyle Whyte under NSERC CREATE-CATP)  
McGill University MSc. 2010 -2014  
CH<sup>4</sup> generation and flux from high Arctic springs generation and flux from high Arctic springs

**Isabelle Raymond-Bouchard** (co-supervised with Dr. Lyle Whyte under NSERC CREATE Canadian Astrobiology Program)  
McGill University PhD 2012 to 2016  
Molecular microbiology of perennial spring communities

**Gregor Lucic** (co-supervised with Dr. J. Stix McGill NSERC Create MAGNET program)  
McGill University PhD. 2012 to 2015  
An isotope study of volcanic CH<sub>4</sub>, CO<sub>2</sub> and Helium

**Senior Research Associate:**

Dr. G. Lacrampe-Couloume - Sept. 1999 to present

**Junior Research Associate:**

Dr. T. Eckert - Jan. 2009-March 2010 (current position Research Associate University of Guelph)

K. Chu – Sept. 2011 to present

**Laboratory Technician and Manager**

M. Wong - Sept. 2004-Aug. 2005

J. Heidenheim - Sept. 2005-Aug. 2007

C. Heidorn - Jan. 2009-March 2010

**Graduate Supervisory Committee member for:**

**J. De Vera** – (PhD Earth Sciences) Supervisor: **B. Bergquist 2014 to present**

**C. Cheyne** – (MSc Earth Sciences) Supervisor: **B. Bergquist 2013-2015**

**G. Schudel** – (MSc Earth Sciences) Supervisor: **B. Bergquist 2013-2014**

**A. Vandersteen** - (PhD - Chemistry) Supervisor: **R. Kluger 2009-2015**

**P. Chandra** (MSc - Geology) Supervisor: **B. Bergquist 2009-2010**

**P. Chandra** (PhD - Geology) Supervisor: **B. Bergquist 2011-present**

**C. Rose** - (MSc - Geology) Supervisor: **B. Bergquist 2008-2010**

**J. Longstaffe** - (PhD - Chemistry) Supervisor: **A. Simpson 2008-2012**

**S. Mundle** - (PhD - Chemistry) Supervisor: **R. Kluger 2007-2010**

**S.J. Brown** - (PhD - Chemistry) Supervisor: **M. Simpson 2006-2010**

**C. Washer** - (PhD - Chemical Eng. And Applied Chemistry) Supervisor: **E. Edwards 2006-2013**

**K. Torayk** - (PhD - Geology) Supervisor: **F.G. Ferris 2006-2010**

**T. Eckert** - (PhD - Geology) Supervisor: **U. Wortmann 2004-2009**

**J. Dinglasan** - (PhD - Chemistry) Supervisor: **S. Mabury and E. Edwards 2002-2006**

**Natasa Draculic** – (PhD - Geology) Supervisor: **M. Douglas 2002-2007**

**Natalie Caciagli** - (PhD - Geology) Supervisor: **J. Brenan 2001-2009**

**U. Basuki** - (PhD - Geology) Supervisor: **E. Spooner 2001-2006**

**C. Shunthirasingham** - (MSc - Chemistry) Supervisor: **M. Simpson 2004-2005**

**Yvonne Litwin** - (PhD - Geology) Supervisor: **F.G. Ferris 2001-2003**

**Darlene Lim** – (PhD - Geology) Supervisor: **M. Douglas 1999-2003**

**Jonathan Dupe** – (PhD - Geology) Supervisor: **J. Rucklidge 1996-2001**

**Roger Moss** - (PhD - Geology) Supervisor: **S. Scott 1996-2000**

**Rick Gerber** (PhD - Geology) Supervisor: **K.W.F. Howard 1995-98**

**Richard Taylor** (PhD - Geology) Supervisor: K.W.F. Howard **1995-97**

**Xia Li** (MSc - Geology) Supervisor: G. Anderson **1995-97**

**Nurudin Ladah** - (MSc - Geography) Supervisor: J. Gerits. **1995-97**

## **V. ADMINISTRATIVE ACTIVITIES**

### ***13A. COMMITTEES AND ORGANIZATIONS WITHIN THE UNIVERSITY***

Massey College, Corporation Board 2012-2017

Massey College Governance Committee (2015)

Massey College Standing House Committee (2014-2015)

University of Toronto Advisory Committee on Fossil Fuel Divestment (2014-2015)

University of Toronto Internal Review Committee for CFI (2015)

University of Toronto Selection Committee for University Professors (2014)

University of Toronto Governing Council 2003-2007

University of Toronto Governing Council Executive Committee 2004-2007

University of Toronto Academic Appeals Committee 2006-2007

University of Toronto Academic Priorities and Planning 2004-2005

University of Toronto Academic Board 2001-2004

Faculty of Arts and Science Senior Promotions Committee 2002-2005

Faculty of Arts and Science Awards Advisory Committee 2011-2013

Natural Sciences and Engineering Panel of the Research Advisory Board, University of Toronto  
Office the Vice-President, Research and International Relations (1999 to 2002)

Departmental Committees (1992-2015):

Undergraduate Curriculum Renewal Committee

Graduate Affairs Committee

Graduate Awards and Admissions

Undergraduate Affairs Committee

Safety Committee

Public Relations and Curriculum Advisory to Students Committee

Promotions Committee

Academic Appeals

Space Committee

Workload Policy Committee

Member of Search Committees for:

Chairman - Department of Geology 1995

Tenure Stream Appointment in Environmental Geosciences (Geology) 1995

Tenure Stream Appointment in Mathematics - Dean's representative 1997

Tenure Stream Appointment in Structural Geology (Geology) 1999

Chairman - Department of Geology 2000

Canadian Research Chair Tier II Appointment in Climate Change 2002

Senior Lecturer Position 2002

Chairman - Department of Chemistry 2003

Chairman - Department of Physics 2004

Director - Dunlap Institute, University of Toronto 2009-2010

Chair, Department of Geology 2011

Graduate Three Campus Chair, Department of Geology 2011

Chairman - Department of Geology 2015

Graduate Three Campus Chair, Department of Geology 2015

Chair of Third Year Review for Dr. J. Mungall (Geology 2001) and Dr. J. Bollmann (Geology 2007)

Member of Third Year review Committee Dr. J. Murphy, Dept. of Chemistry (2009)

Member Reading Committee for Tenure for Dr. J. Bollmann (2010)

Member Reading Committee for Promotion to Full Professor for Dr. M. Simpson (2011)

Tenure Committee Member

M.S.V. Douglas Dept. of Geology (1999)  
K. Strong, Dept. of Physics (2000)  
J. Brenan Dept. of Geology (2002)  
G. Srinivasan Dept of Geology (2008)  
C.-J. Banks Dept. of Geology (2008)  
B.A. Bergquist Dept. of Earth Sciences (2015)

Dept. of Geology Coordinator on Planning Committee for 'Discover Science Day' 1993 and 1994  
and for Take our Daughters to Work Day 1996-98

Faculty of Art and Science - Women in Science Committee Member 1994-96 and 1998-99.

Royal Canadian Institute - Joint Session with the University of Toronto  
Panel Discussion: Women Scientists - Current Issues and Realities

Faculty of Arts and Science Women in Academe Annual Forum - Guest Speaker in 1997, 1999 and 2000.

### ***13B. COMMITTEES AND ORGANIZATIONS OUTSIDE THE UNIVERSITY***

(see also **Professional Affiliations and Activities** p. 2-3)

***Organizer of Special Theme Sessions:***

1. **Geological Society of America Annual Meeting** 1997 (Salt Lake City, Utah)  
"New isotopic tools for detection of the origin and fate of environmental contaminants"  
Chairs: B. Sherwood Lollar and T.A. Abrajano
2. **Geological Society of America Annual Meeting** 1998 (Toronto, Ontario)  
"Origin of non-hydrocarbon gases in sedimentary basin systems"  
Chairs: B. Sherwood Lollar and C.J. Ballentine
3. **Geological Society of America Annual Meeting** 1998 (Toronto, Ontario)  
Organic Geochemical Division (OGD) of the Geochemical Society (GS) Symposium:  
"Research Issues in Petroleum and Environmental Organic Geochemistry"  
Chairs: B. Sherwood Lollar and M. Lewan
4. **Goldschmidt 2000** (Oxford, UK)  
"Chemistry and Microbiology of Pollution" Special Symposium  
Chairs: B. Sherwood Lollar and A. Bath
5. **8<sup>th</sup> International In Situ and On Site Bioremediation Symposium June** 2005 (Baltimore)  
"Tools/Techniques for Chlorinated Solvent Sites" Session  
Chairs: B. Sherwood Lollar and C.M. Aelion.
6. **9<sup>th</sup> International In Situ and On Site Bioremediation Symposium June** 2007 (Baltimore)  
"Microbial Ecology of Reductive Dechlorination and the pH Impact" Session  
Chairs: B. Sherwood Lollar and C.M. Aelion
7. **Executive Program Committee Co-Chair - Goldschmidt 2008 Vancouver, BC** July 2008  
Chairs: R. Carlson and B. Sherwood Lollar
8. CIFAR (Canadian Institute for Advanced Research) Workshop I on Astrobiology, Toronto ON. April 2009  
Chairs: G.F. Slater, B. Sherwood Lollar, R. Pudritz, C. Suttle, L. Whyte
9. **International Program Committee Co-Convenor - Goldschmidt 2009** Davos CH June 2009  
Theme: Earth's Resources I: Origin and Sustainable Exploitation of Oil/Water/Gas Systems
10. **Program Committee ABSCICON 2010** Galveston TX. April 2010.
11. CIFAR (Canadian Institute for Advanced Research) Workshop I on Astrobiology, Toronto ON. Oct. 2010  
Chairs: G.F. Slater, B. Sherwood Lollar, R. Pudritz, C. Suttle, L. Whyte
12. **Sloan Foundation Deep Carbon Observatory Workshop**, Carbon Cycling in the Deep Crustal Biosphere  
University of Free State, Bloemfontein South Africa, Jan. 2011  
Organizers: B. Sherwood Lollar, T.C. Onstott, E. van Heerden and T. Kieft
13. **Battelle International Symposium on Bioremediation and Sustainable Environmental Technologies**, Reno, NV. June 2011.B.  
Organizers: B. Sherwood Lollar and T. Buscheck (Chevron) Co-Chairs  
Special session on **Compound Specific Isotope Investigations at Contaminated Field Sites.**

14. **Origins 2011 Joint Meeting of the ISSOL** (International Astrobiology and Origins of Life Society) and Bioastronomy Society. Montpellier, FR. July 2011. Session Chair and Best Poster Judge.
15. **CIFAR** (Canadian Institute for Advanced Research) Workshop III on Astrobiology, Toronto ON. Feb. 2012  
Chairs: G.F. Slater, B. Sherwood Lollar, R. Pudritz, C. Suttle, L. Whyte
16. **Gordon Research Conference on Organic Geochemistry** – Harkness, NH USA July 29-Aug.3, 2012  
Session Organizer: B. Sherwood Lollar
17. **Goldschmidt 2013** (Florence, Italy)  
Deep Subsurface Fluids, Habitability and Microbial Ecosystems  
Chairs: M. Schrenk, B. Sherwood Lollar and C.J. Ballentine
18. **International Scientific Drilling Program Conference** – Potsdam Germany Nov. 11-14, 2013  
Session Chairs: The Hidden Biosphere. B. Sherwood Lollar and J. Kallmeyer
19. **Gordon Research Conference on Isotopes of Chemical and Biological Sciences** - Galveston Tx USA Feb. 2013  
Session Organizer – Environmental Isotope Frontiers: B. Sherwood Lollar and A. Kohen
20. **Battelle International Symposium on Bioremediation and Environmental Technologies**, Monterey CA. May 2013.  
Special session on **Compound Specific Isotope Investigations at Contaminated Field Sites**.  
Organizers: B. Sherwood Lollar and T. Kuder Co-Chairs

**Peer Reviewer:**

- i) Granting Agencies - NASA, ESTCP/SERDP, NSERC, EPA, DOE, NSF, United States Geologic Survey
- ii) Scientific Journals - Geochimica Cosmochimica Acta  
- Environmental Science and Technology  
- Journal of Contaminant Hydrogeology  
- Organic Geochemistry  
- Chemical Geology  
- Science  
- Nature  
- Nature Geoscience

**Memberships**

Geological Society of America  
National Groundwater Association  
American Geophysical Union  
Organic Geochemistry Society  
American Chemical Society

## F. OTHER RELEVANT INFORMATION

**PUBLIC LIAISON** in 1999-2016 took the form of a number of popular articles/interviews that appeared in the press and highlighted my research in environmental geochemistry, storage and transport of carbon dioxide in the subsurface, and abiogenic hydrocarbon gas formation and deep subsurface microbiology in Precambrian rocks. These included:

- |            |   |
|------------|---|
| Feb. 2016  | NSERC Documentary, <b>Globe &amp; Mail</b> , UofT Bulletin, <b>The National</b> Evening News – coverage of research on deep groundwaters resulting in NSERC John C. Polanyi Award to Sherwood Lollar  |
| Dec. 2015  | <b>CBC Interview Quirks and Quarks, Globe &amp; Mail</b> coverage of our discovery of first eukaryote in deep subsurface groundwaters up to 12,000 years in age (Borgonie et al., 2015)   |
| Sept. 2015 | Interview with <b>Macleans Magazine</b> on our research on deep saline groundwaters and connection to Mars discovery of saline fluids <a href="http://www.macleans.ca/society/science/theres-water-on-mars-but-is-there-life/">http://www.macleans.ca/society/science/theres-water-on-mars-but-is-there-life/</a>   |
| Dec. 2014  | <b>Nature paper (Sherwood Lollar et al. 2014)</b> on reduced gas production in ancient crust published same day as Mars Curiosity confirmation of methane in Mars atmosphere. Related interview for BBC Radio 5, BBC International, The Toronto Star, Globe and Mail, Scientific American, Huffington Post, Science Daily, German National Radio and others news outlets worldwide. On day of publication our interview was most downloaded on BBC news site. |
| Dec. 2014  | <b>Profile published in Nature.</b> “ <i>Earth’s deep crust could support widespread life</i> ”   |
| July 2014  | <b>New Scientist</b> “Ancient water cache may be pristine primordial soup” profile of PDF C. Sutcliffe’s Goldschmidt presentation on deep mines waters. <a href="http://www.newscientist.com/article/mg22329762.600-ancient-water-cache-may-be-pristine-primordial-soup.html?full=true#.U7bNhi-61Cc">http://www.newscientist.com/article/mg22329762.600-ancient-water-cache-may-be-pristine-primordial-soup.html?full=true#.U7bNhi-61Cc</a>                   |
| July 2014  | Public lecture “ <b>Chautauqua of the North series</b> ” Thousand Island Park Corporation “The World’s Oldest water”  |
| March 2014 | <b>Global News Television Documentary</b> “Search for Life” highlights interview and footage from Stable Isotope Lab and Sudbury as well as interviews with NASA Rover team   |

- Dec. 2013 Billion year old water study published in **Nature** 497: 367-360 selected as one of **Top Ten Science Stories of 2013** by Fox News, Discovery and the Geochemical News.
- Dec. 2013 **Macleans Magazine List of Top Stories to Follow for 2014**
- Dec. 2013 Interviews in the **Independent (UK)** and **New Scientist** on topic of the Deep Carbon Observatory and deep subsurface microbial life
- Nov. 2013 Ancient waters of the Canadian Shield. Public Lecture, **Science North Science Centre**. Sudbury, Ontario.
- Oct. 2013 **Canadian Geographic** October Issue. Profiled in list of **Top Ten Canadians who are changing the world** along with director/deep sea explorer James Cameron; astronaut and Commander of the International Space Station Chris Hadfield, paleoclimatologist and Herzberg Medalist Dr. John Smol, and others.
- Sept. 2013 Toronto Science Festival. Life in the Universe. Panelist: Life in Extreme Environment along with NASA JPL Kevin Hand and oceanographer John Baross, University of Toronto, Toronto, Ontario.
- May-Oct. 2013 Billion year old water study published in **Nature** 497: 367-360. This study generated over 200 international news stories including profiles and interviews in Nature, National Public Radio, Popular Science, CBC Radio, CBC The National, CNN, Fox, Globe and Mail, Quirks and Quarks. The story in the LA Times alone garnered over 200,000 hits and 10,000 written responses.
- April 2013 Panelist on Judging Panel for **Weston Innovation Youth Award in Science** sponsored by Ontario Science Centre
- March 2013 U of T Bulletin "U of T geochemist joins the hunt for deep carbon" features Sherwood Lollar and deep subsurface research. Related stories ran in the Ottawa Citizen, Montreal Gazette and on-line stories on CTV and CBC.
- March 2013 Deep Carbon Observatory Symposium and Launch of "Carbon in the Earth" RiMG volume results in 21 stories on 13 international newswires including Reuters, Associated Press, Canadian Press, Agence France Press and Agencia EFE with DCO researchers interviewed on National Public radio, El Pais, EOS, CBS Smart Planet and stories on 500+ sites in 12 languages.
- Feb. 2013 **Canada Press Interview:** Deep Carbon Observatory
- June 2012 Interviews in European media re **Eni Protection for the Environment Gold Medal** Award ceremony in Rome Italy.
- Jan. 2012 Interview in "Source Code: the Methane Race" **Earth Magazine** p. 40-45 (Jan. 2012 edition)
- Nov. 2011 **Convocation Address** to 2012 Graduating Class School of Graduate Studies, University of Toronto
- March 2011 **CBC radio Quirks and Quarks: World's Oldest Water-** based on our recent publication on billion year old Neon in deep groundwaters. Day after interview the story had the record for most hits on CBC website.
- March 2011 Panelist on Judging Panel for **Weston Innovation Youth Award in Science** sponsored by Ontario Science Centre
- Feb. 2011 44 stories in media on **World's Oldest Water** (based on our recent publication on billion year old Neon in deep groundwaters) including Spiegel on-line, Norwegian broadcasting Corporation, Australian Broadcasting Corporation (radio interview) and story in MICROBE (popular science magazine)
- Feb. 2011 Panelist "Science without Borders" Press Breakfast. AAAS Annual Meeting. Washington D.C. Feb. 2011
- Dec. 2010 CTV Evening News – Commentary on discovery of Weird Life – Mono Lake Arsenate bacterium
- Nov. 2010 **Vancouver Institute**. University of British Columbia. "Can Carbon Capture and Storage Solve (or Reduce) Global Climate Change: Lessons from Nature"? Vancouver BC.
- May 2010 Highlighted in University of Toronto's publication "**Ideas that could Change the World**"
- March 2010 Panelist on Judging Panel for **Weston Innovation Youth Award in Science** sponsored by Ontario Science Centre
- Feb 2010 **Australian Broadcasting Corporation:** Interview for Science Radio program on carbon sequestration
- Nov. 2009 **Massey College University of Toronto** Science and Medicine Round Table "Follow the Water". Toronto ON
- Oct. 2009 **Royal Society of Canada** International Year of Astronomy Symposium - The Universe and Our Place in it. Invited Presentation at Canada Museum of Science and Technology, Ottawa. "Astrobiology - Life on Earth and Beyond?"
- April 2009 Press related to Nature Cover story included Canada Press, **Quirks and Quarks**, **CBC Radio** morning shows in Calgary and Edmonton, and international coverage by the BBC, The Independent, Reuters, El Pais, Chemical Engineering News and News and Views piece in Nature
- April 2009 Introduction and Q&A for new IMAX film at **Ontario Science Centre**
- March 2009 Panelist on Judging Panel for **Weston Innovation Youth Award in Science** sponsored by Ontario Science Centre
- Feb 2009 Press related to publication of U.S. Environmental Protection Agency (EPA) White paper on Compound Specific Isotope Analysis Press included stories in U of T Bulletin; HazMat Journal and Chemical News
- Jan. 2009 Girls Rock Science - High School Outreach Program at U of Toronto "Astrobiology - Beyond the Men in Black"
- Nov. 2008 Public Lecture sponsored by U of T Alumni : "Threats to Canadian Groundwater"
- May 2008 Introduction and Q&A for new IMAX film at **Ontario Science Centre**
- May 2008 John Fisher Public School - 4th Grade presentation
- Jan. 2008 Girls Rock Science - High School Outreach Program at U of Toronto "Astrobiology - Beyond the Men in Black"
- November 2007 Public Lecture at UTSC to Alumni on ancient microbial communities found at 2.8 kms in South Africa gold mine
- Aug. 2007 PBS - Sloan Foundation documentary film crew accompanies our field team in the deep subsurface Kidd Creek Mine (Timmins ON)

- January 2007 Public Lecture to Attached High School of Ochanomizu University of Tokyo, Japan.  
**Royal Society of Canada - Science Council of Japan WISET Invited Lecture.**
- December 2006 **Ripley's "Believe it or not" Editorial** cartoon runs throughout North American newspapers highlighting our *Science* paper by Lin et al., 2006 on ancient microbial communities found at 2.8 kmbs in South Africa gold mine
- October 2006 **CBC radio Quirks and Quarks** - Interview our *Science* paper by Lin et al., 2006 on ancient microbial communities found at 2.8 kmbs in South Africa gold mine
- Aug. 2006 **Toronto Star** feature on our research on deep subsurface biosphere and origin of methane
- July 2006 **CBC Radio** Interview - NASA searches for life on Mars deep in the Canadian Shield
- July 2006 **Timmins Daily Press** Kidd Creek Mine: NASA search for extraterrestrial life
- April 2006 **Canadian Space Agency** - New research on terrestrial analogue sites for space studies
- April 2006 **Canadian Chemical News** highlights our work "Countering the hydrocarbon threat - sources and remediation of Canada's groundwater contamination"
- October 2005 **Geotimes** - published by the American Geological Institute - interview and photo on our research on abiogenic hydrocarbons
- April 4, 2005 **Chemical and Engineering News** - Details of Sherwood Lollar American Chemical Society Invited Talk in Session of Biogeochemical Limits of Habitability highlighted
- April 2005 Coordinated 4<sup>th</sup> grade visit to U of T - St. Bridget's Catholic School - Toronto District Separate School Board
- April 2005 4<sup>th</sup> grade talk on geology - John Fisher Public School - Toronto District School Board
- March 2005 Seminar on science careers - Linden School Toronto
- Feb. 2005 **BBC Radio** - Interview by lead author C.J. Ballentine on our research on neon isotopes and mantle-derived gases and related publication in *Nature*
- Jan. 2005 **CBC Radio - Quirks and Quarks** - Interview on our research on neon isotopes and mantle-derived gases and related publication in *Nature* by Ballentine et al., 2005
- Nov. 2004 **Geotimes** - published by the American Geological Institute - interview on abiogenic hydrocarbons p. 11 "Taking the fossil out of fuels"
- Sept. 2004 **New York Times** interview - Petroleum from decay? Maybe not, study says (Tues. Sept. 14, 2004); additional interview on same topic for **ScienceOnline** (website for the leading scientific publication *Science*)
- May 2003 **Scientists in Schools** - Toronto Separate School Board of Education
- Nov. 2002 **American Association of Petroleum Geology** Explorer "Gas Origin Theories to be Studied"
- July 2002 **Canadian Chemical News** - The Chemical Institute of Canada
- Apr. 8, 2002 **U of T Bulletin** "Geochemist identifies origin of mysterious gases"
- Apr. 6, 2002 **CBC Radio - Quirks and Quarks** - Interview on my research on abiogenic hydrocarbons and related publication in *Nature*
- Apr. 5, 2002 **NATIONAL POST** - Article by J. Bryan "Canadian Shield Mystery Solved - U of T Mine Gas Study"
- Apr. 5, 2002 Online german version **Scientific American** (<http://www.wissenschaft-online.de>) "Canadian Shield Mine gas study"
- Apr. 5, 2002 **National GeographicWebsite** (<http://news.nationalgeographic.com/>) story by B. Trivedi "Earth gases may provide clues to evolution of life"
- Apr. 5, 2002 **Radio CKTB** Niagara "Drive at Five" Interview
- Apr. 4, 2002 **Discovery TV** - Interview on my research on abiogenic hydrocarbons and related publication in *Nature* on "@discovery.com" show
- Feb. 2002 University of Toronto publication on research = "**The Edge**" - profiled in cover story on environmental research at University of Toronto
- Sept. 5, 2001 Globe and Mail - - Natural Science and Engineering Council insert - "They don't walk on water but ..". NSERC research initiatives in environmental water research.
- Sept. 5, 2001 La Presse - Natural Science and Engineering Council insert - "They don't walk on water but ..". NSERC research initiatives in environmental water research. French language version of same
- Sept. 1999 **TIME** Magazine - Canada Edition - Profiled as one of 25 "Leaders for the 21<sup>st</sup> Century"
- Sept. 1999 **CBC Radio Metro Morning** Interview
- Sept. 1999 **CBC Radio Ontario Morning** Interview
- Sept. 1999 S&T Post, the official newspaper of the Department of Science & Technology (DOST), Philippines.
- Sept. 1999 Technology News section of **Pollution Engineering** magazine.
- Sept. 1999 Physics Today (scientific periodical). Scientific profile of my research program

Sept. 1999 **Environment News** - Environmental Sciences newsletter of *Organic Geochemistry*  
May 1999 NSERC Tribute to Research Excellence  
Apr. 12, 1999 **University of Toronto Bulletin** "Process to benefit groundwater cleanup".  
Mar. 31, 1999 **NATIONAL POST** article "A new technique measures bacteria's progress in pollution" by A. Lamey  
Spring 1999 NSERC Issue of **Contact**