

M. Alex Smith

## **M. Alexander Smith**

Biodiversity Institute of Ontario & Department of Integrative Biology, University of Guelph, Guelph, Ontario, N1G 2W1, Canada.

Phone: office: (519) 824-4120 ext. 52007, Fax: (519) 824-5703, e-mail: salex@uoguelph.ca.  
Citizenship: Canadian

### **EDUCATION**

Doctor of Philosophy	09/99-03/04	McGill University
Masters of Science	09/96-12/98	Trent University
Bachelor of Science (Honours)	09/92-05/96	Trent University

Ant Course Participant – August 2007 – Professional workshop designed primarily for systematists, ecologists, behaviourists, conservation biologists, and other biologists whose research responsibilities require a greater understanding of ant taxonomy.

### **CURRENT POSITION**

Assistant Professor, Molecular Ecology. Biodiversity Institute of Ontario & Integrative Biology, University of Guelph (Appointed February 2009).

### **MAJOR AWARDS**

Fonds Nature et Technologies B-3 Post Doctoral Fellowship. University of Guelph. April 2004 - March 2006. \$60,000.00.  
Fonds Nature et Technologies B-2 Scholarship. McGill University. March 2002 – September 2002. \$6,666.00.  
NSERC PGS-B Scholarship. McGill University. September 1999 – September 2001. \$38,000.00.  
NSERC PGS-A Scholarship. Trent University. September 1996 – September 1998. \$30,000.00.  
Ontario Graduate Scholarship (Declined) September 1996 – September 1998. \$26,000.00

### **AWARDS**

Canadian Union of Public Service Employees Professional Development Fund. Trent University. November 2007. \$1,200.00.  
Canadian Union of Public Service Employees Professional Development Fund. Trent University. February 2006. \$670.00.  
Alma Mater Student Travel Grant. McGill University. August 2004. \$1,000.00.  
Graduate Training Committee Scholarship. McGill University. August 2004. \$400.00.  
Canadian Union of Public Service Employees Professional Development Fund. Trent University. September 2003. \$400.00.  
MGSF Scholarship. McGill University. September 2002. \$5,000.00.  
Class of 66 Award. McGill University. September 2002. \$2,500.00.  
Philip Carpenter Entrance Scholarship. McGill University. September 1999. \$2,000.00  
Watershed Ecosystems Entrance Award. Trent University. September 1996. \$500.00.

M. Alex Smith

Outstanding Honours Thesis Award. Trent University. May 1996.

Biology Department Scholarship. Trent University. September 1995. \$500.00.

J. E. Goodhead Scholarship. Trent University. September 1994. \$250.00.

Academic All Canadian Award – CIS Academic All-Canadian certificates are presented to student-athletes who have achieved 80% or better average while representing their university as a varsity athlete. Trent University – X-country running: 1993 & 1994.

#### RESEARCH GRANTS

NSERC Discovery Grant “Species and Spaces: Biodiversity at landscape and community scales”. \$100K over 5 years.

NSERC Research and Technologies Instrumentation Grant. “Species and spaces: molecular ecological analyses of biodiversity”. \$61K.

Co-PI on a National Science Foundation (NSF) proposal (Syst Biology & Biodiversity In) with Brian Fisher (CAS), Brice Noonan (U Miss), and Phil Ward (UC Davis): Ants of the Southwest Indian Ocean and East Africa (ASWEA): assessing phylogenetic diversity and biogeographic linkages across the Mozambique Channel (ASWEA) September 2009 – September 2014. - \$230, 000.00.

Research Proposals at Nouragues (French Guiana): Insect biodiversity in the Neotropics: refining affinities and shared diversity between Central-American and Amazonian faunas – Rodolphe Rougheir PI. \$14,000.00

PI on an Arctic Marine Biodiversity mini-grant. Co-Pi is MSc student Christine Carr. Accepted Nov 2007 - \$5,000.00.

World Wildlife Fund, Endangered Species Research Fund. 2003 - 2005, Spatial ecology of Fowler’s Toad (*Bufo fowleri*) populations in Canada, \$30,000.00, (with David M. Green).

MEC Environment Fund Grant. 2002 – 2003. Phylogeography, dispersal and metapopulation ecology of the threatened Fowler’s toad (*Bufo fowleri*). \$4,500.00

#### RESEARCH GRANTS PENDING

Co-PI on Genome Canada’s 2010 large scale applied research project competition.

BEGAB: Budworm EcoGenomics: Applications & Biotechnology. R. Levesque & M. Cusson PI’s. PreApplication submitted August 2010, Full application invited – December 1 2010.

PI on Canada Foundation for Innovation Leaders Opportunity Fund. “Species and spaces: molecular ecological analyses of biodiversity”. Submitted October 2010

I am involved in an emerging 155 million dollar Genome Canada International Consortium Initiative – iBOL (ibol.org) specifically within the research program of WG1.9 Terrestrial Bio-Surveillance (\$18M) which will have ants as one of their target taxonomic groups. Activation expected in July 2010.

Senior Researcher, (non-co-PI), on a National Science Foundation (NSF) proposal (PBI - Planetary Biodiversity Inventories) with Corrie Moreau: PEB: *Pheidole* of the World. Submitted January 2010.

M. Alex Smith

Co-PI on a National Science Foundation (NSF) proposal (DOB – Dimensions of Biodiversity) with George Weiblen and 10 others: Dimensions: Ecological convergence and evolutionary idiosyncrasy in tropical plant-insect food webs. Submitted July 2010.

## PUBLICATION LIST

### IN PRESS

- Smith, M. Alex**, Eveleigh, ES, McCann, KS, McCarthy, PC, Van Rooyen, KI. Barcoding a quantified food web: crypsis, concepts, ecology and hypotheses.
- Rougerie, R., **Smith, M. Alex**, Fernandez- Triana, J., Lopez-Vaamonde, C., and Hebert, PDN. Molecular analysis of parasitoid linkages (MAPL): gut contents of adult parasitoid wasps reveal larval host. *Molecular Ecology*.
- Crozier, R. H., Agapow, P-M., and **M. Alex Smith**. Conservation genetics: from species to habitats. *Biology International* 47: 73-79.
- Zaldívar-Riverón, A., Martínez, J., De Jesús-Bonilla, V., Ceccarelli, F., Rodríguez-Pérez, A., Reséndiz-Flores, A., **Smith, M. Alex** DNA barcoding a megadiverse group of parasitoid wasps (Braconidae: Doryctinae) from a Mexican nature reserve. *Mitochondrial DNA*

### PUBLISHED

- Smith, M. Alex**, and B. L. Fisher. (2009) Invasions, DNA barcodes, and rapid biodiversity assessment using ants of Mauritius. *Frontiers in Zoology*. 6:31. <http://www.frontiersinzoology.com/content/6/1/31>
- One of the top 10 most accessed articles for FZ. <http://www.frontiersinzoology.com/articles/top/browse.asp>
- Smith, M. Alex**, Fernandez, J. T., Roughley, R. and Hebert, P. D. N. (2009) DNA Barcode accumulation curves for understudied taxa and areas. *Molecular Ecology Resources*. 9s1:208-216.
- Research referred to in the preface for the special volume of MER dedicated to barcoding research presented at the 2nd Scientific Symposium of the Canadian Barcode of Life Network in Toronto at the Royal Ontario Museum, April 28-29, 2008.
- Janzen, D. H., Hallwachs, W., **Smith, M. Alex**, and 43 others. (2009) Observations on the integration of DNA barcoding into an ongoing inventory of tropical complex biodiversity. *Molecular Ecology Resources*. 9s1:1-26.
- Smith, M. Alex**, Rodriguez, J., Whitfield, J., Deans, A., Janzen, D. L., Hallwachs, W., and Hebert, P. D. N. (2008) Extreme diversity of tropical parasitoid wasps exposed by iterative integration of natural history, DNA barcoding, morphology and collections. *Proceedings of the National Academy of Sciences*. 105 (34):12359-12364.

- Featured in University of Guelph News Release, Science Daily News, Discover Magazine - Discoblog, Genome Web, Bio-Medicine, and National Geographic News Watch.

Fisher B. L., **Smith M, Alex** (2008) A Revision of Malagasy Species of *Anochetus* Mayr and *Odontomachus* Latreille (Hymenoptera: Formicidae). PLoS ONE 3(5): e1787. doi:10.1371/journal.pone.0001787.

- Featured in several blogs: "Blog Around the Clock", "Myrmecos Blog", "Deep Sea News", "The Other 95%", "PLoS ONE Blog".

**Smith, M. Alex** (2008) DNA barcodes to assess identity and diversity of *Dendropsophus minutes*: Failure? Zootaxa. 1691:67-68.

**Smith, M. Alex**, Poyarkov, N., and Hebert, P. D. N. (2008) CO1 DNA barcoding and amphibians: take the chance, meet the challenge. Molecular Ecology Resources: 8(2): 235-246. doi:10.1111/j.1471-8286.2007.01964.x.

- One of Molecular Ecology Resources most frequently read papers - 2008
- Featured in the Barcode of Life Blog in November 2007 - <http://phe.rockefeller.edu/barcode/blog/2007/11/05/optimizing-pcr-primers-for-amphibian-coi-sequences/>

**Smith, M. Alex**, Wood, D. M., Janzen, D. L., Hallawachs, W. and Hebert, P. D. N. (2007) DNA barcodes affirm that 16 species of apparently generalist tropical parasitoid flies (Diptera, Tachinidae) are not all generalists. Proceedings of the National Academy of Sciences. 104(12):4967-4972.

- Editors selected this article for associated commentary: Miller (2007) DNA barcoding and the renaissance of taxonomy. PNAS 104(12):4775-4776
- Editors selected this article for highlight in a front section of the print journal called *In This Issue* to highlight certain articles published in that issue. PNAS 104(12): 4771-4772
- One of the 50 most read articles in PNAS in Spring 2007.

**Smith, M. Alex**, Green, D. M. (2006) Sex, isolation and fidelity: unbiased long distance dispersal in a terrestrial amphibian. Ecography. 29: 649-658.

Hajibabaei, M., **Smith, M. Alex**, Janzen, D. H., Rodriguez, J. J., Whitfield, J. B., and Hebert, P. D. N. (2006) Identifying specimens with degraded DNA using minimalist barcodes. Molecular Ecology Notes. 6: 959-964.

- One of Molecular Ecology Notes most frequently read papers (2006-2008)

**Smith, M. Alex**, Woodley, N. Hallwachs, W. Janzen, D. H. Hebert, P. D. N. (2006) DNA barcodes reveal cryptic host-specificity within the presumed polyphagous members of a genus of parasitoid flies (Diptera: Tachinidae). Proceedings of the National Academy of Sciences. 103(10):3657-3662.

- Cover article that was one of the most-frequently-read articles in PNAS in spring 2006.
- Editors selected article for associated commentary: Herre, E. A. (2006) Barcoding helps biodiversity fly Proceedings of the National Academy of Sciences. 103(11): 3949-3950.

- Smith, M. Alex**, Fisher, B. L., and Hebert, P. D. N. (2005) DNA barcoding for effective biodiversity assessment of a hyperdiverse arthropod group: the ants of Madagascar. *Philosophical Transactions of the Royal Society: B*. 360:1828-1834.
- Cover article of special volume devoted to DNA barcoding.
  - One of *Phil. Trans. R. Soc. B* most cited papers.  
(<http://publishing.royalsociety.org/index.cfm?page=1483>)
  - Collaboration is part of the cover article of the March 2006 issue of *Discover* (<http://discover.com/issues/mar-06/features/ants-madagascar/>)
- Smith, M. Alex**, Green, D. M. (2005) Dispersal and the metapopulation paradigm in amphibian ecology and conservation: Are all amphibian populations metapopulations? *Ecography* 28(1): 110-128.
- One of *Ecography's* most frequently read papers (2006-2008).
- Smith, M. Alex**, Green, D. M. (2005) *Bufo fowleri* (Fowler's Toad): Predation. *Herpetological Review* 36(2):159-160.
- Smith, M. Alex**, Green, D. M. (2004) Phylogeography of *Bufo fowleri* at its northern edge of range. *Molecular Ecology* 13(12): 3723–3733.
- Smith, M. Alex**, Berrill, M., and Kapron, C. (2002) Photolyase activity of the embryo and the ultraviolet absorbance of embryo jelly for several Ontario amphibian species. *Canadian Journal of Zoology* 80:1109-1116
- Smith, M. Alex**, and Green, D. M. (2002) *Bufo fowleri*: Predation. *Herpetological Review* 33(2): 125
- Smith, M. Alex** (2002) *Pseudacris triseriata triseriata*: Reproduction. *Herpetological Review* 33(2): 127
- Smith, M. Alex**, Kapron, C., and Berrill, M. (2000) Induction of photolyase activity in wood frog (*Rana sylvatica*) embryos. *Photochemistry and Photobiology* 72:575-578.
- Smith, M. Alex** (2000) Problems utilizing enzyme sensitive site assays for photorepair of exogenous DNA with cell free extracts made from amphibian embryos. *Canadian Journal of Zoology* 78:1869-1872.
- Crump, D., Berrill, M., Coulson, D., Lean, D. R. S., McGillivray, L., and **Smith, M. Alex** (1999) Sensitivity of eight species of amphibian embryos, tadpoles and larvae to enhanced UV-B radiation in natural pond conditions in Southern Ontario. *Canadian Journal of Zoology* 77:1956-1966.
- Smith, M. Alex**, and Bidochka, M. (1998) Bacterial fitness and plasmid loss: the importance of culture conditions and plasmid size. *Canadian Journal of Microbiology* 44: 351-355.

#### PUBLICATIONS IN REVIEW

- Smith, M. Alex**, and Green, D. M. An analysis of amphibian population turnover using two metapopulation models: More apparent than real. *Ecography*:E5133
- Fernandez-Triana\*, J., **Smith, M. Alex\***, Boudreault, C., Goulet, H., Roughley, R., and P.D.N. Hebert. The diversity of Microgastrinae wasps (Hymenoptera):

M. Alex Smith

Braconidae) at Churchill, Manitoba has changed. *Global Change Biology*.  
(\*these authors made equal contributions). GCB-10-0622  
Agapow, P.-M., Crozier, R. H., and **M. Alex Smith**. Methodologies for assessing  
phylogenetic biodiversity using DNA barcodes. *Frontiers in Zoology*.  
626986156322300

#### IN PREP PUBLICATIONS

Crosby, K., Fu, J., and **Smith, M. Alex**, Molecular ecology of rare and understudied  
amphibians of China (Hynobidae and Megophriidae): *Proceedings of the Royal  
Society B. Biology*

**Smith, M. Alex** and 27 authors listed alphabetically after 1<sup>st</sup>. *Wolbachia* and Barcoding  
Insects: Problems, Patterns and Potential. *Proceedings of the Royal Society B.  
Biology*.

Rodriguez, J. J., Whitfield, J. B., Janzen, D. H., Hallawachs, W., and **Smith, M. Alex**. Host  
parasitoid specialization, species richness and diversification of *Apanteles* wasps  
(Braconidae: Microgastrinae).

**Smith, M. Alex**, Green, D. M. Isolation by distance and genetic neighborhood in the  
Fowler's toad (*Bufo fowleri*) using two mitochondrial genes. *BMC Ecology*.

**Smith, M. Alex**, and Fisher, B. L., Extreme isolation and sex-biased dispersal in  
Malagasy winged and wingless ants. *Evolution*.

**Smith, M. Alex**, Green, D. M. Introgression of *Bufo americanus* mtDNA in *Bufo fowleri*  
populations. *Molecular Ecology*

**Smith, M. Alex**, Umphrey, G. J., Davis, L. R., and Fisher, B. L., Barcoding ants of North  
America. *Molecular Ecology Resources*.

**Smith, M. Alex** Rapid assessment of ant diversity in a northern World Biosphere  
Preserve using DNA barcodes: the ant fauna of the South Nahanni River, NWT,  
Canada. *Canadian Journal of Zoology*.

**Smith, M. Alex**, Green, D. M. Population viability analysis of a threatened amphibian  
(*Bufo fowleri*) at its northern range edge. *Biological Conservation*

**Smith, M. Alex**, Green, D. M. No effect of toe clipping on recapture rate in *Bufo fowleri*:  
power analysis. *Copeia*.

#### NON-REFEREED PUBLICATIONS

Green, D. M., and Smith, M. Alex – Status report on *Bufo (Anaxyrus) fowleri* (Fowler's  
Toad): Prepared for the Committee on the Status of Endangered Wildlife in  
Canada (COSEWIC).

Smith, M. Alex. (2009) "Myrmecos blog" - DNA barcoding is intellectually bankrupt...a  
reply from Alex Smith.

Smith, M. Alex. (2009) "Discarding the future" - Globe and Mail letter to the Editor  
30/01/09 page A12.- Regarding the contributions to science contained in the 2009  
budget.

Crozier, R. H., Agapow, P. M., and **M. Alex Smith** Crozier, R. H. (2008). Conservation  
genetics: from species to habitats. *Proceedings of the 9th Ordinary Meeting of the*

- Conference of the Parties to the Convention on Biological Diversity. Bonn Germany. 12 – 16 May 2008.
- Smith M. Alex**, Fisher, B. L., and Hebert, P.D. N. (2005). Biodiversity assessment of a hyperdiverse arthropod group: DNA barcoding the ants of Madagascar. p 164-166 In, SUCCESS STORIES IN IMPLEMENTATION OF THE PROGRAMMES OF WORK ON DRY AND SUB-HUMID LANDS AND THE GLOBAL TAXONOMY INITIATIVE. Secretariat of the Convention on Biological Diversity. Abstracts of Poster Presentations at the 11th Meeting of the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity. Montreal, Technical Series no. 21, 189 pages.  
<https://biodiv.org/doc/publications/cbd-ts-21.pdf>
- M. Alex Smith** and Green, D. M. (2004) Species at risk assessment for *Bufo fowleri* in Canada – Population Viability Analysis. Prepared for the Recovery of Nationally Endangered Wildlife Committee
- M. Alex Smith** (2003) Spatial Ecology of *Bufo fowleri*. PhD thesis, Department of Biology, McGill University.
- Green, D. M., and **Smith M. Alex**. (2000) Ecology and viability of Fowler's Toads (*Bufo fowleri*) populations. A report for the World Wildlife Fund Endangered Species Recovery Fund.
- M. Alex Smith** (1998) Estimating photolyase activity for seven amphibian species from south-central Ontario. M.Sc thesis, Watershed Ecosystems Graduate Program, Trent University.
- M. Alex Smith** (1996) The costs of extra-genomic DNA to bacteria. B.Sc Honours thesis, Biology Department, Trent University.

#### INVITED PRESENTATIONS

- Smith, M. Alex** (2010). Embracing Diversity in a Living City. Toronto Region Conservation Authority (TRCA) Education Professional Development Day, Tuesday, Toronto Ontario. September 7, 2010.
- Smith, M. Alex**. (2010) Conservation genetics, community ecology and environmental science. University of Saskatchewan, School of Environment and Sustainability, Saskatoon, SK. March 22<sup>nd</sup> 2010.
- Smith, M. Alex**. (2010) Webs, temperature and time: integrating community ecology and DNA barcoding. University of Toronto, Toronto, Ontario. February 12<sup>th</sup> 2010.
- Smith, M. Alex**. (2009) Integrating community ecology and DNA barcoding. Ontario Genomics Institute - Student Network (OGI-SN). University of Toronto, Toronto, Ontario. November 20<sup>th</sup>, 2009.
- Smith, M. Alex**. (2009) Integrating community ecology and DNA barcoding. Third International Barcode of Life Meeting, Plenary session, Mexico City, Mexico. November 11<sup>th</sup>, 2009.
- Smith, M. Alex**. (2009) Multi-gene and GIS analyses in the Barcode of Life Datasystem. Third International Barcode of Life Meeting, Mexico City, Mexico. November 10<sup>th</sup>, 2009.

- Smith M. Alex.** (2009) Fine Outreach for Science GigaPan Research program, Pittsburgh PA, USA – one of 5 invited scientists that have been beta testing this imaging robotic/software technique. May 19-22<sup>nd</sup> 2009.
- Smith M. Alex.** (2009) Building a biological barometer: climate change and DNA barcoding. Ecological and Evolutionary Implications of Climate Change Symposium Centre for Northern Studies Lakehead University, Thunder Bay, Ontario, Canada. March 7<sup>th</sup> 2009.
- Smith M. Alex.** (2008) DNA barcoding and Biodiversity: a comparative approach to species, diversity and ecology. Niagara College, Niagara on the Lake, Ontario. November 29, 2008.
- Smith M. Alex.** (2008) “Now this is not the end”: a comparative approach to species, diversity and ecology. University of Guelph, Guelph, Ontario. Sept 2008.
- Smith M. Alex.** (2008) Barcoding all ants – what it would take; what we would learn. GAP: First International Meeting of a Global Campaign to Barcode Ants. May 29, 2008. Harvard University, Cambridge Massachusetts
- Smith M. Alex.** (2008) DNA barcoding Hymenoptera: what to learn from parasitoid wasps and ants. BeeBol: First International Meeting of a Global Campaign to Barcode Pollinators. May 12, 2008 York University, Toronto, Canada
- Smith M. Alex.** (2008) Accelerating species discovery: case studies in hyper-diverse parasitoid assemblages. 2<sup>nd</sup> Annual Meeting of the Canadian Barcode of Life Network Symposium. April 28 2008. Royal Ontario Museum, Toronto, Ontario, Canada.
- Smith M. Alex.** (2008) A comparative approach to species discovery, diversity estimates and new ecological tools through integrated evolutionary ecology, genomics and barcoding. CRC Tier II Job Search: Phylogenomics. April 21, 2008, University of Manitoba, Winnipeg, Canada
- Smith M. Alex.** (2008) Species discovery, diversity estimates and spatial ecology through integrating environmental biology, evolution and molecular ecology: a comparative approach. Environmental Biology Job Search. April 19, 2008 Ryerson University, Toronto, Canada
- Smith M. Alex.** (2008) Conserving species and spaces in a barcoded world. The American Natural History Museum, March 7, 2008 New York, NY, USA.
- Smith M. Alex.** (2008) What we learn from DNA barcoding hyper-diverse parasitoid insect communities. February 25 2008. Department of Entomology, University of Illinois, Campaign-Urbana, Illinois, USA
- Smith M. Alex.** (2008) A CO1 DNA barcode is a sufficient lens to initiate species discovery: case studies in hyper-diverse parasitoid assemblages. January 12 2008. The Plant & Animal Genome XVI Conference. San Diego, California, USA [talk cancelled due to illness]
- Smith M. Alex.** (2007) Conserving species and spaces in a barcoded world. September 29 2007. The 3rd International Conservation Genetics Symposium (ConsGen3) – The American Natural History Museum, New York, NY, USA.

- Smith M. Alex.** (2007) Barcode of Life Datasystems (BOLD). First Workshop of the Leading Labs Workshop. July 10 2007. Smithsonian National Museum of National History, Washington DC, USA.
- Smith M. Alex.** (2007) Barcoding the parasitic Hymenoptera of Churchill. First Workshop of the International effort to barcode polar life (POLARBOLI). June 17 2007. Guelph, Ontario, Canada.
- Smith M. Alex.** (2007) Integrative ecology: examples with ants and flies. Presented to the Biology Department of Wilkes University. Biology Search. February 22 2007, Wilkes Pennsylvania, USA.
- Smith M. Alex.** (2007) DNA barcoding and invasive species: challenges and opportunities. Presented to the 18<sup>th</sup> USDA Interagency Research Forum on Invasive Species. January 11 2007, Annapolis, Maryland, USA.
- Smith M. Alex.** (2006) Integrative ecology: examples with amphibians, ants and flies. Presented to the Biology Department of Cape Breton University. Biology Search. March 22, 2006, Sydney, Nova Scotia, Canada.
- Smith M. Alex.** (2006) Integrative ecology: examples with amphibians, ants and flies. Presented to the Biology Department of Trent University. Biology Search. March 20, 2006, Peterborough, Ontario, Canada.
- Smith M. Alex.** (2005) DNA barcodes facilitate species inference and estimation of diversity in Hymenoptera. Canadian Barcode of Life Network (BOL.ca) Launch. May 5, 2005, Guelph, Ontario, Canada.
- Smith M. Alex.** (2005) Using DNA barcodes to identify biodiversity on agricultural lands. Assessing Biodiversity on Agricultural Lands: AAFC Environmental Farm Planning Initiative. March 7-8, 2005, Mississauga, Ontario, Canada.
- Smith M. Alex.** (2005) Examples of integrative ecology with amphibians and ants. Presented to the Biology Department of Brandon University. CRC Tier II Environmental Biology Search. January 21, 2005, Brandon, Manitoba, Canada.
- Smith M. Alex.** (2002) Population ecology and phylogeography of a threatened amphibian at the edge of its distribution. Presented at the Trent University Biology Department Seminar Series. November 13, 2002, Peterborough, Ontario, Canada.
- Smith M. Alex.** (2002) Metapopulation biology of the Fowler's toad (*Bufo fowleri*). Presented at Ontario Universities Field Course: "Life on the Edge: Wetland and Littoral Ecosystems" hosted by the Oliver Centre at Trent University. August 27, 2002, Bobcaygeon, Ontario, Canada.

#### PRESENTATIONS

- J. Rodriguez, **M. Alex Smith**, J. Whitfield, W. Hallwachs, DH Janzen. Phylogenies, foodwebs and finding them all: integrating approaches to explore the diversity of parasitoid wasps. Evolution 2010: the joint annual meeting of the Society for the Study of Evolution (SSE), the Society of Systematic Biologists (SSB), and the American Society of Naturalists (ASN)Portland Oregon. June 25 2010 [By Josephine Rodriguez]

- M. Alex Smith**, Jose L. Fernández-Triana, Kees van Achterberg, Henri Goulet, Winnie Hallwachs, Jan Hrcek, John T. Huber, Daniel H. Janzen, Scott Miller, Donald Quicke, Josephine Rodriguez, Michael J. Sharkey, Darren Ward, James B. Whitfield, Alejandro Zaldivar, Paul D. N. Hebert. An inordinate fondness for parasitoid wasps: DNA barcoding data from a global array of projects. International Society of Hymenopterists International Meeting. Koeszeg, Hungary. June 2010 [by Jose Fernandez-Triana].
- Chesters, D., Vogler, A.P., **Smith, M. Alex**, Janzen, D.HJ, Hallwachs, W., Triana Fernandez, J., Laurene, N. M., Zaldivar-Riveron, A., Shaw, M.R. , Broad, G.R., Klopstein, S., Shaw, S.R., Hrcek, J., Hebert, P.D.N., Miller, S., Rodriguez, J., Whitfield, J., Sharkey, M. J., Gauld, I.D. [deceased], Quicke, D.L.J. Beyond the barcode to the tree: Ichneumonoid phylogeny and the importance of taxon sampling density and strategy. International Society of Hymenopterists International Meeting. Koeszeg, Hungary. June 2010 [by Douglas Chesters].
- Rodolphe Rougerie, **M. Alex Smith**, Jose Fernandez-Triana, Carlos Lopez-Vaamonde, Sujeevan Ratnasingham, Paul D.N. Hebert. Post-metamorphosis persistence of host-DNA in the gut-contents of parasitoid wasps. ECBOL2: 2010 International Year of Biodiversity (2nd Conference of the European Consortium for the Barcode of Life) 2 - 4 June 2010 Braga, Portugal. [by Rodolphe Rougerie].
- M. Alex Smith** and Fisher, B. L., Applications to biodiversity conservation. Entomological Society of America December 15, 2009 [by Brian Fisher].
- Rodriguez, J. J., **M. Alex Smith**, Janzen, D. H., Hallwachs, W., and Whitfield, J. B (2009). Evolutionary patterns in host use by *Apanteles* parasitoid wasps. Entomological Society of America December 16, 2009 [by Josephine Rodriguez]
- Fisher, B. L., and **M. Alex Smith**. (2009) Identifying cryptic invasives in the Malagasy region. Third International Barcode of Life Meeting, Mexico City, Mexico. November 10 2009. [by Brian Fisher].
- Crozier, R. H., **M. Alex Smith**, Agapow, P-M. (2009) Ants, phylogenetic biodiversity assessment and conservation. Joint Conference: Australian Entomological Society's 40th AGM and Scientific Conference/9th Invertebrate Biodiversity and Conservation Conference/Society of Australian Systematic Biologists. September 2009. [by Ross Crozier].
- Smith, M. Alex**, Jose Fernandez, Rob Roughley, Paul Hebert. (2008). Progress on barcoding parasitic wasps (Hymenoptera) from Churchill, Canada, and its implication for biodiversity and ecosystems studies within the Arctic. International Arctic Change 2008. Quebec City, Quebec, December 5, 2008. [poster]
- Jose Fernandez, **M. Alex Smith**, Henri Goulet, Caroline Bouderault and Paul Hebert (2008). Combining barcoding and traditional taxonomy to study the diversity of Microgastrinae wasps (Hymenoptera: Braconidae) in Arctic North America. International Arctic Change 2008. Quebec City, Quebec, December 5, 2008. [By Jose Fernandez]

- Smith, M. Alex.** (2008). Extreme diversity of tropical parasitoid wasps exposed by iterative integration of natural history, DNA barcoding, morphology, and collections. Joint Meeting of the Entomological Societies of Canada and Ontario. Ottawa, Ontario. October 19, 2008.
- Smith, M. Alex.** (2008). CO1 DNA barcoding amphibians: successes and failures. 88th annual meeting of the American Society of Ichthyologists and Herpetologists. Montreal, Quebec. July 24, 2008.
- Smith M. Alex.** (2008) A barcoding hyper-diverse parasitoid insect communities. BEPAR Genetics and Genomics of Parasitic Insects. June 5-6 2008. University of Edinburgh, Edinburgh, UK.
- Crozier, R. H., Agapow, P. M., and **M. Alex Smith** Crozier, R. H. (2008). Conservation genetics: from species to habitats. 9th Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity. Bonn Germany. 12 – 16 May 2008 [by Ross Crozier].
- Rodriguez, J. J., Whitfield, J. B., Janzen, D. H., and **M. Alex Smith.** (2007). Host parasitoid specialization, species richness and diversification of *Apanteles* wasps (Braconidae: Microgastrinae). Entomological Society of America December 11, 2007 San Diego, CA [by Josephine Rodriguez]
- Fisher, B. L., and **M. Alex Smith.** (2007). Transforming taxonomy for effective biodiversity assessment of arthropods in Madagascar. 2<sup>nd</sup> International Barcode of Life Conference. Sept 18 – 20 2007 Taipei, Taiwan [by Brian Fisher]
- Janzen, D. H., Hallwachs, W., Hajibabaei, M., Burns, J. M., **Smith, M. Alex,** Rodriguez, J. J., Wood, M., Dapkey T., and PDN Hebert. (2007). Ecological inventory with a barcoder, the ecological taxascope: who eats what in a complex tropical forest. 2<sup>nd</sup> International Barcode of Life Conference. Sept 18 – 20 2007 Taipei, Taiwan [by Dan Janzen]
- Fisher, B. L. and **Smith M. Alex** (2007). Transforming taxonomy for effective biodiversity assessment of ants in Madagascar. 9<sup>th</sup> Annual Bay Area Conservation Biology Symposium. Saturday, February 10<sup>th</sup>, 2007 at UC Berkley. [by Brian Fisher]
- Woodley, N. **Smith, M. Alex,** Hallwachs, W. Janzen, D. H. Hebert, P. D. N. DNA barcodes reveal cryptic host-specificity within the presumed polyphagous members of a genus of parasitoid flies (Diptera: Tachinidae). Sixth International Congress of Dipterology, Fukuoka, Japan, 23<sup>rd</sup> September 2006. [by Norman Woodley]
- Fisher, B. L., **Smith M. Alex,** and Hebert, P.D. N. (2006). The use of DNA barcoding for effective biodiversity assessment of ants in Mauritius. Invited Symposia. The International Union for the Study of Social Insects Congress. July 30<sup>th</sup> 2006, Washington DC, USA. [by Brian Fisher].
- Smith M. Alex,** Fisher, B. L., and Hebert, P.D. N. (2006). Biodiversity assessment of a hyperdiverse arthropod group: DNA barcoding the ants of Madagascar. Peter Yodzis Colloquium in Fundamental Ecology "Biodiversity, Structure, and

- Function" May 17<sup>th</sup> and 18<sup>th</sup>, 2006. University of Guelph - Guelph Ontario – Canada. Poster.
- Fisher, B. L., **Smith M. Alex**, and Hebert, P.D. N. (2006). Biodiversity assessment of a hyper-diverse arthropod group: DNA barcoding the ants of Madagascar. 8th Annual Bay Area Conservation Biology Symposium. Saturday, February 4<sup>th</sup>, 2006 at San Francisco State University. [by Brian Fisher]
- Smith M. Alex**, Fisher, B. L., and Hebert, P.D. N. (2005). Biodiversity assessment of a hyperdiverse arthropod group: DNA barcoding the ants of Madagascar. Presented at the Eleventh meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) – Secretariat of the Convention on Biological Diversity – Montreal, Canada, 28 November 2005 – Poster.
- Smith M. Alex**, Fisher, B. L., and Hebert, P.D. N. (2005). Using DNA barcodes to rapidly quantify the ant biodiversity in Madagascar. Presented at the Annual Meeting of the Ecological Society of America. Montreal, Quebec. 7-12 August 2005.
- Smith M. Alex**, and Green, D. M. (2005) Complex phylogeography of *Bufo fowleri* at its northern range limit. Presented at the Annual Meeting of Ichthyologists and Herpetologists. Tampa, Florida, 6-11 July 2005.  
<http://www.asih.org/meetings/2005/abstracts2005pt4.pdf>
- Smith M. Alex**, Umphrey, G. J., Fisher, B. L., and Hebert, P.D. N. (2005). Rapid assessment of ant diversity in a northern World Heritage Site using DNA barcodes. *Poster*. International Conference for the Barcoding of Life, London, England. 6-9 February 2005.
- Smith M. Alex**, and Green, D. M. (2004) Spatial Ecology of *Bufo fowleri*. Presented at the Annual Meeting of the Ecological Society of America. Portland, Oregon. August 1-6 2004.
- Smith M. Alex**, and Green, D. M. (2004) The Dispersal Curve for Fowler's Toad (*Bufo fowleri*). Presented at the Annual Meeting of Ichthyologists and Herpetologists. Oklahoma City, 26 - 31 May 2004.
- Smith M. Alex**, and Green, D. M. (2002) Dispersal and viability of Fowler's Toads (*Bufo fowleri*) populations in Canada. Presented at the annual meeting of the Canadian Amphibian and Reptile Conservation Network September 27, 2002, Winnipeg, Manitoba. [by David Green].
- Smith, M. Alex**. (2001) What ties things together: the importance of dispersal to the metapopulation ecology and phylogeography of the threatened Fowler's toad (*Bufo fowleri*) in Canada. Presented at the 2001 Redpath Museum Seminar Series, December 16, 2001, Montreal, Quebec.
- Smith M. Alex**, Berrill, M., and Kapron, C. (1999) *In vivo* induced photolyase activity of wood frog embryos. Presented at the annual meeting of the Canadian Amphibian and Reptile Conservation Network October 14-18, 1999. Quebec City, Quebec.
- Smith, M. Alex**, Berrill, M., Kapron, C., and Lean, D.R.S. (1997) Ability to repair damage from ultraviolet-B radiation: photolyase concentrations for amphibians of

Ontario. Presented at the 7th annual meeting of the Task Force on Declining Amphibian Populations in Canada. Oct. 3-6, 1997. Wolfville, Nova Scotia.

#### FIELD WORK

- 2011:** Two week ant collecting expedition to French Guiana, January  
**2010:** Two week ant collecting expedition to Area de Conservacion de Guanacaste, Costa Rica, November/December.  
**2010:** One week ant collecting expedition to Lamani, Belize April.  
**2010:** Two week ant collecting expedition to Area de Conservacion de Guanacaste, Costa Rica, January.  
**2009:** Organisation and participation in the BioBus collection trip in National Parks of Eastern Canada (Newfoundland, Nova Scotia and New Brunswick).  
**2009:** Two week ant collecting expedition to Volcan Cacao, ACG, Costa Rica, March.  
**2008:** Two week ant collecting expedition to Volcan Cacao, ACG, Costa Rica.  
**2008:** 4 day ant collecting trip in Rocky Mountain National Park, Colorado.  
**2007:** 2 week ant collecting trip in Arizona.  
**2006:** 2 week ant collecting trip in Texas.  
**2004:** 2 week expedition down the Nahanni River, NWT, Canada. Ant collecting  
**2002-2007:** Organised and taught field course on Pigeon Lake, near Bobcaygeon Ontario.  
**1999 – 2004:** Lake Erie phylogeography study of *Bufo fowleri*. Long Point tip trips.

#### POPULAR PRESS AND OUTREACH

**2010 –**

- GigaPan article featured in the iBOL bulletin. ([ibol.org/gigapan](http://ibol.org/gigapan))
- GigaPans featured on the GigaPan homepage.
- Dairy Bush GigaPan featured in GigaPan Magazine, Vol 2 Issue 5: Science and Society.
- "At Guelph" article about the Costa Rica ant and GigaPan Projects: "Biologist Zooms In on Ants and Other Species".
- FOFS GigaPan blog about the Dairy Bush GigaPan project
- Guelph Tribune article about the Dairy Bush GigaPan project and the BIObus.
- Science - News Focus (100110) - "The Little Wasp That Could" by Elizabeth Pennisi.
- Ontario Ministry of Research and Innovation video story on BIO and DNA barcoding.
- Dairy Bush GigaPan series featured on GigaPan home page "Snow" collection
- Lead introduction to biodiversity and barcoding talks and workshops for BIO visitors, students and high school students (~1/fortnightly).

**2009 –**

- Segment on Discovery Channel's 'Daily Planet' program for segment celebrating Darwin's 200<sup>th</sup> birthday, February 12<sup>th</sup>.
- "Anti-aquatic antics of ants" - Globe and Mail - Collected Wisdom, 07/02/09 page A19. - Ant strategies for surviving floods and snow.

M. Alex Smith

- "Discarding the future" - Globe and Mail -Letter to the Editor, 30/01/09 page A12. - Regarding contributions to science contained in the 2009 budget.
- Lead introduction to biodiversity and barcoding workshops for UNIV first year students and high school students (~1/fortnightly).

2008 –

- Led introduction to biodiversity and barcoding workshops for students, teachers and philanthropic guests of the University President's Office (~1/month).

2007 –

- Participated in two professional development days organised for science teachers from the Upper Grand River Board of Education.
- Taped interview with journalist from 'The Scientist' magazine for a central piece in their December 2007 edition on DNA barcoding (October)
- Live phone interview about DNA barcoding on, "The Rutherford Show", News Talk CHQR – Calgary, Alberta, Canada. (Sept 25)
- Live phone interview about DNA barcoding on, "On the QT with Scott Williams", Q102 - Dublin, Ireland (Sept 20)
- Live phone interview about DNA barcoding on, "ABC 936 Breakfast with Andy Muirhead", Hobart, Tasmania, Australia. (Sept 19)
- Phone interview with NewScientist.com news service regarding cryptic species research ([www.newscientist.com/article/dn12293-hidden-species-may-be-surprisingly-common.html](http://www.newscientist.com/article/dn12293-hidden-species-may-be-surprisingly-common.html)) (July 19)
- Interview with anthropologists from Lancaster University conducting a 'sociological and anthropological study of a real-time shift in the taxonomic sciences' and how that affects and is affected by, DNA barcoding. (July 10)

2006 –

- Facilitation of SPARK student authors writing "Focus On": DNA barcoding magazine:  
([www.uoguelph.ca/research/publications/Assets/PDF/FocusOn/Focus\\_On\\_DNA.pdf](http://www.uoguelph.ca/research/publications/Assets/PDF/FocusOn/Focus_On_DNA.pdf)). (November)
- Phone interview with Discover Magazine regarding DNA barcoding the ants of Madagascar.

#### PROFESSIONAL SOCIETIES AND SERVICES

Ecological Society of America – Full member, Canadian Chapter

Sigma XI, The scientific research society – Full member

American Society of Ichthyologists and Herpetologists – Full member

Fowler's Toad Recovery Team – Science advisor.

Reviewer (15): Journal of Animal Ecology, Molecular Ecology, Journal of Biogeography, Canadian Journal of Zoology, Herpetologica, BMC Evolutionary Biology, Biological Conservation, Proceedings of the Royal Society B: Biological Sciences, Frontiers in Zoology, Biology Letters, Animal Conservation, Oecologia, Genetica, Applied Herpetology, Zootaxa

Funding Agencies Reviewer: Leverhulme Trust (UK), National Science Foundation (NSF) International Research Fellow Awards (USA).

M. Alex Smith

**COLLABORATORS** – Canada, United States, United Kingdom, Australia, Russia, Costa Rica, Papua New Guinea and Madagascar

Daniel H. Janzen and Winnie Hallwachs (Department of Biology, University of Pennsylvania, Philadelphia, PA, 19104, USA) – Using DNA barcodes to identify parasitoids, rates of parasitic evolution, molecular ecology and ecological specialization.

Brian L. Fisher (Curator Entomology, California Academy of Sciences, 875 Howard Street, San Francisco, CA 94103-3009) – Using DNA barcodes to identify the endemic and rare ants of Madagascar. Molecular ecology, biodiversity and phylogeography of Madagascar.

Eldon Eveleigh (Canadian Forestry Services, New Brunswick) and Kevin McCann (University of Guelph, Integrative Biology). Food-web ecology of spruce-budworm outbreaks.

Paul-Michael Agapow (Institute for Animal Health, Pirbright, Surrey GU24 0NF United Kingdom) Molecular methods of total biodiversity assessment.

James B. Whitfield (Department of Entomology, 320 Morrill Hall, University of Illinois at Urbana-Champaign, 505 S. Goodwin Ave, Urbana, IL 61801 U.S.A.) – Species discovery, ecological specialization and the evolution of parasitism in braconid wasps.

Phil Ward (University of California Davis), Gary J. Umphrey (Department of Mathematics & Statistics, 50 Stone Road East, University of Guelph, Guelph ON Canada N1G 2W1), Corrie Moreau (Chicago Field Museum), Jack T. Longino (Evergreen College) – Using DNA barcodes to identify North American ants.

Scott E. Miller Smithsonian Institution PO Box 37012, MRC 105, Rm. E-512 Washington, DC 20013-7012 – Hymenoptera and Diptera parasitoids of Papua New Guinea Lepidoptera

Corrie Moreau (Assistant Curator, Field Museum of Natural History, Chicago, IL in the Department of Zoology, Division of Insects) – Molecular analysis of the most diverse group of ants: *Pheidole*.

David M. Green (Director, Redpath Museum, McGill University) – Phylogeography and population biology of *Bufo (Anaxyrus) fowleri*.

#### TEACHING EXPERIENCE AND SERVICE

Guest lectures in four courses within the past year at Guelph. 1) “Communicating Science - advocacy obligation”: 4<sup>th</sup> year Ecological Field Methods. 2) “Co-evolution”: 3<sup>rd</sup> year Invertebrate Biology. 3) “Conservation Genetics”: 4<sup>th</sup> year Conservation Biology, 4) “Webs, temperature and time”: 3<sup>rd</sup> year Evolution.

I currently supervise two MSc students:

- Ariel Levitsky (May 2010 - ): Cryptic diversity and conservation of the enigmatic ant genus, *Melissotarsus* in Madagascar.
- Connor Warne (Sept 2010 - ): Costa Rican volcanoes and climate change.

I am currently serving on one MSc student committees:

M. Alex Smith

- Claudia Bertrandt (Sept 2009 - ) – The identification of cryptic species of Costa Rican Butterfly.

Two MSc students whose committee I served upon have defended:

- Taika von Königsłow (2006 – 2009) – Differentiating between error and information in DNA sequence data (defended March 2009).
- Christine Carr (2007- ) – Inferring patterns of molecular evolution: the utility of DNA barcoding in analyzing sequence evolution among Amphipoda and Polychaeta

I also supervise undergraduate student research projects

- Kaleb Smith: (2010/11). Kayleb will be working on documenting the effects of *Wolbachia* on the cryptic diversity of parasitoid wasps in Costa Rica and Canada.
- Vincent Beluz: (2010/11). Vincent will be working on testing whether host insects can be determined by amplifying the gut-contents of the adult parasitoid wasps.
- Lauren van Patter: Undergraduate Research assistant. Summer 2009, Fall/Winter 2009/10, Summer 2010. Lauren is working on the Costa Rican ant community and climate change project.
- Mark Merillo: Undergraduate Research project (4500/4501, 2009/10). Mark worked on testing the effect of cryptic species identification on the balsam fir/spruce budworm foodweb.

I served as second reader on the 4<sup>th</sup> year projects

- Krisztina Mosdossy (“An Analysis of Insect Species Richness in the Diet of Adult and Juvenile White-faced Capuchin monkeys (*Cebus capucinus*) Using DNA barcoding and Next-Generation Sequencing Approach”)
- Elizabeth Boyle (“Analysis of sub-Arctic Trichoptera co-existence and community structure using phylogenetic and taxonomic approaches”).

**Supervisor** for numerous volunteers within BIO.

**Organised and delivered** “Welcome to BIO” for 2009 summer undergraduates and fall 2009 work study students.

**Instructor and co-organizer** for BIOL-386: (*Ecology of the Kawarthas*). 2007 was my fourth year teaching third and fourth year undergraduates (May 2004, June 2005, June 2006, and June 2007) through the Ontario Universities Program in Field Biology. I am responsible for course preparation and delivery in methods of field biology. The development of this course has been by primary teaching outlet since moving to Guelph and I am quite passionate about it. Unfortunately, due to construction at the field station, the course was not offered in 2008 or 2009.

University of Guelph, College of Biological Sciences **Graduate Program Development Committee (GPDC) Committee Member** – 2007-2008.

**Special Graduate Faculty** at the Department of Integrative Biology (2006-2009),

**Guest lecturer** in IBIO\*6020, ‘Advances in Evolutionary Biology’ and MBG\*3000 ‘Population Genetics’ at the University of Guelph.

I was an **advisor** for 2 third-year undergraduate projects in molecular biology and field ecology at the University of Guelph.

M. Alex Smith

**Instructor** for BIOL-385: (*Life on the Edge: wetland and littoral ecosystems*). 12 third and fourth year undergraduates. August 2003, Ontario Universities Program in Field Biology. Responsible for lecture delivery and preparation, instruction in methods of field biology, assignment marking.

Chief Teaching Assistant BIOL-305b (*Diversity of Life*). Winter term 2001 - 2004. ~70 third year undergraduates. McGill University. Responsible for TA organization, Web-CT management, lab direction and marking. Delivered 6 lectures over this time. Supervisors: Graham Bell, David Green

Sole Teaching Assistant BIOL-465a (*Conservation Biology*). Fall Term 2002. ~80 fourth year undergraduates. McGill University. Responsible for assignment/exam marking, Web-CT management. Delivered 1 lecture. Supervisors: David Green, Catherine Potvin.

Teaching Assistant BIOL-208a (*Introductory Ecology*). Fall Term 2001. ~50 second year undergraduates. McGill University. Responsible for computer lab setup and delivery, assignment marking. Fall 2001. Supervisors: Kevin McCann, Joe Rasmussen.

Sole Teaching Assistant BIOL-327a (*Herpetology*). Fall Term 2000. ~40 third year undergraduates. McGill University. Responsible for assignment marking, identification lab setup and delivery. Delivered 2 lectures. Supervisors: David Green, Jason Irwin.

Chief Teaching Assistant BIOL-360 (*Evolution*). Fall Terms 1994, 1995, and 1997. ~70 third year undergraduates. Trent University. Responsible for assignment marking, identification lab setup and delivery. Delivered 1 lecture. Supervisor: Michael Berrill.

Teaching Assistant BIOL-101 (*Introductory Biology*). Fall and Winter Term 1996/97. ~250 first year undergraduates. Trent University. Responsible for assignment marking, identification lab setup and delivery. Supervisor: Erica Nol.

Teaching Assistant BIOL-208a (*Invertebrate Zoology*). Fall and Winter Term 1993/94. ~30 second year undergraduates. Trent University. Responsible for assignment marking, identification lab setup and delivery. Supervisors: Terry Mathews and Ian Sandeman.

Fourteen years of teaching at a whitewater paddling school, the last four as the Head Instructor responsible for instruction, scheduling, and instructor training.

#### SKILLS, INTERESTS AND ACTIVITIES

I am a CRCA Level III whitewater kayaking instructor-trainer and a CRCA/ORCA Level III whitewater open-canoe instructor-trainer. I have been a member of the esteemed "Thursday Zoology Hockey" group, Guelph Kayak Club, the Guelph Nordic Ski Club, and the Guelph Grotto Indoor Climbing Gym and enjoy paddling, running, skiing, road-cycling, playing guitar, looking for ants and repairing my house.

M. Alex Smith

REFERENCES

Daniel H. Janzen djanzen@sas.upenn.edu	Department of Biology 301 Leidy Laboratories University of Pennsylvania Philadelphia, PA 19104 USA	Collaborator – often in Costa Rica.
David M. Green david.m.green@mcgill.ca	Director, Redpath Museum McGill University 859 Sherbrooke St. W Montreal QC H3A 2K6	PhD thesis supervisor.
Michael Berrill mberrill@trentu.ca	Emeritus professor Trent University Peterborough, Ontario.	MSc thesis supervisor.