

Curriculum Vitae

Mark C. Chen

Academic Positions:

Department of Physics, Engineering Physics & Astronomy, Queen's University, Kingston, ON, Canada

2014- Gordon and Patricia Gray Chair in Particle Astrophysics
2011- Professor
2003-2011 Associate Professor
2000-2003 Assistant Professor

Canadian Institute for Advanced Research

2004- CIFAR Fellow (now called Senior Fellow, since 2013)
2000-2004 CIAR Scholar

Physics Department, Princeton University, Princeton, NJ, USA

1997-2000 Assistant Professor
1994-1997 Research Associate

Visiting Academic Positions:

2011-2012 Visiting Fellow, Mansfield College, University of Oxford
2003 Enseignant-Chercheur, Université de la Méditerranée, Aix-Marseille II (Ecole Supérieure d'Ingénieurs de Luminy)

Education:

Ph.D., Physics (*Advisor: Felix H. Boehm*)

1989-1994 California Institute of Technology Pasadena, CA, USA

B.Sc.(Eng.) with Honours, Engineering Physics

1985-1989 Queen's University Kingston, ON, Canada

2003-present P.Eng, Professional Engineers Ontario

Awards:

2016 Breakthrough Prize in Fundamental Physics
2006 NSERC John C. Polanyi Award
2003 Premier's Research Excellence Award
1993 John S. Stemple Memorial Prize in Physics (Caltech)

Academic Administration:

2017- Board of Trustees, Institute of Particle Physics
2014-2015 Associate Head of Department, Physics, Engineering Physics & Astronomy
2004-2018 Chair of Undergraduate Studies and Advisor, Physics, Arts and Science

Current Research Activities:

I am the Director and Spokesperson of the SNO+ experiment. I lead an international collaboration of over 120 scientists. My research contributions include:

- proposing the SNO+ experiment

- establishing the scientific goals (low energy solar neutrinos – especially pep and CNO, geo neutrinos, reactor neutrino oscillations and double beta decay search with dissolved neodymium – a novel approach for a double beta decay experiment)
- completing R&D on the technical feasibility (e.g. scintillator-acrylic compatibility, testing scintillator purification, R&D for neodymium-loading techniques)
- developing a new liquid scintillator not previously used in particle/nuclear/neutrino experiments based on the solvent linear alkylbenzene (LAB); LAB-based liquid scintillator has since been widely adopted for use in neutrino detectors around the world
- co-developing (with S. Biller) the full potential of Te-loaded liquid scintillator for double beta decay searches in SNO+

In the past 7 years, SNO+ received over \$17 million funding, and has been built and installed in the SNOLAB underground laboratory. Data taking in the first of three phases started in 2017.

Teaching:

2000-present Queen's University

APSC 200, PHYS 225, 250, 351, 352, 450, 832, 841, 843, 844

1997-2000 Princeton University

PHY 102, 103, 104, 203, 203/205

Graduate Student Supervision:

Degree Completed

- 2 Ph.D. students: Alexander Wright, Erin O'Sullivan
- 10 M.Sc. students: Bryan Fulsom, Ryan Martin, Chunlin Lan, Sarah Quirk, Xu Liu, Satoko Asahi, Maryam Seddighin, Matthew Walker, Emilie Mony, Joseph McLaughlin

In Progress

- 3 Ph.D students
- 1 M.Sc. student

Major Research Grants (past 10 years):

2017-2019	NSERC SAP Project	\$2,600,000	SNO+
2016-2017	NSERC SAP Project	\$1,380,000	SNO+
2015	CFI Innovation Fund	\$3.7 million	Enhanced Tellurium Purification
2015-2016	NSERC SAP Project	\$1,250,000	SNO+
2013-2015	NSERC SAP Project	\$2,200,000	SNO+
2012-2013	NSERC SAP Project	\$1,138,000	SNO+
2010-2012	NSERC SAP Project	\$1,680,000	SNO+
2009	CFI New Initiatives	\$26.4 million	SNO+ and DEAP-3600
2008-2009	FedNor Innovation	\$380,000	SNO+ Scintillator Purification
2008-2010	NSERC SAP Project	\$2.6 million	SNO+
2007-2008	NSERC SAP Project	\$400,000	SNO+ Continued Development
2006-2008	NSERC SRO	\$145,000	GMRT Cosmic Rays

Miscellaneous Professional Service:

2018 Institute for Basic Science Center for Underground Physics 5-year Review, Chair
 2016-present Canfranc Underground Laboratory Scientific Committee
 2003-2012 SNOLAB scientific executive
 2001 elected to SNO scientific board

Publications

1. P.-A. Amaudruz et al., (DEAP-3600 Collaboration), “First Results from the DEAP-3600 Dark Matter Search with Argon at SNOLAB”, *Physical Review Letters* **121**, 071801-1 to 6 (2018).
2. B. Aharmim et al., (SNO Collaboration), “Search for neutron-antineutrino oscillations at the Sudbury Neutrino Observatory”, *Physical Review D* **96**, 092005-1 to 092005-15 (2017).
3. N.L.P. Andrews, J.Z. Fan, R.L. Forward, M.C. Chen and H.-P. Looock, “Determination of the thermal, oxidative and photochemical degradation rates of scintillator liquid by fluorescence EEM spectroscopy”, *Physical Chemistry Chemical Physics* **19**, 73-81 (2017).
4. P.-A. Amaudruz et al., (DEAP-1 Collaboration), “Measurement of the scintillation time spectra and pulse-shape discrimination of low-energy beta and nuclear recoils in liquid argon with DEAP-1”, *Astroparticle Physics* **85**, 1-23 (2016).
5. A. Bialek, M. Chen, B. Cleveland, P. Gorel, A. Hallin, P.J. Harvey, J. Heise, C. Kraus, C.B. Krauss, I. Lawson, C.J. Ng, B. Pinkney, D.M. Rogowsky, L. Sibley, R. Soluk, J. Soukup, E. Vázquez-Jáuregui, “A rope-net support system for the liquid scintillator detector for the SNO+ experiment”, *Nuclear Instruments and Methods in Physics Research A* **827**, 152-160 (2016).
6. M.C. Chen (2016), Chapter 8 “SNO+ geo-neutrino program”, published March 2016 in L. Ludhova (ed.) *Geo-neutrinos*, Berlin: Open Academic Press.
7. B. von Krosigk, M. Chen, S. Hans, A.R. Junghans, T. Kögler, C. Kraus, L. Kuckert, X. Liu, R. Nolte, H.M. O’Keeffe, H. Wan Chan Tseung, J.R. Wilson, A. Wright, M. Yeh, K. Zuber, “Measurement of alpha-particle quenching in LAB based scintillator in independent small-scale experiments”, paper accepted for publication in *Eur. Phys. J. C* (2016).
8. S. Andringa et al., (SNO+ Collaboration), “Current Status and Future Prospects of the SNO+ Experiment,” *Advances in High Energy Physics*, vol. **2016**, Article ID 6194250, 21 pp., (2016). doi:10.1155/2016/6194250.
9. S. Hans, R. Rosero, L. Hu, O. Chkvorets, W.T. Chan, S. Guan, W. Beriguete, A. Wright, R. Ford, M.C. Chen, S. Biller, M. Yeh, “Purification of telluric acid for SNO+ neutrinoless double-beta decay search”, *Nuclear Instruments and Methods in Physics Research A* **795**, 132-139 (2015).
10. P.-A. Amaudruz et al., (DEAP-1 Collaboration), “Radon backgrounds in the DEAP-1 liquid-argon-based dark matter detector”, accepted for publication in *Astroparticle Physics* **62**, 178-194 (2015).
11. B. Aharmim et al., (SNO Collaboration), “A search for astrophysical burst signals at the Sudbury Neutrino Observatory”, *Astroparticle Physics* **55**, 1-7 (2014).
12. M.C. Chen, *Treatise on Geochemistry* (2nd edition), Volume 15, 443-454 (2014), Chapter 24 “Geoneutrino Detection”, published November 2013; Chen M.C. (2014) Geoneutrino Detection. In: Holland H.D. and Turekian K.K. (eds.) *Treatise on Geochemistry*, Second Edition, vol. 15, pp. 443-453. Oxford: Elsevier.
13. B. Aharmim et al., (SNO Collaboration), *Combined Analysis of all Three Phases of Solar Neutrino Data from the Sudbury Neutrino Observatory*, *Phys. Rev. C* **88**, 025501-1 to 025501-27 (2013).
14. B. Aharmim et al., (SNO Collaboration), *Measurement of the ν_e and Total 8B Solar Neutrino Fluxes with the Sudbury Neutrino Observatory Phase-III Data Set*, *Phys. Rev. C* **87**, 015502-1 to 015502-43 (2013).
15. P.-A. Amaudruz et al., *Radon backgrounds in the DEAP-1 liquid argon based dark matter detector*, submitted to *Astroparticle Physics* (2012).
16. *Treatise on Geochemistry*, 2nd edition, Chapter 33 *Geoneutrino Detection*, submitted and accepted (2012).
17. Annie C. Dorris, Clemence Sicard, Mark C. Chen, Arthur McDonald and Christopher J. Barrett, *Stabilization of neodymium oxide nanoparticles via soft polymer adsorption*, DOI: 10.1021/am200515q, *ACS Appl. Mater. Interfaces* 2011, **3**, 3357–3365 (2011).
18. M.C. Chen, *Solar Neutrino Experiments: Status and Prospects*, *Physics of Particles and Nuclei*, **42**, 558-565 (2011).
19. H.M. O’Keeffe, E. O’Sullivan and M.C. Chen, *Scintillation Decay Time and Pulse Shape Discrimination in Oxygenated and Deoxygenated Solutions of Linear Alkylbenzene for the SNO+ Experiment*, *Nuclear Instruments and Methods in Physics Research A* **640**, 119-122 (2011).
20. B. Aharmim et al., (SNO Collaboration), *Low Multiplicity Burst Search at the Sudbury Neutrino Observatory*, *The Astrophysical Journal* **728**, 83-89 (2011).
21. B. Aharmim et al., (SNO Collaboration), “Low-Energy-Threshold Analysis of the Phase I and Phase II Data Sets of the Sudbury Neutrino Observatory”, *Physical Review C* **81**, 055504-1 to 055504-49 (2010).
22. B. Aharmim et al., (SNO Collaboration), “Searches for High-Frequency Variations in the 8B Solar Neutrino Flux at the Sudbury Neutrino Observatory”, *The Astrophysical Journal*, **710**, 540–548 (2010).
23. G. Alimonti et al., (Borexino Collaboration), “The Liquid Handling Systems for the Borexino Solar Neutrino Detector”, *Nuclear Instruments and Methods in Physics Research A* **609** 58-78 (2009).

24. J. Benziger et al., “*The fluid-filling system for the Borexino solar neutrino detector*”, Nuclear Instruments and Methods in Physics Research A **608** 464-474 (2009).
25. G. Alimonti et al., (Borexino Collaboration), *The Borexino Detector at the Laboratori Nazionali del Gran Sasso*, Nuclear Instruments and Methods in Physics Research A **600** 569-593 (2009).
26. B. Aharmim et al., (SNO Collaboration), *Measurement of the Cosmic Ray and Neutrino-Induced Muon Flux at the Sudbury Neutrino Observatory*, Physical Review D **80**, 012001-1 to 012001-15 (2009).
27. H.O. Back et al., (Borexino-CTF Collaboration), *Study of Phenylxylethane (PXE) as Scintillator for Low Energy Neutrino Experiments*, Nuclear Instruments and Methods in Physics Research A **585**, 48-60 (2008).
28. B. Aharmim et al., (SNO Collaboration), *Independent Measurement of the Total Active ^8B Solar Neutrino Flux Using an Array of ^3He Proportional Counters at the Sudbury Neutrino Observatory*, Physical Review Letters **101**, 111301-1 to 111301-5 (2008). arXiv:0806.0989
29. C. Arpesella et al., (Borexino Collaboration), “*Direct Measurement of the ^7Be Solar Neutrino Flux with 192 Days of Borexino Data*”, Physical Review Letters **101**, 091302-1 to 091302-6 (2008). arXiv:0805.3843v2
30. B. Aharmim et al., (SNO Collaboration), *Determination of the ν_e and total ^8B solar neutrino fluxes using the Sudbury Neutrino Observatory Phase I data set*, Physical Review C **75**, 045502-1 to 045502-69 (2007).
31. M.C. Chen, *Geo-neutrinos in SNO+*, Earth, Moon and Planets **99**, 221-228 (2006).
32. B. Aharmim et al., (SNO Collaboration), *A Search for Neutrinos from the Solar hep Reaction and the Diffuse Supernova Neutrino Background with the Sudbury Neutrino Observatory*, Astrophysical Journal **653**, 1545-1551 (2006).
33. *Topical Workshop on Low Radioactivity Techniques*, B. Cleveland, R. Ford, M. Chen (editors), AIP Conference Proceedings, Melville, NY (2005).
34. B. Aharmim et al., (SNO Collaboration), *Electron Energy Spectra, Fluxes, and Day-Night Asymmetries of ^8B Solar Neutrinos from Measurements with NaCl Dissolved in the Heavy-Water Detector at the Sudbury Neutrino Observatory*, Physical Review C **72**, 055502-1 to 055502-47 (2005).
35. B. Aharmim et al., (SNO Collaboration), *Search for Periodicities in the ^8B Solar Neutrino Flux Measured by the Sudbury Neutrino Observatory*, Physical Review D **72**, 052010-1 to 052010-8 (2005).
36. H.O. Back et al., (Borexino Collaboration), *New Experimental Limits on Violations of the Pauli Principle Obtained with the Borexino Counting Test Facility*, European Physical Journal C **37**, 421-431 (2004).
37. B. Aharmim et al., (SNO Collaboration), *Electron Antineutrino Search at the Sudbury Neutrino Observatory*, Physical Review D **70**, 093014-1 to 093014-8 (2004).
38. S.N. Ahmed et al., (SNO Collaboration), *Measurement of the Total Active ^8B Solar Neutrino Flux at the Sudbury Neutrino Observatory with Enhanced Neutral Current Sensitivity*, Physical Review Letters **92**, 181301-1 to 181301-6 (2004).
39. S.N. Ahmed et al., (SNO Collaboration), *Constraints on Nucleon Decay via “Invisible” Modes from the Sudbury Neutrino Observatory*, Physical Review Letters **92**, 102004-1 to 102004-4 (2004).
40. H.O. Back et al., (Borexino Collaboration), *New Limits on Nucleon Decays into Invisible Channels with the BOREXINO Counting Test Facility*, Physics Letters B **563**, 23-34 (2003).
41. H.O. Back et al., (Borexino Collaboration), *Study of Neutrino Electromagnetic Properties with the Prototype of the Borexino Detector*, Physics Letters B **563**, 35-47 (2003).
42. H.O. Back et al., (Borexino Collaboration), *New Experimental Limits on Heavy Neutrino Mixing in ^8B Decay Obtained with the Borexino Counting Test Facility*, JETP Letters **78**, 261-266 (2003).
43. Q.R. Ahmad et al. (SNO Collaboration), *Direct Evidence for Neutrino Flavor Transformation from Neutral-Current Interactions in the Sudbury Neutrino Observatory*, Physical Review Letters **89**, 011301-1 to 011301-6 (2002).
44. Q.R. Ahmad et al. (SNO Collaboration), *Measurement of Day and Night Neutrino Energy Spectra at SNO and Constraints on Neutrino Mixing Parameters*, Physical Review Letters **89**, 011302-1 to 011302-5 (2002).
45. C. Arpesella et al., (Borexino Collaboration), *Measurement of Extremely Low Radioactivity Levels in BOREXINO*, Astroparticle Physics **18**, 1-25 (2002).
46. H.O. Back et al., (Borexino Collaboration), *Search for Electron Decay Mode $e \rightarrow \gamma + \nu$ with Prototype of Borexino Detector*, Physics Letters B **525**, 29-40 (2002).
47. L. Cadonati, F.P. Calaprice and M.C. Chen, *Supernova Neutrino Detection in Borexino*, Astroparticle Physics **16**, 361-372 (2002).
48. G. Alimonti et al., (Borexino Collaboration), *Science and Technology of Borexino: A Real-Time Detector for Low Energy Solar Neutrinos*, Astroparticle Physics **16**, 205-234 (2002).

49. Q.R. Ahmad et al. (SNO Collaboration), *Measurement of the Rate of $\nu_e + d \rightarrow p + p + e^-$ Interactions Produced by 8B Solar Neutrinos at the Sudbury Neutrino Observatory*, Physical Review Letters **87**, 071301-1 to 071301-6 (2001).
50. G. Bellini, B. Caccianiga, M.G. Giammarchi, L. Miramonti, E. Meroni, F.A. Danevich, V.V. Kobychhev, B.N. Kropivnyansky, A.S. Nikolaiko, O.A. Ponkratenko, V.I. Tretyak, S.Yu. Zdesenko, Yu.G. Zdesenko, M. Chen, L. Oberauer, *The CAMEO Project: High Sensitivity Quest for Majorana Neutrino Mass with the BOREXINO Counting Test Facility*, Part. Nucl. Lett. **106**, 116-130 (2001).
51. G. Bellini, B. Caccianiga, M. Chen, F.A. Danevich, M.G. Giammarchi, V.V. Kobychhev, B.N. Kropivnyansky, E. Meroni, A.S. Nikolayko, L. Oberauer, O.A. Ponkratenko, V.I. Tretyak, S.Yu. Zdesenko, Yu.G. Zdesenko, *High Sensitivity Double-Beta Decay Study of ^{116}Cd and ^{100}Mo with the BOREXINO Counting Test Facility (CAMEO project)*, European Physical Journal C **19**, 43-55 (2001).
52. G. Bellini, B. Caccianiga, M. Chen, F.A. Danevich, M.G. Giammarchi, V.V. Kobychhev, B.N. Kropivnyansky, E. Meroni, A.S. Nikolayko, L. Oberauer, O.A. Ponkratenko, V.I. Tretyak, S.Yu. Zdesenko, Yu.G. Zdesenko, *High Sensitivity Quest for Majorana Neutrino Mass with the BOREXINO Counting Test Facility*, Physics Letters B **493**, 216-228 (2000).
53. G. Alimonti et al., (Borexino-CTF Collaboration), *Light Propagation in a Large Volume Liquid Scintillator*, Nuclear Instruments and Methods in Physics Research A **440**, 360-371 (2000).
54. M. Chen, F. Elisei, F. Masetti, U. Mazzucato, C. Salvo and G. Testera, *Quenching of Undesired Fluorescence in a Liquid Scintillator Particle Detector*, Nuclear Instruments and Methods in Physics Research A **420**, 189-201 (1999).
55. J.B. Benziger, M. Johnson, F.P. Calaprice, M. Chen, N. Darnton, F. Loeser and R.B. Vogelaar, *A Scintillator Purification System for a Large Scale Solar Neutrino Experiment*, Nuclear Instruments and Methods in Physics Research A **417**, 278-296 (1998).
56. M. Johnson, J. Benziger, C. Stoia, F. Calaprice, M. Chen, N. Darnton, F. Loeser and R.B. Vogelaar, *A ^{222}Rn Source for Low-Background Liquid Scintillation Detectors*, Nuclear Instruments and Methods in Physics Research A **414**, 459-465 (1998).
57. C.G. Rothschild, M.C. Chen and F.P. Calaprice, *Antineutrino Geophysics with Liquid Scintillator Detectors*, Geophysical Research Letters **25**, 1083-1086 (1998).
58. G. Alimonti et al., (Borexino-CTF Collaboration), *Measurement of the ^{14}C Abundance in a Low-Background Liquid Scintillator*, Physics Letters B **422**, 349-358 (1998).
59. G. Alimonti et al., (Borexino-CTF Collaboration), *Ultra-Low Background Measurements in a Large-Volume Underground Detector*, Astroparticle Physics **8**, 141-157 (1998).
60. G. Alimonti et al., (Borexino-CTF Collaboration), *A Large-Scale, Low-Background Liquid Scintillation Detector: The Counting Test Facility at Gran Sasso*, Nuclear Instruments and Methods in Physics Research A **406**, 411-426 (1998).
61. R. Hertenberger, M. Chen and B.L. Dougherty, *Muon-induced Neutron and Pion Production in an Organic Liquid Scintillator at a Shallow Depth*, Physical Review C **52**, 3449-3459 (1995).
62. M. Chen, B. Cook, H. Henrikson, R. Hertenberger, N. Mascarenhas, V. Novikov, F. Boehm and P. Vogel., *The San Onofre Neutrino Oscillation Experiment*, Nuclear Physics B **S35**, 447-449 (1994).
63. M. Chen, V.M. Novikov and B.L. Dougherty, *Measurements of the Fast Neutron Flux at 20 mwe Underground*, Nuclear Instruments and Methods in Physics Research A **336**, 232-235 (1993).
64. M. Chen, D.A. Imel, T.J. Radcliffe, H. Henriksen and F. Boehm, *New Limits on the 17 keV Neutrino*, Physical Review Letters **69**, 3151-3154 (1992).

Major Published Conference Proceedings

65. P.-A. Amaudruz et al., (DEAP-3600 Collaboration), "DEAP-3600 Dark Matter Search", Nuclear and Particle Physics Proceedings (refereed conference proceedings) 273-275, 340-346 (2016).
66. M.C. Chen, "Neutrinoless Double Beta Decay Experiments", proceedings of NuPhys 2013 Prospects in Neutrino Physics, December 19-20, 2013, London, UK, J. Phys.: Conf. Ser. **598**, 012008 (2015).
67. M.C. Chen, "Solar Neutrino Experiments: Recent Results and Future Prospects", *J. Phys.: Conf. Ser.* **312** 072001-1 to 072001-6 (2011). Proceedings of the International Nuclear Physics Conference 2010, July 4-9, 2010, Vancouver, BC (invited review talk, refereed proceedings).
68. R. Ford, M. Chen, O. Chkvorets, D. Hallman, E. Vazquez-Jauregui, "SNO+ Scintillator Purification and Assay", proceedings of LRT 2010 August 28-29, 2010, Sudbury, Canada, AIP Conf. Proc. **1338**, 183-194 (2011).

69. Mark C. Chen, “Double Beta Decay: Scintillators” *J. Phys.: Conf. Ser.* **136** 022035-1 to 022035-6 (2008). Neutrino 2008 conference proceedings (invited review talk).
70. M.C. Chen, “The SNO+ Experiment”, proceedings of the 34th International Conference on High Energy Physics (ICHEP 2008), Philadelphia, Pennsylvania (2008). arXiv:0810.3694
71. Mark C. Chen, “Solar Neutrino Experiments” *J. Phys.: Conf. Ser.* **120** 052001-1 to 052001-7 (2008). TAUP2007 conference proceedings (invited review talk).
72. M.C. Chen, “SNO and SNO+”, AIP Conf. Proc. **944**, 25-30 (2007).
73. M.C. Chen, “The SNO liquid scintillator project”, Nucl. Phys. Proc. Suppl. **145**, 65-68 (2005).
74. M.C. Chen (for the SNO Collaboration), “The Sudbury Neutrino Observatory: Comparison of phases”, Nucl. Phys. Proc. Suppl. **145**, 5-10 (2005).
75. M.C. Chen (for the SNO Collaboration), “Sudbury Neutrino Observatory: Physics implications of upcoming data”, proceedings of the 4th Workshop on Neutrino Oscillations and their Origin (NOON2003), Kanazawa, Japan (2003).

Recent Invited Seminars, Colloquia, Invited Talks (past 6 years):

Seminars and Colloquia

York University, Physics and Astronomy	September 2017
Institute of High Energy Physics, Beijing	June 2015
University of Toronto, Astronomy	November 2013
Queen’s University, Physics	April 2013
Kobe University, Particle Physics	June 2012
University of Liverpool, Particle Physics	February 2012

Conferences and Workshops Talks

XVIII Mexican School of Particle and Fields, Hermosillo, Mexico (invited talk)	October 2018
ISAPP geo neutrino summer school, Ferrara, Italy (invited lectures, talk)	July 2018
Neutrinos and Dark Matter 2018, Daejeon, Korea (invited talk)	June 2018
Mini-Workshop Neutrino Physics, Mexico City, Mexico (invited lectures)	November 2017
TAUP 2017, Sudbury, ON (invited parallel talk)	July 2017
New Directions in Dark Matter and Neutrino Physics, Waterloo, ON (invited)	July 2017
Jinping Neutrino Experiment 2 nd Workshop, Beijing, China (invited talk)	July 2017
GSSI 2016, Assergi, Italy (invited lecturer, invited talk)	July 2016
FroST Workshop, Fermilab (invited double beta scintillator review talk)	March 2016
Neutrino Geoscience 2015, Paris, France (invited K-40 geo talk)	June 2015
Tsinghua JinPing Mini-Workshop, Beijing, China (invited solar prospects talk)	June 2015
CIDER pre-AGU geo neutrino workshop (asked to give talk)	December 2014
Gran Sasso Summer Institute, Assergi, Italy (invited lecturer)	September 2014
TRISEP 2014 at SNOLAB, Sudbury, ON (invited lecturer)	June 2014
ArtFest Symposium, Kingston, ON (talk and organizing committee)	May 2014
NuPhys 2013, London, UK (invited review talk)	December 2013
TAUP 2013, Asilomar, CA (invited parallel future geo review talk)	September 2013
Neutrino Geoscience 2013, Takayama, Japan (invited talk)	March 2013
SNOLAB Grand Opening Symposium, Sudbury, ON (invited review talk)	May 2012