

# Adam Aczel

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## Research Interests

I study strongly-correlated electron systems, with a current emphasis on frustrated magnetism, long period magnetic structures such as soliton and skyrmion lattices, and 4d/5d transition metal-based magnets with strong spin-orbit coupling. I study these materials primarily with neutron scattering, but I also perform muon spin rotation/relaxation ( $\mu$ SR), synchrotron x-ray experiments, and high magnetic field bulk characterization measurements in select cases when these other techniques can provide additional insight into a particular material. Finally, I have maintained an interest in synthesizing polycrystalline samples and single crystals of new materials and characterizing them via magnetometry, heat capacity, resistivity, and X-ray diffraction measurements.

## Professional Experience

### Neutron Scattering Scientist

2013 - present

Neutron Scattering Division (2017 - present)  
Quantum Condensed Matter Division (2013 - 2017)  
Neutron Sciences Directorate  
Oak Ridge National Laboratory, Oak Ridge, USA

#### *Job Duties:*

- Perform excellent research at ORNL and maintain a strong scientific publication record
- Act as an instrument scientist for the triple axis spectrometers at the High Flux Isotope Reactor by serving as a local contact for general user experiments and helping users analyze and publish their results
- Work to improve the performance of the triple axis spectrometers
- Attract new users and work on strengthening the triple axis spectrometer user community

### Assistant Professor, Joint Faculty Program

2017 - present

Department of Physics and Astronomy  
University of Tennessee, Knoxville, USA

### Postdoctoral Research Associate

2010 - 2013

Quantum Condensed Matter Division  
Neutron Sciences Directorate  
Oak Ridge National Laboratory, Oak Ridge, USA

*Collaborators:* S.E. Nagler, G.E. Granroth, D. Mandrus

*Research Projects:* Crystal growth, basic characterization and neutron scattering studies of the vibrational and magnetic properties of geometrically-frustrated and itinerant magnets

## Education

**Doctor of Philosophy (Physics)** 2005 - 2010

**McMaster University, Hamilton, Canada**

*Collaborators:* G.M. Luke (Ph.D. supervisor), Y.J. Uemura, M. Jaime

*Research Projects:* Crystal growth and high magnetic field measurements of quantum magnets,  $\mu$ SR measurements of exotic magnets and unconventional superconductors

*Thesis Title:* Studies of Bose-Einstein condensates in magnetic insulators

**Bachelor of Science (Physics Honours – Co-op)** 2001 - 2005

**University of Windsor, Windsor, Canada**

*Minor:* mathematics

## Honors and Awards

2016: *UT Battelle Team Research Award* and *UT Battelle Director's Team Research Award*: "For team effort culminating in the observation of fractionalized quantum spin liquid excitations"

2005 - 2009: *Alexander Graham Bell Canada Graduate Scholarship, National Science and Engineering Research Council of Canada*. Awarded to a high caliber scholar engaged in a doctoral program in the natural sciences or engineering.

2006 - 2007: *James F. Harvey and Helen S. Harvey Travel Scholarship, McMaster University*

2005 - 2006: *Golden Key Graduate Scholar Award, Golden Key International Honour Society*. Awarded to an outstanding graduate student who excels in the areas of academics, leadership, and service.

2006: *Board of Governor's Medal, Physics, University of Windsor*. Awarded to the graduating student with the highest average in their discipline.

## Teaching and Mentoring Experience

### 1. Oak Ridge National Laboratory

2016 - present: *Graduate student advisor*

- (i) **Q. Chen**, University of Tennessee (2017 – present), co-supervision with Prof. H.D. Zhou through the Joint Faculty Program
- (ii) **D. Reig-i-Plessis**, University of Illinois at Urbana-Champaign (2016), co-supervision with Prof. G.J. MacDougall for six months through the DOE Office of Science Graduate Student Research Program (SCGSR).

2013 - present: *Graduate student mentor*

I have mentored several ORNL postdocs and University of Tennessee graduate students including **Arnab Banerjee**, **Travis Williams**, **Paige Kelley**, and **Yuen Yiu**.

2013 - 2017: *Instructor, Neutron and X-ray Scattering Summer School*

I led a tutorial for graduate students explaining how to perform a triple axis spectroscopy neutron scattering experiment.

## **2. McMaster University**

2006 - 2010: *Lab instructor, PHYS 3H03: Intermediate Laboratory*

2007, 2010: *Teaching assistant, PHYS 750: Statistical Mechanics (Graduate Level)*

2006 - 2009: *Teaching assistant, PHYS 729 and 730: Condensed Matter I and II (Graduate Level)*

2007 - 2008: *Teaching assistant, PHYS 4K03: Solid State Physics*

2005, *Lab instructor, PHYS 1BA3: Introduction to Modern Physics (Physical Science Majors), PHYS 1BB3: Modern Physics for Life Sciences, PHYS 1D03: Introductory Mechanics and PHYS 1E03: Waves, Electricity, and Magnetic Fields*

## **Memberships**

- American Physical Society, including GMAG, DMP, and DCOMP
- American Crystallographic Association
- Golden Key International Honour Society
- Neutron Scattering Society of America
- Canadian Institute for Neutron Scattering

## **Workshops Organized**

2018 - 3<sup>rd</sup> Quantum Materials Young Investigators Meeting, ORNL

2017 - 2<sup>nd</sup> Quantum Materials Young Investigators Meeting, ORNL

2017 - MANTA: A new cold triple axis spectrometer for HFIR, 2<sup>nd</sup> workshop, ORNL

2016 - Quantum Materials Young Investigators Meeting, ORNL

2015 - MANTA: A new cold triple axis spectrometer for HFIR, ORNL

## **Service**

2018 – Present: *Committee Member*

NHMFL Pulsed Field Advisory Sub-Committee

2018 – Present: *Committee Member*

APS March Meeting Frustrated Magnetism Focus Topic Committee

2018 – Present: *Committee Member*

Neutron Scattering Division (NSD) Career Advancement Committee

*We provide recommendations to NSD management on career advancement policies and procedures for neutron scattering scientists.*

2017 – Present: *Committee Chair*

ORNL Neutron Scattering Division Early Career Scientist (ECS) Initiative

*I work with a task force of ECS staff members to organize career development events and seminars with the overall goal of enhancing the science culture in our division.*

2015 - Present: *Proposal Reviewer for x-ray/neutron scattering user programs*  
Cornell High Energy Synchrotron Source and National Institute of Standards and Technology

2015 - Present: *Committee Member*  
ORNL Neutron Sciences High Magnetic Field and Low Temperature Sample Environment Steering Committee  
*We discuss high magnetic field and low temperature sample environment policies and development projects. We also make recommendations to management for new equipment.*

2009 - Present: *Referee*  
Physical Review B, Physical Review Letters, Physical Review Materials, npj Quantum Materials, Materials Science and Engineering B, the European Physical Journal B, the Journal of Solid State Chemistry, Journal of Physics and Chemistry of Solids, and Inorganic Chemistry

2015 - 2017: *Committee Member*  
ORNL DOE Scientific Highlights Committee  
*We chose ORNL neutron scattering highlights for our management to present to the Department of Energy.*

2014 - 2016: *Committee Member*  
ORNL Quantum Condensed Matter Seminar Series

## **Publications**

**Impact:** H-index = 20 and 1672 total citations (Web of Science, Dec. 2018)

87. G. Hester, H.S. Nair, T. Reeder, D.R. Yahne, T.N. DeLazzer, L. Berges, D. Ziat, J.A. Quilliam, J.R. Neilson, **A.A. Aczel**, G. Sala, and K.A. Ross, *A novel strongly spin-orbit coupled quantum dimer magnet:  $\text{Yb}_2\text{Si}_2\text{O}_7$* , Submitted to Phys. Rev. Lett. (2018)

86. M.D. LeBlanc, **A.A. Aczel**, G.E. Granroth, B.W. Southern, J.-Q. Yan, S.E. Nagler, J.P. Whitehead, and M.L. Plumer, *Impact of further-range exchange and cubic anisotropy on magnetic excitations in the fcc kagome antiferromagnet  $\text{IrMn}_3$* , Submitted to Phys. Rev. B (2018)

85. D. Reig-i-Plessis, S.V. Geldern, **A.A. Aczel**, D. Kochkov, B.K. Clark, G.J. MacDougall, *Deviation from the dipole-ice model in a new spinel spin-ice candidate*, Submitted to Phys. Rev. Lett. (2018)

84. B.K. Rai, S. Chikara, X. Ding, I.W.H. Oswald, R. Schonemann, V. Loganathan, A.M. Hallas, H.B. Cao, M. Stavinoha, H. Man, S. Carr, J. Singleton, V.S. Zapf, K. Benavides, J.Y. Chan, Q.R. Zhang, D. Rhodes, Y.C. Chiu, L. Balicas, **A.A. Aczel**, Q. Huang, J.W. Lynn, J. Gaudet, P. Dai, A.H. Nevidomskyy, C.-L. Huang, and E. Morosan, *Anomalous metamagnetism in the low carrier density Kondo lattice  $\text{YbRh}_3\text{Si}_7$* , Accepted by Phys. Rev. X (2018)

83. C. Thompson, D. Reig-i-Plessis, L. Kish, **A.A. Aczel**, B. Zhang, E. Karapetrova, G.J. MacDougall, and C. Beekman, *Spin canting and orbital order in spinel vanadate thin films*, Phys. Rev. Mat. **2**, 104411 (2018)
82. C. Mauws, A.M. Hallas, G. Sala, **A.A. Aczel**, P.M. Sarte, J. Gaudet, D. Ziat, J.A. Quilliam, J.A. Lussier, M. Bieringer, H.D. Zhou, A. Wildes, M.B. Stone, D.L. Abernathy, G.M. Luke, B.D. Gaulin and C.R. Wiebe, *Dipolar-octupolar Ising antiferromagnetic in  $Sm_2Ti_2O_7$ : a moment fragmentation candidate*, Phys. Rev. B **98**, 100401(R) (2018)
81. N. Metoki, H. Yamauchi, H.S. Suzuki, H. Kitazawa, M. Hagihara, T. Masuda, **A.A. Aczel**, S. Chi, T. Hong, M. Matsuda, D.P. Pajerowski, and J.A. Fernandez-Baca, *The  $f$ -electron states in  $PrPd_5Al_2$* , J. Phys. Soc. Jpn. **87**, 094704 (2018)
80. H.-Y. Yang, J. Gaudet, **A.A. Aczel**, D.E. Graf, P. Blaha, B.D. Gaulin, and F.F. Tafti, *Interplay of magnetism and transport in  $HoBi$* , Phys. Rev. B **98**, 045136 (2018)
79. **A.A. Aczel**, L.M. DeBeer-Schmitt, T.J. Williams, M.A. McGuire, N.J. Ghimire, L. Li, and D. Mandrus, *Extended exchange interactions stabilize long-period magnetic structures in  $Cr_{1/3}NbS_2$* , Appl. Phys. Lett. **113**, 032404 (2018)
78. A.V. Zakrzewski, S. Gangopadhyay, G.J. MacDougall, **A.A. Aczel**, S. Calder, and T.J. Williams, *Evolution of magnetic and orbital properties in the magnetically-diluted A-site spinel  $Cu_{1-x}Zn_xRh_2O_4$* , Phys. Rev. B **97**, 214411 (2018)
77. Hiroyuki Takeya, **A.A. Aczel**, Tao Hong, Masaaki Matsuda, Hazuki Kawano-Furukawa, *Weak ferromagnetic superconductor  $Tb_{0.47}Y_{0.53}Ni_2^{11}B_2C$* , Physica B, published online (2017)
76. N. Blanc, J. Trinh, L. Dong, X. Bai, **A.A. Aczel**, M. Mourigal, L. Balents, T. Siegrist, and A.P. Ramirez, *Quantum criticality among entangled spin chains*, Nature Physics **14**, 273 (2018)
75. A. Banerjee, P. Lampen-Kelley, J. Knolle, C. Balz, **A.A. Aczel**, B. Winn, Y. Liu, D. Pajerowski, J.-Q. Yan, C.A. Bridges, A.T. Savici, B.C. Chakoumakos, M.D. Lumsden, D.A. Tennant, R. Moessner, D.G. Mandrus, and S.E. Nagler, *Excitations in the field-induced quantum spin liquid state of  $\alpha$ - $RuCl_3$* , npj Quantum Materials **3**, 8 (2018)
74. J. Xiong, J.-Q. Yan, **A.A. Aczel**, and P.M. Woodward, *Type I antiferromagnetic order in  $Ba_2LuReO_6$ : Exploring the role of structural distortions in double perovskites containing  $5d^2$  ions*, Journal of Solid State Chemistry **258**, 762 (2018)
73. P. Lampen-Kelley, A. Banerjee, **A.A. Aczel**, H.B. Cao, J.-Q. Yan, S.E. Nagler, and D. Mandrus, *Destabilization of magnetic order in a dilute Kitaev spin liquid candidate*, Phys. Rev. Lett. **119**, 237203 (2017)
72. T.J.S. Munsie, M.N. Wilson, A. Millington, C.M. Thompson, R. Flacau, C. Ding, Z. Gong, S. Guo, **A.A. Aczel**, H.B. Cao, T.J. Williams, H.A. Dabkowska, F. Ning, J.E. Greedan, and

- G.M. Luke, *Neutron diffraction and  $\mu$ SR studies of two polymorphs of nickel niobate ( $\text{NiNb}_2\text{O}_6$ )*, Phys. Rev. B **96**, 144417 (2017)
71. P.M. Sarte, **A.A. Aczel**, G. Ehlers, C. Stock, B.D. Gaulin, C. Mauws, M.B. Stone, S. Calder, S.E. Nagler, J.W. Hollett, J.S. Gardner, J.P. Attfield, and C.R. Wiebe, *Quantum confinement of monopole quasiparticles in a quantum spin ice*, Journal of Physics: Condensed Matter **29**, 45LT01 (2017), **Annual Journal Highlight**
70. D. Ziat, **A.A. Aczel**, R. Sinclair, Q. Chen, H.D. Zhou, T.J. Williams, M.B. Stone, A. Verrier, and J.A. Quilliam, *Frustrated spin-1/2 molecular magnetism in the mixed-valence antiferromagnets  $\text{Ba}_3\text{MRu}_2\text{O}_9$  ( $M = \text{In}, \text{Y}, \text{Lu}$ )*, Phys. Rev. B **95**, 184424 (2017)
69. T.J. Williams, **A.A. Aczel**, M.B. Stone, M.N. Wilson, and G.M. Luke, *Hidden order signatures in the antiferromagnetic phase of  $\text{U}(\text{Ru}_{1-x}\text{Fe}_x)_2\text{Si}_2$* , Phys. Rev. B **95**, 104440 (2017)
68. A. Thaler, E. Northen, **A.A. Aczel**, and G.J. MacDougall, *A mechanical rotator for neutron scattering measurements*, Rev. Sci. Instrum. **87**, 125109 (2016)
67. G.J. MacDougall, **A.A. Aczel**, Y. Su, W. Schweika, E. Faulhaber, A. Schneidewind, A.D. Christianson, J.L. Zarestky, H.D. Zhou, D. Mandrus, and S.E. Nagler, *Revisiting the ground state of  $\text{CoAl}_2\text{O}_4$ : comparison to the conventional antiferromagnet  $\text{MnAl}_2\text{O}_4$* , Phys. Rev. B **94**, 184422 (2016), **Editor's suggestion**
66. X. Chen, D. Bansal, S. Sullivan, D.L. Abernathy, **A.A. Aczel**, J. Zhou, O. Delaire, and L. Shi, *Weak coupling of acoustic-like phonons and magnon dynamics in incommensurate spin ladder compound  $\text{Sr}_{14}\text{Cu}_{24}\text{O}_{41}$* , Phys. Rev. B **94**, 134309 (2016), **Editor's suggestion**
65. R. Morrow, A.E. Taylor, D.J. Singh, J. Xiong, S. Rodan, A.U.B. Wolter, S. Wurmehl, B. Buchner, M.B. Stone, A.I. Kolesnikov, **A.A. Aczel**, A.D. Christianson, and P.M. Woodward, *Spin-orbit coupling control of anisotropy, ground state, and frustration in  $5d^2$   $\text{Sr}_2\text{MgOsO}_6$* , Scientific Reports **6**, 32462 (2016)
64. **A.A. Aczel**, A.M. Cook, T.J. Williams, S. Calder, A.D. Christianson, G.-X. Cao, D. Mandrus, Yong-Baek Kim, and A. Paramakanti, *Highly-anisotropic exchange interactions of  $j_{\text{eff}} = 1/2$  iridium moments on the fcc lattice in  $\text{La}_2\text{BIR}_2\text{O}_6$  ( $B = \text{Mg}, \text{Zn}$ )*, Phys. Rev. B **93**, 214426 (2016), **Editor's suggestion**
63. **A.A. Aczel**, Z. Zhao, S. Calder, D.T. Adroja, P.J. Baker, and J.-Q. Yan, *Structural and magnetic properties of the  $5d^2$  double perovskites  $\text{Sr}_2\text{BReO}_6$  ( $B = \text{Y}, \text{In}$ )*, Phys. Rev. B **93**, 214407 (2016)
62. A. Glavic, H. Dixit, V.R. Cooper, and **A.A. Aczel**, *Exchange coupling between ferro- and antiferromagnets in  $\text{NdMnO}_3/\text{SrMnO}_3$  superlattices*, Phys. Rev. B **93**, 140413(R) (2016)

61. Z.Y. Zhao, S. Calder, **A.A. Aczel**, M.A. McGuire, B.C. Sales, D.G. Mandrus, G. Chen, N. Trivedi, H.D. Zhou, and J.-Q. Yan, *Fragile singlet ground state magnetism in pyrochlore osmates  $R_2Os_2O_7$  ( $R = Y, Ho$ )*, Phys. Rev. B **93**, 134426 (2016)

60. R. Morrow, J.R. Soliz, A.J. Hauser, J.C. Gallagher, M.A. Sunser, M.D. Sumption, **A.A. Aczel**, J.-Q. Yan, F.Y. Yang, and P.M. Woodward, *Effect of Chemical Pressure on the High Temperature Ferrimagnet Double Perovskites  $Sr_2CrOsO_6$  and  $Ca_2CrOsO_6$* , Journal of Solid State Chemistry **238**, 46 (2016)

59. A. Banerjee, C.A. Bridges, J.-Q. Yan, **A.A. Aczel**, L. Li, M.B. Stone, G.E. Granroth, M.D. Lumsden, Y. Yiu, D.L. Kovrizhin, S. Bhattacharjee, R. Moessner, D.A. Tennant, D.G. Mandrus, and S.E. Nagler, *Proximate Kitaev quantum spin liquid behavior in  $\alpha$ - $RuCl_3$* , Nature Materials **15**, 733 (2016)

#### News articles and press based on this work:

- (1) P.N. Armitage, *Kitaev's Exact Solution Approximated*, Nature Materials **15**, 701 (2016)
- (2) Featured in *Discover* magazine as #18 in the Top Science Stories of 2016

58. A.M. Hallas, J. Gaudet, M.N. Wilson, T.J. Munsie, **A.A. Aczel**, M.B. Stone, R.S. Freitas, A.M. Arevalo-Lopez, J.P. Attfield, M. Tachibana, C.R. Wiebe, G.M. Luke, and B.D. Gaulin,  *$\Psi_5$  Ground State in the Effective  $S = 1/2$  Pyrochlore Antiferromagnet  $Yb_2Ge_2O_7$* , Phys. Rev. B **93**, 104405 (2016)

57. H.J. Silverstein, E. Skoropata, P.M. Sarte, C. Mauws, **A.A. Aczel**, E.S. Choi, J. van Lierop, C.R. Wiebe, and H.D. Zhou, *Crystal supercell, polarization-flop, and the possibility of ferrotoroidicity in the multiferroic ilmenite  $MnTiO_3$* , Phys. Rev. B **93**, 054416 (2016)

56. D. Reig-I-Plessis, D. Casavant, V.O. Garlea, **A.A. Aczel**, M. Feyngenson, J. Neuefeind, H.D. Zhou, S.E. Nagler, and G.J. MacDougall, *Structural transition and orbital glass physics in near itinerant  $CoV_2O_4$* , Phys. Rev. B **93**, 014437 (2016)

55. Y. Yiu, **A.A. Aczel**, G.E. Granroth, D.L. Abernathy, M.B. Stone, W.J.L. Buyers, J.Y.Y. Lin, G.D. Samolyuk, G.M. Stocks and S.E. Nagler, *Light atom quantum oscillations in UC and US*, Phys. Rev. B **93**, 014306 (2016)

54. J.Y.Y. Lin, H.L. Smith, G.E. Granroth, D.L. Abernathy, M.D. Lumsden, B. Winn, **A.A. Aczel**, M. Alvazis, and B. Fultz, *MCVine – An object oriented Monte Carlo neutron ray tracing simulation package*, Nuclear Inst. and Methods in Physics Research A **810**, 86 (2016)

53. M.G. Kim, M. Wang, G.S. Tucker, P.N. Valdivia, D.L. Abernathy, S. Chi, A.D. Christianson, **A.A. Aczel**, T. Hong, T.W. Heitmann, S. Ran, P.C. Canfield, E.D. Bourret-Courchesne, A. Kreyssig, D.H. Lee, A.I. Goldman, R.J. McQueeney, and R.J. Birgeneau, *Spin dynamics near a putative antiferromagnetic quantum critical point in Cu substituted  $BaFe_2As_2$  and its relation to high-temperature superconductivity*, Phys. Rev. B **92**, 214404 (2015)

52. S. Calder, J.W. Kim, G.-X. Cao, C. Cantoni, A.F. May, H.B. Cao, **A.A. Aczel**, M. Matsuda,

- Y. Choi, D. Haskel, B.C. Sales, D. Mandrus, M.D. Lumsden, and A.D. Christianson, *Evolution of competing magnetic order in the  $J_{\text{eff}} = 1/2$  insulating state of  $\text{Sr}_2\text{Ir}_{1-x}\text{Ru}_x\text{O}_4$* , Phys. Rev. B **92**, 165128 (2015)
51. A. Pramanick, A. Glavic, G.D. Samolyuk, **A.A. Aczel**, V.V. Lauter, H. Ambaye, Z. Gai, J. Ma, A.D. Stoica, G.M. Stocks, S.M. Shapiro, and X.-L. Wang, *Direct in situ measurement and coupled magnetostructural evolution in a ferromagnetic shape memory alloy and its theoretical modeling*, Phys. Rev. B **92**, 134109 (2015)
50. T.J. Williams, **A.A. Aczel**, M.D. Lumsden, S.E. Nagler, M.B. Stone, J.-Q. Yan, and D. Mandrus, *Magnetic correlations in the quasi-2D semiconducting ferromagnet  $\text{CrSiTe}_3$* , Phys. Rev. B **92**, 144404 (2015)
49. A.M. Cook, S. Matern, C. Hickey, **A.A. Aczel**, and A. Paramakanti, *Magnetism of  $j = 1/2$  moments on the fcc lattice in double perovskite Mott insulators*, Phys. Rev. B **92**, 020417(R) (2015)
48. **A.A. Aczel**, L. Li, V.O. Garlea, J.-Q. Yan, F. Weickert, V.S. Zapf, M. Jaime, P.J. Baker, V. Keppens, and D. Mandrus, *Spin liquid ground state in the frustrated  $J_1$ - $J_2$  zigzag chain system  $\text{BaTb}_2\text{O}_4$* , Phys. Rev. B **92**, 041110(R) (2015)
47. A.E. Taylor, T. Berlijn, S.E. Hahn, A.F. May, T.J. Williams, L. Poudel, S. Calder, R.S. Fishman, M.B. Stone, **A.A. Aczel**, H.B. Cao, M.D. Lumsden, and A.D. Christianson, *Influence of interstitial Mn on magnetism in room-temperature ferromagnet  $\text{Mn}_{1+\delta}\text{Sb}$* , Phys. Rev. B **91**, 224418 (2015)
46. F.A. Perez, P. Borisov, T.A. Johnson, T.D. Stanescu, R. Trappen, M.B. Holcomb, D. Lederman, M.R. Fitzsimmons, **A.A. Aczel** and T. Hong, *Phase diagram of a three-dimensional antiferromagnet with random magnetic anisotropy*, Phys. Rev. Lett. **114**, 097201 (2015)
45. J. Ma, J.H. Lee, S.E. Hahn, T. Hong, H.B. Cao, **A.A. Aczel**, Z.L. Dun, M.B. Stone, W. Tian, Y. Qiu, J.R.D. Copley, H.D. Zhou, R.S. Fishman, and M. Matsuda, *Strong competition between orbital-ordering and itinerancy in a frustrated spinel vanadate*, Phys. Rev. B **91**, 020407(R) (2015)
44. **A.A. Aczel**, L. Li, V.O. Garlea, J.-Q. Yan, F. Weickert, M. Jaime, B. Maiorov, R. Movshovich, L. Civale, V. Keppens, and D. Mandrus, *Magnetic ordering in the frustrated  $J_1$ - $J_2$  Ising chain candidate  $\text{BaNd}_2\text{O}_4$* , Phys. Rev. B **90**, 134403 (2014)
43. G.J. MacDougall, I. Brodsky, **A.A. Aczel**, V.O. Garlea, G.E. Granroth, A.D. Christianson, T. Hong, H.D. Zhou and S.E. Nagler, *Magnons and a two-component spin gap in  $\text{FeV}_2\text{O}_4$* , Phys. Rev. B **89**, 224404 (2014)
42. Y. Tsujimoto, A. Kitada, M. Nishi, Y. Narumi, K. Kindo, T. Goko, Y.J. Uemura, **A.A. Aczel**, T.J. Williams, G.M. Luke, Y. Ajiro, and H. Kageyama, *Singlet ground state in the 2D quantum spin antiferromagnet  $(\text{CuCl})\text{Ca}_2\text{Nb}_3\text{O}_{10}$* , J. Phys. Soc. Jpn. **83**, 074712 (2014)



41. Z. Wang, D. Kamenskyi, O. Cepas, M. Schmidt, D.L. Quintero-Castro, A.T.M.N. Islam, B. Lake, **A.A. Aczel**, H.A. Dabkowska, A.B. Dabkowski, G.M. Luke, Y. Wan, A. Loidl, M. Ozerov, J. Wosnitza, S.A. Zvyagin and J. Deisenhofer, *High-field spectroscopy of singlet-triplet transitions in the spin-dimer systems  $Sr_3Cr_2O_8$  and  $Ba_3Cr_2O_8$* , Phys. Rev. B **89**, 174406 (2014)
40. J. Ma, V.O. Garlea, A. Rondinone, **A.A. Aczel**, S. Calder, C. de la Cruz, R. Sinclair, W. Tian, S. Chi, H.D. Zhou and M. Matsuda, *Magnetic and structural phase transitions in the spinel compound  $Fe_{1+x}Cr_{2-x}O_4$* , Phys. Rev. B **89**, 134106 (2014)
39. J.Y.Y. Lin, **A.A. Aczel**, D.L. Abernathy, S.E. Nagler, W.J.L. Buyers and G.E. Granroth, *Using Monte Carlo ray tracing simulations to model the quantum harmonic oscillator modes observed in uranium nitride*, Phys. Rev. B **89**, 144302 (2014)
38. **A.A. Aczel**, P.J. Baker, D.E. Bugaris, J. Yeon, H.-C. zur Loye, T. Guidi and D.T. Adroja, *Exotic magnetism on the quasi-FCC lattices of the  $d^3$  double perovskites  $La_2NaB'O_6$  ( $B' = Ru, Os$ )*, Phys. Rev. Lett. **112**, 117603 (2014)
37. J. Munevar, H. Micklitz, M. Alzamora, C. Arguello, T. Goko, F.L. Ning, T. Munsie, T.J. Williams, **A.A. Aczel**, G.M. Luke, G.F. Chen, W. Yu. Y.J. Uemura and E. Baggio-Saitovitch, *Magnetism in superconducting  $EuFe_2As_{1.4}P_{0.6}$  single crystals studied by local probes*, Solid State Communications **187C**, 18 (2014)
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- (1) D. Belitz and T.R. Kirkpatrick, Nature Physics **3**, 15 (2007)

#### Presentations

(a) The following is a list of **talks** that I have given:

27. *Evidence for dominant Kitaev interactions on the fcc lattice in  $La_2BIrO_6$  ( $B = Mg, Zn$ )* (**invited**), Meeting of the American Crystallographic Association, Toronto ON, Canada (2018)
26. *Magnetic order and spin dynamics of  $J_{eff} = 1/2 Ir^{4+}$  moments on the fcc lattice in  $La_2BIrO_6$  ( $B = Mg, Zn$ )*, American Conference on Neutron Scattering, College Park MD, USA (2018)
25. *Magnetic order and spin dynamics of  $J_{eff} = 1/2 Ir^{4+}$  moments on the fcc lattice in  $La_2BIrO_6$  ( $B = Mg, Zn$ )*, March Meeting of the American Physical Society, Los Angeles CA, USA (2018)
24. *Exotic magnetism in double perovskites based on heavy transition metals* (**invited**), Condensed Matter Science Colloquium, Los Alamos National Laboratory, Los Alamos NM, USA (2017)
23. *Structural and magnetic properties of the  $5d^2$  double perovskites  $Sr_2BReO_6$  ( $B = In, Y$ )*, March Meeting of the American Physical Society, New Orleans LA, USA (2017)
22. *Neutrons and muons as probes of magnetism in heavy transition metal compounds* (**invited**), Physics Colloquium, University of Notre Dame, Notre Dame IN, USA (2017).
21. *Spin liquid ground state in the frustrated  $J_1$ - $J_2$  zigzag chain system  $BaTb_2O_4$* , March Meeting of the American Physical Society, Baltimore MD, USA (2016).

20. *Exotic magnetism on the quasi-FCC lattices of the  $d^3$  double perovskites  $La_2NaTO_6$  ( $T = Ru, Os$ ) (invited)*, March Meeting of the American Physical Society, San Antonio TX, USA (2015).
19. *Exotic magnetism on the quasi-FCC lattices of the  $d^3$  double perovskites  $La_2NaTO_6$  ( $T = Ru, Os$ )*, American Conference on Neutron Scattering, Knoxville TN, USA (2014).
18. *Low temperature magnetic ordering in the frustrated zigzag ladder system  $BaNd_2O_4$* , March Meeting of the American Physical Society, Denver CO, USA (2014).
17. *Quantum oscillations of nitrogen atoms in uranium nitride (invited)*, International Conference on Neutron Scattering, Edinburgh, UK (2013).
16. *Quantum oscillations of nitrogen atoms in uranium nitride*, March Meeting of the American Physical Society, Baltimore MD, USA (2013).
15. *Frustration by competing interactions in the highly-distorted double perovskites  $La_2NaTO_6$  ( $T = Ru, Os$ )*, March Meeting of the American Physical Society, Baltimore MD, USA (2013).
14. *Quantum oscillations of nitrogen atoms in uranium nitride (invited)*, Physics Colloquium, Rice University, Houston TX, USA (2013).
13. *Quantum oscillations of nitrogen atoms in uranium nitride (invited)*, Basic Energy Sciences, Department of Energy review of the ORNL Neutron Scattering Sciences Directorate, Oak Ridge National Laboratory, Oak Ridge TN, USA (2012).
12. *Quantum oscillations of nitrogen atoms in uranium nitride*, American Conference on Neutron Scattering, Washington DC, USA (2012).
11. *Coexisting short and long-range magnetic order in  $SrYb_2O_4$* , Conference on Highly-Frustrated Magnetism, Hamilton ON, Canada (2012).
10. *Quantum oscillations of nitrogen atoms in uranium nitride*, Neutron Scattering Science Directorate Friday Seminar Series, Oak Ridge National Laboratory, Oak Ridge TN, USA (2012).
9. *Magnetic structure and dynamics of the ferromagnetic chalcogenides  $Cr_2Te_3$  and  $tr-Cr_5Te_8$* , March Meeting of the American Physical Society, Boston MA, USA (2012).
8. *Magnetic excitations in the rare earth magnet  $Gd$* , March Meeting of the American Physical Society, Boston MA, USA (2012).
7. *Coexistence of ferromagnetism and superconductivity in single crystalline  $EuFe_2(As_{0.7}P_{0.3})_2$* , March Meeting of the American Physical Society, Dallas TX, USA (2011).
6. *BEC of magnons in Cr-based quantum magnets (invited)*, Oak Ridge National Laboratory, Oak Ridge TN, USA (2010).

5. *Field-induced Bose-Einstein condensation of triplons up to  $\sim 8$  K in  $Sr_3Cr_2O_8$* , March Meeting of the American Physical Society, Portland OR, USA (2010).
4. *Bose-Einstein Condensation of Triplons in  $Ba_3Cr_2O_8$* , March Meeting of the American Physical Society, Pittsburgh PA, USA (2009).
3. *Crystal growth and high field magnetization of the spin dimer compound  $Ba_3Cr_2O_8$* , March Meeting of the American Physical Society, New Orleans LA, USA (2008).
2.  *$Cr^{+5}$  compounds: a new area of magnetic oxide research (*invited*)*, Solid state chemistry seminar at McMaster University, Hamilton ON, Canada (2008).
1. *Muon perturbation effects in pure and doped  $SrCu_2(BO_3)_2$* , March Meeting of the American Physical Society, Denver CO, USA (2007).

(b) The following is a list of **posters** that I have presented:

7. *Magnetic Properties of the  $S = 1/2$  Quantum Molecular Magnets  $Ba_3BRu_2O_9$  ( $B = In, Y, Lu$ )*, American Conference on Neutron Scattering, Long Beach CA, USA (2016).
6. *Magnetic Properties of the Frustrated  $J_1$ - $J_2$  chain systems  $BaR_2O_4$  ( $R = Nd, Tb$ )*, Big Ideas in Quantum Materials Workshop, San Diego CA, USA (2015).
5. *MANTA: A New Multi-Analyzer Triple Axis Spectrometer at the HFIR*, JCNS Workshop, Tutzing, Germany (2014).
4. *Field-Induced Magnetic Ordering in the Spin Dimer System  $Sr_3Cr_2O_8$* , Meeting of the Canadian Institute for Advanced Research, Vancouver BC, Canada (2009).
3. *The spin dimer system  $Ba_3Cr_2O_8$ : A new BEC of magnons compound*, Meeting of the Canadian Institute for Advanced Research, Toronto ON, Canada (2008).
2. *Muon perturbation effects in pure and doped  $SrCu_2(BO_3)_2$* , I2CAM/FAPERJ spring school entitled "New Phenomena in Highly Correlated Quantum Matter", Rio de Janeiro, Brazil (2007).
1.  *$\mu$ SR study of the spin singlet state in the two-dimensional system  $SrCu_2(BO_3)_2$* , Meeting of the Canadian Institute for Advanced Research, Montreal, Canada (2006).

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