

Joel S. Helton

CONTACT INFORMATION	United States Naval Academy Chauvenet Hall - Physics Department 572C Holloway Rd. Annapolis, MD 21402-5026 USA	<i>Phone:</i> (410) 293-6674 (office) <i>E-mail:</i> helton@usna.edu <i>Website:</i> www.usna.edu/Users/physics/helton/	
RESEARCH INTERESTS	quantum magnetism, strongly correlated electrons, neutron spectroscopy, x-ray scattering		
EDUCATION	Ph.D., Physics B.S., Physics	Massachusetts Institute of Technology University of Dayton	June 2009 May 2002
APPOINTMENTS	Associate Professor of Physics Assistant Professor of Physics Guest Researcher Visiting Assistant Professor Postdoctoral Researcher	United States Naval Academy United States Naval Academy NIST Center for Neutron Research University of Maryland - College Park NIST Center for Neutron Research	2018-Present 2013-2018 2013-Present 2017 2009-2013
TEACHING AND MENTORING EXPERIENCE	Classes taught:	SP211 <i>General Physics I</i> SP212 <i>General Physics II</i> SP221 <i>Physical Mechanics I</i> SP324 <i>Physics of the Atom I</i> SP481C/482C <i>Physics Research Preparation</i> SP483C <i>Physics Research Introduction</i> SP495/496 <i>Physics Research Project</i>	2013-2014, 2018 2014-2016 2015-2017 2017-2019 2015-2016 2015 2016-2017, 2019
AWARDS	Office of Naval Research, Naval Academy Research Council award National Research Council Postdoctoral Research Award		2014-2016 2009-2010
DEPARTMENTAL SERVICE	Coordinator of Physics Department majors assessment Faculty organizer for USNA internships at Sandia National Laboratories Director of the Applied Physics (SPA) track		2018-Present 2015-Present 2017-2018
PROFESSIONAL ACTIVITIES	Member, American Physical Society Member, American Association of Physics Teachers		2006-Present 2015-Present

Referee for *EPL*, *Journal of Alloys and Compounds*, *Journal of Magnetism and Magnetic Materials*, *Journal of Physics: Condensed Matter*, *MMM Annual Conference Proceedings* (published in *Journal of Applied Physics*), *Nature Communications*, *Physical Review B*, *Physical Review Letters*, and *Physical Review X*. Recognized as an IOP Outstanding Reviewer for *Journal of Physics: Condensed Matter* in 2016. Technical reviewer for a DOE Small Business Innovation Research grant. DOE grant reviewer.

Workshop participant, *Neutron Measurements for Materials Design and Characterization* - Potomac, Maryland (August 21-22, 2014)

Outreach:

NIST Center for Neutron Research Summer School
NIST Summer Institute for Middle School Science Teachers

1. “Damping and softening of transverse acoustic phonons in colossal magnetoresistive $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ and $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ ” by [Joel S. Helton](#), Yang Zhao, Dmitry A. Shulyatev, and Jeffrey W. Lynn, *Physical Review B* **99**, 024407 (2019).
2. “Spin wave damping arising from phase coexistence below T_c in colossal magnetoresistive $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ” by [Joel S. Helton](#), Susumu K. Jones[†], Daniel Parshall, Matthew B. Stone, Dmitry A. Shulyatev, and Jeffrey W. Lynn, *Physical Review B* **96**, 104417 (2017).
3. “Correlated impurities and intrinsic spin-liquid physics in the kagome material herbertsmithite” by Tian-Heng Han, M.R. Norman, J.-J. Wen, Jose A. Rodriguez-Rivera, [Joel S. Helton](#), Collin Broholm, and Young S. Lee, *Physical Review B* **94**, 060409(R) (2016).
4. “Magnetic transitions in the topological magnon insulator $\text{Cu}(1,3\text{-bdc})$ ” by R. Chisnell, [J.S. Helton](#), D.E. Freedman, D.K. Singh, F. Demmel, C. Stock, D.G. Nocera, and Y.S. Lee, *Physical Review B* **93**, 214403 (2016).
5. “Magnetic structure of $\text{Yb}_2\text{Pt}_2\text{Pb}$: Ising moments on the Shastery-Sutherland lattice” by W. Müller, L.S. Wu, M.S. Kim, T. Orvis, J.W. Simonson, M. Gamża, D.M. McNally, C.S. Nelson, G. Ehlers, A. Podlesnyak, [J.S. Helton](#), Y. Zhao, Y. Qiu, J.R.D. Copley, J.W. Lynn, I. Zaliznyak, and M.C. Aronson, *Physical Review B* **93**, 104419 (2016).
6. “Topological Magnon Bands in a Kagome Lattice Ferromagnet” by R. Chisnell, [J.S. Helton](#), D.E. Freedman, D.K. Singh, R.I. Bewley, D.G. Nocera, and Y.S. Lee, *Physical Review Letters* **115**, 147201 (2015).
7. “Chemical pressure tuning of URu_2Si_2 via isoelectronic substitution of Ru with Fe” by Pinaki Das, N. Kanchanavatee, [J.S. Helton](#), K. Huang, R.E. Baumbach, E.D. Bauer, B.D. White, V.W. Burnett, M.B. Maple, J.W. Lynn, and M. Janoschek, *Physical Review B* **91**, 085122 (2015).
8. “Polaron-mediated spin correlations in metallic and insulating $\text{La}_{1-x}\text{A}_x\text{MnO}_3$ ($A=\text{Ca}$, Sr , or Ba)” by [Joel S. Helton](#), Daniel M. Pajerowski, Yiming Qiu, Yang Zhao, Dmitry A. Shulyatev, Yakov M. Mukovskii, Georgii L. Bychkov, Sergei N. Barilo, and Jeffrey W. Lynn, *Physical Review B* **90**, 214411 (2014).
9. “Carrier localization and electronic phase separation in a doped spin-orbit driven Mott phase in $\text{Sr}_3(\text{Ir}_{1-x}\text{Ru}_x)_2\text{O}_7$ ” by Chetan Dhital, Tom Hogan, Wenwen Zhou, Xiang Chen, Zhensong Ren, Mani Pokharel, Yoshinori Okada, M. Heine, Wei Tian, Z. Yamani, C. Opeil, [J.S. Helton](#), J.W. Lynn, Ziqiang Wang, Vidya Madhavan, and Stephen D. Wilson, *Nature Communications* **5**, 3377 (2014).
10. “Coexistence of Half-Metallic Itinerant Ferromagnetism with Local-Moment Antiferromagnetism in $\text{Ba}_{0.60}\text{K}_{0.40}\text{Mn}_2\text{As}_2$ ” by Abhishek Pandey, B.G. Ueland, S. Yeninas, A. Kreyssig, A. Sapkota, Yang Zhao, [J.S. Helton](#), J.W. Lynn, R.J. McQueeney, Y. Furukawa A.I. Goldman, and D.C. Johnston, *Physical Review Letters* **111**, 047001 (2013).
11. “Absence of a static in-plane magnetic moment in the ‘hidden-order’ phase of URu_2Si_2 ” by P. Das, R.E. Baumbach, K. Huang, M.B. Maple, Y. Zhao, [J.S. Helton](#), J.W. Lynn, E.D. Bauer, and M. Janoschek, *New Journal of Physics* **15**, 053031 (2013).
12. “Fractionalized excitations in the spin-liquid state of a kagome-lattice antiferromagnet” by Tian-Heng Han, [Joel S. Helton](#), Shaoyan Chu, Daniel G. Nocera, Jose A. Rodriguez-Rivera, Collin Broholm, and Young S. Lee, *Nature* **492**, 406 (2012).
13. “Paramagnetic spin correlations in colossal magnetoresistive $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ” by [Joel S. Helton](#), Matthew B. Stone, Dmitry A. Shulyatev, Yakov M. Mukovskii, and Jeffrey W. Lynn, *Physical Review B* **85**, 144401 (2012).

14. “Numerical study of the thermodynamics of clinoatacamite” by Ehsan Khatami, [Joel S. Helton](#), and Marcos Rigol, *Physical Review B* **85**, 064401 (2012).
15. “Evolution of the commensurate and incommensurate magnetic phases of the $S = 3/2$ kagome staircase $\text{Co}_3\text{V}_2\text{O}_8$ in an applied field” by [Joel S. Helton](#), Ying Chen, Georgii L. Bychkov, Sergei N. Barilo, Nyrisa Rogado, Robert J. Cava, and Jeffrey W. Lynn, *Journal of Physics: Condensed Matter* **24**, 016003 (2012).
16. “Magnetic order of the hexagonal rare earth manganite $\text{Dy}_{0.5}\text{Y}_{0.5}\text{MnO}_3$ ” by [Joel S. Helton](#), Deepak K. Singh, Harikrishnan S. Nair, and Suja Elizabeth, *Physical Review B* **84**, 064434 (2011).
17. “Dzyaloshinskii-Moriya interaction and spin-reorientation transition in the frustrated kagome lattice antiferromagnet” by K. Matan, B.M. Bartlett, [J.S. Helton](#), V. Sikolenko, S. Mat’áš, K. Prokeš, Y. Chen, J.W. Lynn, D. Grohol, T.J. Sato, M. Tokunaga, D.G. Nocera, and Y.S. Lee, *Physical Review B* **83**, 214406 (2011).
18. “Synthesis and characterization of single crystals of the spin-1/2 kagome-lattice antiferromagnets $\text{Zn}_x\text{Cu}_{4-x}(\text{OH})_6\text{Cl}_2$ ” by T.H. Han, [J.S. Helton](#), S. Chu, A. Prodi, D.K. Singh, C. Mazzoli, P. Müller, D.G. Nocera, and Y.S. Lee, *Physical Review B* **83**, 100402(R) (2011).
19. “Pressure-induced spin-Peierls to incommensurate charge-density-wave transition in the ground state of TiOCl ” by A. Prodi, [J.S. Helton](#), Y. Feng, and Y.S. Lee, *Physical Review B* **81**, 201103(R) (2010).
20. “Dynamic Scaling in the Susceptibility of the Spin-1/2 Kagome Lattice Antiferromagnet Herbertsmithite” by [J.S. Helton](#), K. Matan, M.P. Shores, E.A. Nytko, B.M. Bartlett, Y. Qiu, D.G. Nocera, and Y.S. Lee, *Physical Review Letters* **104**, 147201 (2010).
21. “Muon-spin spectroscopy of the organometallic spin-1/2 kagome-lattice antiferromagnet $\text{Cu}(1,3\text{-benzenedicarboxylate})$ ” by Lital Marcipar, Oren Ofer, Amit Keren, Emily A. Nytko, Daniel G. Nocera, Young S. Lee, [Joel S. Helton](#), and Chris Baines, *Physical Review B* **80**, 132402 (2009).
22. “Polarized neutron scattering studies of the kagomé lattice antiferromagnet $\text{KFe}_3(\text{OH})_6(\text{SO}_4)_2$ ” by K. Matan, [J.S. Helton](#), D. Grohol, D.G. Nocera, S. Wakimoto, K. Kakurai, and Y.S. Lee, *Physica B* **404**, 2529 (2009). (Conference Proceedings)
23. “ $\text{CdCu}_3(\text{OH})_6(\text{NO}_3)_2$: An $S=1/2$ Kagomé Antiferromagnet” by Emily A. Nytko, Matthew P. Shores, [Joel S. Helton](#), and Daniel G. Nocera, *Inorganic Chemistry* **48** (16), 7782 (2009).
24. “Spin correlations in the geometrically frustrated pyrochlore $\text{Tb}_2\text{Mo}_2\text{O}_7$ ” by D.K. Singh, [J.S. Helton](#), S. Chu, T. Han, C. Bonnoit, S. Chang, H.J. Kang, J.W. Lynn, and Y.S. Lee, *Physical Review B* **78**, 220405(R) (2008).
25. “A Structurally Perfect $S=1/2$ Metal-Organic Hybrid Kagomé Antiferromagnet” by Emily A. Nytko, [Joel S. Helton](#), Peter Müller, and Daniel G. Nocera, *Journal of the American Chemical Society* **130** (10), 2922 (2008).
26. “Spin Dynamics of the $S=1/2$ Kagome Lattice Antiferromagnet $\text{ZnCu}_3(\text{OH})_6\text{Cl}_2$ ” by [J.S. Helton](#), K. Matan, M.P. Shores, E.A. Nytko, B.M. Bartlett, Y. Yoshida, Y. Takano, A. Suslov, Y. Qiu, J.-H. Chung, D.G. Nocera, and Y.S. Lee, *Physical Review Letters* **98**, 107204 (2007).
27. “High-Flux Beam Source for Cold, Slow Atoms or Molecules” by S.E. Maxwell, N. Brahm, R. deCarvalho, [J.S. Helton](#), S.V. Nguyen, D. Patterson, J. Petricka, D. DeMille, and J.M. Doyle, *Physical Review Letters* **95**, 173201 (2005).
28. “Zeeman Relaxation of CaF in Low-Temperature Collisions with Helium” by Kenneth Mausang, Dima Egorov, [Joel S. Helton](#), Scott V. Nguyen, and John M. Doyle, *Physical Review Letters* **94**, 123002 (2005).

29. “Magnetic trapping of an atomic ^{55}Mn - ^{52}Cr mixture” by S.V. Nguyen, J.S. Helton, K. Maussang, W. Ketterle, and J.M. Doyle, *Physical Review A* **71**, 025602 (2005).
30. “Zeeman effect in $\text{CaF}_2(\text{F}_2)$ ” by R.V. Krems, D. Egorov, J.S. Helton, K. Maussang, S.V. Nguyen, and J.M. Doyle, *Journal of Chemical Physics* **121**, 11639 (2004).

News Coverage and Secondary Reports of Kagomé Lattice Work:

- “Do quantum spin liquids exist?” by Takashi Imai and Young S. Lee, *Physics Today* **69** (8), 30-36 (August 2016).
- “MIT researchers discover a new kind of magnetism” by David Chandler, *MIT News*, <http://web.mit.edu/newsoffice/2012/mit-researchers-discover-a-new-kind-of-magnetism-1219.html> (December 2012)
- “For Newly-Discovered ‘Quantum Spin Liquid’, the Beauty Is in Its Simplicity” by Chad Boutin, *NIST TechBeat*, <http://www.nist.gov/ncnr/spin-121912.cfm> (December 2012).
- “Do frustrated magnets go critical?” by Daniel Ucko, *APS Physics* synopsis, <http://physics.aps.org/synopsis-for/10.1103/PhysRevLett.104.147201> (April 2010).
- “An End to the Drought of Quantum Spin Liquids” by Patrick A. Lee, *Science* **321**, 1306-1307 (September 2008).
- “New Candidate Emerges for a Quantum Spin Liquid” by Barbara Goss Levi, *Physics Today* **60** (2), 16-19 (February 2007).

INVITED
CONFERENCE
PRESENTATIONS

- “Spin Dynamics and Scaling Behavior in the Spin-1/2 Kagomé Lattice Antiferromagnet Herbertsmithite”, *Novel Physics on the Kagomé Network* - Orsay, France (January 18, 2010)
- “The Physics of Frustration in a Spin-1/2 Kagomé Lattice Antiferromagnet”, *The Heisenberg Model: Past, Present, and Future* - Brasilia, Brazil (July 20, 2009)

INVITED SEMINARS

- “Neutron Scattering as a Probe of the Magnetic, Structural, and Spin Dynamical Properties of Colossal Magnetoresistive Manganites”, NCNR Summer School Research Seminar, *NIST Center for Neutron Research* (June 9, 2015)
- “Classical and Quantum Frustration: Magnetism on the Kagomé Lattice”, Physics Seminar, *University of Dayton* (March 25, 2013)
- “Classical and Quantum Frustration: Magnetism on the Kagomé Lattice”, Physics Seminar, *United States Naval Academy* (February 21, 2013)
- “Classical and Quantum Frustration: Magnetism on the Kagomé Lattice”, Physics Seminar, *Otterbein University* (December 12, 2011)
- “The Physics of Frustration in a Spin-1/2 Kagomé Lattice Antiferromagnet”, NCNR Summer School Research Seminar, *NIST Center for Neutron Research* (June 22, 2011)
- “The Physics of Frustration in a Spin-1/2 Kagomé Lattice Antiferromagnet”, Condensed Matter Theory Seminar, *Georgetown University* (April 26, 2010)
- “The Physics of Frustration in a Spin-1/2 Kagomé Lattice Antiferromagnet”, Condensed Matter Physics Seminar, *Johns Hopkins University* (February 17, 2010)

CONTRIBUTED
CONFERENCE
PRESENTATIONS

- “Spin wave damping in colossal magnetoresistive $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ”, *APS March Meeting* - Baltimore, Maryland (March 14, 2016)
- “Polaron-Mediated Spin Correlations in Metallic and Insulating $\text{La}_{1-x}\text{A}_x\text{MnO}_3$ ($A = \text{Ca}, \text{Sr}, \text{Ba}$)”, *APS March Meeting* - San Antonio, Texas (March 3, 2015)
- “Paramagnetic Spin Fluctuations in Optimally Doped CMR Manganites $\text{La}_{0.7}\text{A}_{0.3}\text{MnO}_3$ ($A = \text{Ca}, \text{Sr}, \text{Ba}$)”, *APS March Meeting* - Baltimore, Maryland (March 21, 2013)
- “Paramagnetic Spin Correlations in Colossal Magnetoresistive $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ”, *American Conference on Neutron Scattering* - Washington, District of Columbia (June 27, 2012)
- “Competing Interactions in the $S=3/2$ Kagome Staircase $\text{Co}_3\text{V}_2\text{O}_8$: Evolution of the Commensurate and Incommensurate Phases in a Magnetic Field”, *APS March Meeting* - Boston, Massachusetts (February 27, 2012)

- “Dynamic Scaling in the Susceptibility of the Spin-1/2 Kagomé Lattice Antiferromagnet Herbertsmithite”, *APS March Meeting* - Portland, Oregon (March 16, 2010)
- “Magnetic Order and Spin Fluctuations in the Spin-1/2 Three-Dimensional Frustrated Magnet Clinoatacamite, $\text{Cu}_2(\text{OH})_3\text{Cl}$ ”, *APS March Meeting* - New Orleans, Louisiana (March 11, 2008)
- “Spin Dynamics of the S=1/2 Kagomé Lattice Antiferromagnet $\text{ZnCu}_3(\text{OH})_6\text{Cl}_2$ ”, *APS March Meeting* - Denver, Colorado (March 6, 2007)

CONTRIBUTED
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POSTERS

- “Spin wave excitations in kagome staircase $\text{Co}_3\text{V}_2\text{O}_8$ ”, *APS March Meeting* - New Orleans, Louisiana (March 14, 2017)
- “Magnetic Order and Spin Dynamics in a Hexagonal Rare Earth Manganite”, *APS March Meeting* - Dallas, Texas (March 22, 2011)

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