

Joseph A M Paddison

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Employment **Oak Ridge National Laboratory, USA** October 2019 to present
Distinguished Staff Fellow (Eugene P. Wigner Fellow)

Churchill College, University of Cambridge, UK October 2016 to September 2019
Junior Research Fellow in Physics

School of Physics, Georgia Institute of Technology, USA June 2015 to September 2016
Postdoctoral Fellow in Physics
• Mentor: Prof Martin Mourigal

Education **Department of Chemistry, University of Oxford, UK and STFC-ISIS, Rutherford Appleton Laboratory, UK** October 2011 to July 2015
DPhil in Inorganic Chemistry
• Title: *Neutron-Scattering Studies of Frustrated Magnetic Materials*
• Supervisors: Prof Andrew Goodwin and Dr Ross Stewart

Wadham College, University of Oxford, UK September 2007 to July 2011
MChem in Chemistry
• Classification: 1st

Barnard Castle School, UK September 2001 to May 2007

- Selected Publications
- Geometric Frustration on the Trillium Lattice in a Magnetic Metal-Organic Framework
J M Bulled, **J A M Paddison**, A R Wildes, E Lhotel, S J Cassidy, B Pato-Doldán, L C Gómez-Aguirre, P J Saines, A L Goodwin
Phys Rev Lett **128**, 177201 (2022).
 - Magnetic structure and exchange interactions in the Heisenberg pyrochlore antiferromagnet $\text{Gd}_2\text{Pt}_2\text{O}_7$
P G Welch, **J A M Paddison**, M D Le, J S Gardner, W-T Chen, A R Wildes, A L Goodwin, J R Stewart
Phys Rev B **105**, 094402 (2022).
 - Suppressed-Moment 2-**k** Order in the Canonical Frustrated Antiferromagnet $\text{Gd}_2\text{Ti}_2\text{O}_7$
J A M Paddison, G Ehlers, A B Cairns, J S Gardner, O A Petrenko, N P Butch, D D Khalyavin, P Manuel, H E Fischer, H Zhou, A L Goodwin, and J R Stewart
npj Quantum Materials **6**, 1 (2021).
 - Emergent Magnetic Phases in Pressure-Tuned van der Waals Antiferromagnet FePS_3
M J Coak, D M Jarvis, H Hamidov, A R Wildes, **J A M Paddison**, C Liu, C R S Haines, N T Dang, S E Kichanov, B N Savenko, S Lee, M Kratochvílova, S Klotz, T Hansen, D P Kozlenko, J-G Park, and S S Saxena
Phys Rev X **11**, 011024 (2021).
 - Sample Dependence of Magnetism in the Next Generation Cathode Material $\text{LiNi}_{0.8}\text{Mn}_{0.1}\text{Co}_{0.1}\text{O}_2$
P Mukherjee, **J A M Paddison**, C Xu, Z Ruff, A Wildes, D A Keen, R I Smith, C P Grey, S E Dutton
Inorganic Chemistry **60**, 263 (2021)
 - Dynamical Ground State in the XY Pyrochlore $\text{Yb}_2\text{GaSbO}_7$
P M Sarte, K Cruz-Kan, B R Ortiz, K H Hong, M M Bordelon, D Reig-i-Plessis, M Lee, E S Choi, M B Stone, S Calder, D M Pajerowski, L Mangin-Thro, Y Qiu, J P Attfield, S D Wilson, C Stock, H D Zhou, A M Hallas, **J A M Paddison**, A A Aczel, C R Wiebe
npj Quantum Materials **6**, 1 (2021)

7. Hierarchical Excitations from Correlated Spin Tetrahedra on the Breathing Pyrochlore Lattice
S Gao, A F May, M-H Du, **J A M Paddison**, H S Arachchige, G Pokharel, C dela Cruz, Q Zhang, G Ehlers, D S Parker, D G Mandrus, M B Stone, A D Christianson
Phys. Rev. B **103**, 214418 (2021).
8. Scattering Signatures of Bond-Dependent Magnetic Interactions
J A M Paddison
Phys Rev Lett **125**, 247202 (2020)
9. Cluster Frustration in the Breathing Pyrochlore Magnet $\text{LiGaCr}_4\text{S}_8$
G Pokharel, H S Arachchige, T J Williams, A F May, R S Fishman, G Sala, S Calder, G Ehlers, D S Parker, T Hong, A R Wildes, D Mandrus, **J A M Paddison**, and A D Christianson
Phys Rev Lett **125**, 167201 (2020) [DOE research highlight](#)
10. Quantum versus Classical Spin Fragmentation in Kagome Ice $\text{Ho}_3\text{Mg}_2\text{Sb}_3\text{O}_{14}$
Z L Dun, X Bai, **J A M Paddison**, E Hollingworth, N P Butch, C D Cruz, M B Stone, T Hong, F Demmel, M Mourigal, and H D Zhou
Phys Rev X **10**, 031069 (2020)
11. Magnetic Excitations of the Classical Spin Liquid MgCr_2O_4
X Bai, **J A M Paddison**, E Kapit, S M Koohpayeh, J-J Wen, S E Dutton, A T Savici, AI Kolesnikov, G E Granroth, C L Broholm, J T Chalker, and M Mourigal
Phys Rev Lett **122**, 097201 (2019)
12. Ultrafast Calculation of Diffuse Scattering from Atomistic Models
J A M Paddison
Acta Crystallographica A **75**, 14-24 (2019)
13. Hierarchy of Exchange Interactions in the Triangular-Lattice Spin-Liquid YbMgGaO_4
X Zhang, F Mahmood, M Daum, Z L Dun, **J A M Paddison**, N J Laurita, T Hong, H D Zhou, N P Armitage, and M Mourigal
Phys Rev X **8**, 031001 (2018)
14. Magnetic Structure of Paramagnetic MnO
J A M Paddison, M J Gutmann, J R Stewart, M G Tucker, M T Dove, D A Keen, and A L Goodwin
Phys Rev B **97**, 014429 (2018)
15. Low-Dimensional Quantum Magnetism in $\text{Cu}(\text{NCS})_2$: A Molecular Framework Material
M J Cliffe, J Lee, **J A M Paddison**, S Schott, P Mukherjee, M W Gaultois, P Manuel, H Siringhaus, S E Dutton, and C P Grey
Phys Rev B **97** 144421 (2018)
16. Continuous Excitations of the Triangular-Lattice Quantum Spin Liquid YbMgGaO_4
J A M Paddison, M Daum, Z L Dun, G Ehlers, Y Liu, M B Stone, H D Zhou, and M Mourigal
Nature Physics **13**, 117 (2017) [Web of Science Highly Cited Paper \(Top 1% in its academic field\)](#);
[Top 10 ORNL Neutron Science Achievements of 2017](#); [Phys.org](#); [Science Bulletin](#)
17. Orbital Dimer Model for the Spin-Glass State in $\text{Y}_2\text{Mo}_2\text{O}_7$
P M M Thygesen, **J A M Paddison**, R Zhang, K A Beyer, K W Chapman, H Y Playford, M G Tucker, D A Keen, M A Hayward, and A L Goodwin
Phys Rev Lett **118**, 067201 (2017)
18. Spin Order and Dynamics in the Diamond-Lattice Heisenberg Antiferromagnets CuRh_2O_4 and CoRh_2O_4
L Ge, J Flynn, **J A M Paddison**, M B Stone, S Calder, M A Subramanian, A P Ramirez, and M Mourigal
Phys Rev B **96**, 064413 (2017) [Editors' Suggestion](#)
19. Spin Correlations in the Dipolar Pyrochlore Antiferromagnet $\text{Gd}_2\text{Sn}_2\text{O}_7$
J A M Paddison, G Ehlers, O A Petrenko, A R Wildes, J S Gardner, and J R Stewart
J Phys: Condens Matter **29**, 144001 (2017) ["Emerging Leaders" Special Issue](#)
20. Emergent Order in the Kagome Ising Magnet $\text{Dy}_3\text{Mg}_2\text{Sb}_3\text{O}_{14}$
J A M Paddison, H S Ong, J O Hamp, P Mukherjee, X Bai, M G Tucker, N P Butch, C Castelnovo, M Mourigal, and S E Dutton
Nature Communications **7**, 13842 (2016)
21. Encoding Complexity Within Supramolecular Analogues of Frustrated Magnets
A B Cairns, M J Cliffe, **J A M Paddison**, D Daisenberger, M G Tucker, F-X Coudert, and A L Goodwin
Nature Chemistry **8**, 442 (2016) [Nature Chemistry News and Views](#)
22. Hidden Order in Spin-Liquid $\text{Gd}_3\text{Ga}_5\text{O}_{12}$
J A M Paddison, H Jacobsen, O A Petrenko, M T Fernández-Díaz, P P Deen, and A L Goodwin
Science **350**, 179 (2015) [Phys.org](#)

23. Searching Beyond Gd for Magnetocaloric Frameworks: Magnetic Properties and Interactions of the $\text{Ln}(\text{HCO}_2)_3$ Series
P J Saines, **J A M Paddison**, P M M Thygesen, and M G Tucker
Materials Horizons **2**, 528 (2015)
24. Spin Correlations in $\text{Ca}_3\text{Co}_2\text{O}_6$: Polarized-Neutron Diffraction and Monte Carlo Study
J A M Paddison, S Agrestini, M R Lees, C L Fleck, P P Deen, A L Goodwin, J R Stewart, and O A Petrenko
Phys Rev B **90**, 014411 (2014)
25. Liquidlike Correlations in Single-Crystalline $\text{Y}_2\text{Mo}_2\text{O}_7$: An Unconventional Spin Glass
H J Silverstein, K Fritsch, F Flicker, A M Hallas, J S Gardner, Y Qiu, G Ehlers, A T Savici, Z Yamani, K A Ross, B D Gaulin, M J P Gingras, **J A M Paddison**, K Foyevtsova, R Valenti, F Hawthorne, C R Wiebe, and H D Zhou
Phys Rev B **89**, 054433 (2014)
26. Spinvert: A Program for Refinement of Paramagnetic Diffuse Scattering Data
J A M Paddison, J R Stewart, and A L Goodwin
J Phys: Condens Matter **25**, 454220 (2013)
27. Emergent Frustration in Co-doped β -Mn
J A M Paddison, J R Stewart, P Manuel, P Courtois, G J McIntyre, B D Rainford, and A L Goodwin
Phys Rev Lett **110**, 267207 (2013) **STFC-ISIS Highlight**
28. Statics and Dynamics of the Highly Correlated Spin Ice $\text{Ho}_2\text{Ge}_2\text{O}_7$
A M Hallas, **J A M Paddison**, H J Silverstein, A L Goodwin, J R Stewart, A R Wildes, J G Cheng, J S Zhou, J B Goodenough, E S Choi, G Ehlers, J S Gardner, C R Wiebe, and H D Zhou
Phys Rev B **86**, 134431 (2012)
29. Empirical Magnetic Structure Solution of Frustrated Spin Systems
J A M Paddison and A L Goodwin
Phys Rev Lett **108**, 017204 (2012) **Cover of Bluesci magazine**

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| Funding | <ul style="list-style-type: none"> • (Jan 2020–present) PI on “Understanding Quantum Materials at the Nanoscale” (ORNL Laboratory Directed Research & Development) with \$419k budget in FY20-FY22 • (2017–present) Awarded beamtime at STFC-ISIS Neutron Source (UK) with value £318k • (2018) Funded as academic lead supervisor for student placement at Institut Laue-Langevin |
| Software authored | <ul style="list-style-type: none"> • Spinvert: A program for refinement of paramagnetic diffuse-scattering data. • Scatty: A program for ultrafast calculation of diffuse scattering from atomistic models. Programs available at www.joepaddison.com/software |
| Invited seminars | <ul style="list-style-type: none"> • The “Winter” Crystallography Meeting, Milton Hill House, UK (May 16–17, 2022) • American Crystallographic Association Annual Meeting, virtual (July 30–August 5, 2021) • LINXS scattering workshop, virtual (March 25–26, 2021) • American Physical Society March Meeting, virtual (March 14–18, 2021) • Physics colloquium, University of Tennessee–Knoxville, USA (Feb 24, 2020) • Solid-State Seminar, Department of Chemistry, University of Oxford, UK (Dec 6, 2019) • APS Southeastern Section Meeting, Wrightsville Beach, NC, USA (Nov 7-9, 2019) • Theoretical and Experimental Magnetism Meeting, Abingdon, UK (July 17–19, 2019) • ORNL Neutron Scattering User Meeting, Oak Ridge, TN, USA (June 4–7, 2019) • Condensed Matter Physics Seminar, University of Warwick, Coventry, UK (April 30, 2019) • ADD2019 Analysis of Diffraction Data in Real Space, Grenoble, France (March 17–22, 2019) • American Physical Society March Meeting, Boston, MA, USA (March 4–8, 2019) • Institute for Quantum Matter, Johns Hopkins University, Baltimore, MD, USA (Jan 14, 2019) • Institut Laue-Langevin and ESS User Meeting, Grenoble, France (Oct 10, 2018) • High Field Magnet Laboratory, University of Nijmegen, Netherlands (April 12, 2018) • International Union of Crystallography Triennial Congress, Hyderabad, India (Aug 21–28, 2017) |
| Awards | <ul style="list-style-type: none"> • (2021) BTM Willis Prize • (2020) Reviewer of the Month (July 2020), <i>Communications Materials</i> • (2017) European Physical Society Early Career Prize • (2011) Inorganic Chemistry Part II thesis prize, University of Oxford, UK |
| Teaching | <ul style="list-style-type: none"> • (Mar 2021 & 2020) Led workshop at Hercules European Scattering School (virtual) • (Sept 2019) Lectured & led workshop at SISN Advanced School, Ispra, Italy • (Oct 2018–July 2019) Academic lead supervisor of 1-year undergraduate student project • (Mar 2019) Lectured & led workshops at ADD2019, Grenoble, France |

- (July 2018) Lectured at Polarised Neutrons for Condensed-Matter Investigations, UK
- (2017–2018) Small-group teaching of “Electrons in Solids” undergraduate course
- (Sept 2016) Lectured at Highly Frustrated Magnetism summer school, Taipei, Taiwan
- (Oct 2016–Sept 2019) Involved in mentoring 2 graduate students as JRF at Cambridge

Professional activities

- Reviewer, US D.O.E. Office of Basic Energy Sciences (2020, 2016)
- Reviewer for *Nature Communications*, *Communications Materials*, *Physical Review X*, *Physical Review Letters*, *Physical Review B*, *Ann. Phys.*, and *Acta Crystallographica A*
- Member of STFC-ISIS Facility Access Panel (UK)