Anthony Ashmore

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Academic positions

Sorbonne Université, Paris, France — 2023 to 2024
Marie Skłodowska-Curie Global Fellow

University of Chicago, Chicago, USA — 2022 to 2023
Kadanoff Fellow

University of Chicago, Chicago, USA — 2020 to 2022
Marie Skłodowska-Curie Global Fellow

University of Pennsylvania, Philadelphia, USA — 2019 to 2020
Postdoctoral Research Fellow

University of Oxford, Oxford, UK — 2016 to 2019
Junior Research Fellow, Merton College

Education

Imperial College London, London, UK — Sep 2012 to Nov 2016
PhD, Theoretical Physics

- "Generalised geometry for supersymmetric flux backgrounds" with Prof. Daniel Waldram

Princeton University, Princeton, New Jersey, US — Sep 2011 to Aug 2012
MA, Physics

- Enrolled as PhD student; studies interrupted by family circumstances to return to UK

University of Oxford, Oxford, UK — Sep 2007 to June 2011
MPhys (Hons), Physics, First Class

Publications

[1] "A heterotic Kodaira–Spencer theory at one-loop", A. Ashmore, J. J. M. Ibarra, D. D. McNutt, C. Strickland-Constable, E. E. Svanes, D. Tennyson, and S. Winje, *JHEP* **10** (2023) 130, [arXiv:2306.10106 [hep-th]].

[2] "Numerical spectra of the Laplacian for line bundles on Calabi–Yau hypersurfaces", A. Ashmore, Y.-H. He, E. Heyes, and B. A. Ovrut, *JHEP* **07** (2023) 164, [arXiv:2305.08901 [hep-th]].

[3] "Geometric flows and supersymmetry", A. Ashmore, R. Minasian, and Y. Proto [arXiv:2302.06624 [hep-th]].

[4] "$N = (2,0)$ AdS_3 Solutions of M-theory", A. Ashmore, *JHEP* **23** (2022) 101, [arXiv:2209.10680 [hep-th]].

[5] A. Ashmore, "Calabi-Yau metrics, CFTs and random matrices" in *Nankai Symposium on Mathematical Dialogues*. (2022) . [arXiv:2202.05896 [hep-th]].

[6] "Calabi-Yau Metrics, Energy Functionals and Machine-Learning", A. Ashmore, L. Calmon, Y.-H. He, and B. A. Ovrut, *International Journal of Data Science in the Mathematical Sciences* **01** 01, (2023) 49–61, [arXiv:2112.10872 [hep-th]].

[7] "Exactly Marginal Deformations and Their Supergravity Duals", A. Ashmore, M. Petrini, E. L. Tasker, and D. Waldram, *Phys. Rev. Lett.* **128** 19, (2022) 191601, [arXiv:2112.08375 [hep-th]].

[8] "Machine learning line bundle connections", A. Ashmore, R. Deen, Y.-H. He, and B. A. Ovrut, *Phys. Lett. B* **827** (2022) 136972, [arXiv:2110.12483 [hep-th]].

[9] "Topological G_2 and Spin(7) strings at 1-loop from double complexes", A. Ashmore, A. Coimbra, C. Strickland-Constable, E. E. Svanes, and D. Tennyson, *JHEP* **02** (2022) 089, [arXiv:2108.09310 [hep-th]].

[10] "Calabi-Yau CFTs and Random Matrices", N. Afkhami-Jeddi, A. Ashmore, and C. Cordova, *JHEP* **02** (2022) 021, [arXiv:2107.11461 [hep-th]].

[11] "Hidden Sectors from Multiple Line Bundles for the $B - L$ MSSM", A. Ashmore, S. Dumitru, and B. A. Ovrut, *Fortsch. Phys.* **70** 7-8, (2022) 2200071, [arXiv:2106.09087 [hep-th]].

[12] "Moduli-dependent KK towers and the swampland distance conjecture on the quintic Calabi-Yau manifold", A. Ashmore and F. Ruehle, *Phys. Rev. D* **103** 10, (2021) 106028, [arXiv:2103.07472 [hep-th]].

[13] "Explicit soft supersymmetry breaking in the heterotic M-theory $B - L$ ", A. Ashmore, S. Dumitru, and B. A. Ovrut, *JHEP* **08** (2021) 033, [arXiv:2012.11029 [hep-th]].

[14] "Eigenvalues and eigenforms on Calabi–Yau threefolds", A. Ashmore, *J. Geom. Phys.* **195** (2024) 105028, [arXiv:2011.13929 [hep-th]].

[15] "Line Bundle Hidden Sectors for Strongly Coupled Heterotic Standard Models", A. Ashmore, S. Dumitru, and B. A. Ovrut, *Fortsch. Phys.* **69** 7, (2021) , [arXiv:2003.05455 [hep-th]].

[16] "Heterotic backgrounds via generalised geometry: moment maps and moduli", A. Ashmore, C. Strickland-Constable, D. Tennyson, and D. Waldram, *JHEP* **11** (2020) 071, [arXiv:1912.09981 [hep-th]].

[17] "Machine Learning Calabi–Yau Metrics", A. Ashmore, Y.-H. He, and B. A. Ovrut, *Fortsch. Phys.* **68** 9, (2020) 2000068, [arXiv:1910.08605 [hep-th]].

[18] "Generalising G_2 geometry: involutivity, moment maps and moduli", A. Ashmore, C. Strickland-Constable, D. Tennyson, and D. Waldram, *JHEP* **01** (2021) 158, [arXiv:1910.04795 [hep-th]].

[19] "Marginal deformations of 3d $\mathcal{N} = 2$ CFTs from AdS_4 backgrounds in generalised geometry", A. Ashmore, *JHEP* **12** (2018) 060, [arXiv:1809.03503 [hep-th]].

[20] "Finite deformations from a heterotic superpotential: holomorphic Chern–Simons and an L_∞ algebra", A. Ashmore, X. de la Ossa, R. Minasian, C. Strickland-Constable, and E. E. Svanes, *JHEP* **10** (2018) 179, [arXiv:1806.08367 [hep-th]].

[21] "Exactly marginal deformations from exceptional generalised geometry", A. Ashmore, M. Gabella, M. Graña, M. Petrini, and D. Waldram, *JHEP* **01** (2017) 124, [arXiv:1605.05730 [hep-th]].

[22] "The exceptional generalised geometry of supersymmetric AdS flux backgrounds", A. Ashmore, M. Petrini, and D. Waldram, *JHEP* **12** (2016) 146, [arXiv:1602.02158 [hep-th]].

[23] "Exceptional Calabi–Yau spaces: the geometry of $\mathcal{N} = 2$ backgrounds with flux", A. Ashmore and D. Waldram, *Fortsch. Phys.* **65** 1, (2017) 1600109, [arXiv:1510.00022 [hep-th]].

[24] A. Ashmore and Y.-H. He, "Calabi–Yau three-folds: Poincaré polynomials and fractals" in *Strings, gauge fields, and the geometry behind: The legacy of Maximilian Kreuzer*, pp. 173–186. (2011) . [arXiv:1110.1612 [hep-th]].

[25] "Numerical analysis of space charge effects in electron bunches at laser-driven plasma accelerators", A. Ashmore, R. Bartolini, and N. Delerue, *Central Eur. J. Phys.* **9** (2011) 980–985, [arXiv:1008.4823 [physics.acc-ph]].

Grants and Funding

Marie Curie Individual Fellowship: €260,000 2020 to 2024
Global Fellowship for three-year research programme at the University of Chicago and Sorbonne Université

MATRIX-Simons Travel Grant : $1,600 Jan 2024
Awarded to attend "New Deformations of Quantum Field and Gravity Theories" at MATRIX, a research institute for the mathematical sciences in Australia.

Grant for Short Term Scientific Mission: €1,150 Jan 2016
Awarded by COST Action MP1210, for visit to LPTHE at UPMC, Paris

EPSRC Prize Studentship 2012 to 2016
Awarded for PhD study, one of seven university wide

Teaching and Mentoring Experience

Tutor, Merton College, Oxford Spring 2019
Third-year undergraduate tutorials on General Relativity and Cosmology

Lecturer, Mathematical Institute, Oxford Autumn 2018
Course lecturer and assessor for General Relativity I masters course

Tutor, Merton College, Oxford Autumn 2018
Second-year undergraduate tutorials on Mathematical Methods

College mentor, Merton College, Oxford 2017 to 2019
College subject mentor providing supplementary academic support to undergraduates

Class tutor, Mathematical Institute, Oxford 2017 to 2018
Intercollegiate classes for General Relativity I and General Relativity II masters courses

Tutorial assistant, Imperial College London 2012 to 2015
First- and second-year undergraduate tutorials covering classical mechanics, quantum mechanics, thermodynamics, statistical mechanics and nuclear physics

Awards and Prizes

Departmental Teaching Award, Mathematical Institute, Oxford 2019
Awarded for lecturing of General Relativity I graduate course

Professional Activities and Academic Service

Oraganiser and Mentor Aug 2022 to present
Oraganiser and Mentor for String Theory Mentoring Program

External examiner Aug 2022
External examiner for masters thesis at University of Stavanger, Norway

Seminar organiser 2021 to present
Organiser for Particle Theory Seminar series at University of Chicago

External examiner Aug 2021
External examiner for masters thesis at University of Stavanger, Norway

Outreach Oct 2020
High-school talk for Women in Math Honor Society students on string theory and uses of mathematics

Reviewer 2018 to present
Referee for Annals of Physics, Annales Henri Poincaré, the Journal of Symbolic Computation, SIGMA and SciPost

Undergraduate interviews, Merton College, University of Oxford Dec 2018
Interviewer and assessor for undergraduate applicants in physics

Workshop organiser, South East Mathematical Physics Seminars Jul 2018
Organiser of the 12th meeting of the South East Mathematical Physics Seminar

General interest talk, Merton College, University of Oxford Jun 2018
Presentation on string theory and my work for a general audience

Oxford string theory website, University of Oxford 2018 to 2019
Web administrator for string theory group website

Library committee, Merton College, University of Oxford 2018 to 2019
Committee member on matters relating to the college library and archives, including approving annual budget and publication rights

Gardens committee, Merton College, University of Oxford 2017 to 2019
Committee member on matters relating to the maintenance and amenity of the college gardens and grounds

Outreach 2014 to 2016
Interviewed for podcasts discussing black holes and symmetries in nature

Conference Presentations

"Calabi–Yau Metrics, CFTs and Random Matrices" Dec 2021
Plenary talk, string_data_2021, University of Cape Town, South Africa

"Calabi–Yau metrics: what are they good for?" Aug 2021
Plenary talk, Nankai Symposium, Nankai University, Tianjin

"Numerical metrics and the swampland distance conjecture" July 2021
Plenary talk, String Pheno 2021, Virtual

Chair of discussion session on numerical metrics May 2021
Simons Collaboration on Special Holonomy in Geometry, Analysis and Physics, Virtual

"Moduli and obstructions from a heterotic superpotential" Sep 2018
String Theory, Geometry and String Model Building, Mainz

"Moduli and obstructions of $N = 1$ heterotic backgrounds" July 2018
String Pheno 2018, Warsaw

"Generalising Calabi–Yau for generic flux backgrounds" Feb 2017
22nd European String Workshop – COST MP1210 Conference, University of Milano–Bicocca

"Marginal deformations from generalised geometry" Feb 2017
Strings, Cosmology and Gravity Student Conference, Institut Henri Poincaré

"Generalised geometry and supersymmetric flux backgrounds" Mar 2015
The Particle Physics and Cosmology of Supersymmetry and String Theory, DESY Hamburg

"Supergravity backgrounds and generalised geometry" Nov 2014
London Student Triangle, Imperial College London

"The geometry of supersymmetric AdS backgrounds" Nov 2013
Strings, Cosmology and Gravity Student Conference, Max Planck Institute for Physics, Munich

Invited Seminars

"Machine learning for geometry and string compactifications" Sept 2023
Rencontres théoriciennes – Joint Paris Theory Seminar

"Machine Learning for String Compactifications" March 2023
University of Wisconsin – Madison Theory Seminar

"Deformed N=1 SCFTs and their Supergravity Duals" May 2022
Exceptional Geometry Seminar Series

"Deformed N=1 SCFTs and their Supergravity Duals" April 2022

String Phenomenology Seminar Series

"Exactly Marginal Deformations and their Supergravity Duals" March 2022

Joint Israeli High Energy Seminar

"Machine Learning for Calabi-Yau Compactifications" Nov 2021

Joint Edinburgh Mathematical Physics Group Seminar

"Calabi–Yau Metrics, CFTs and Random Matrices" Oct 2021

String Theory Seminar at Imperial College London

"Calabi–Yau Metrics, CFTs and Random Matrices" Sept 2021

Joint Geometry Fields and Strings Seminar at University of New England

"Calabi-Yau metrics: what are they good for?" May 2021

String Theory Seminar at University of Vienna

"Calabi-Yau metrics: what are they good for?" May 2021

High-Energy Theory Seminar at University of Liverpool

"Calabi-Yau metrics: what are they good for?" Apr 2021

String Theory Seminar at Virginia Tech

"Calabi-Yau metrics, machine learning, and the spectrum of the Laplace operator" Feb 2021

High-Energy Theory Seminar at KEK Theory Center

"Moduli of general $N = 1$ heterotic backgrounds" Oct 2018

Mathematical Physics Seminar at University of Surrey

"Moduli of general $N = 1$ heterotic backgrounds" Apr 2018

String Theory Seminar at Enrico Fermi Institute, University of Chicago

"Marginal deformations from generalised geometry" Feb 2018

Joint Edinburgh Mathematical Physics Group Seminar

"Generalising Calabi–Yau for generic flux backgrounds" Jan 2016

String Theory Seminar at Queen Mary University of London

"Generalising Calabi–Yau for generic flux backgrounds" Nov 2015

String Theory Seminar at LMU Munich

"Generalising Calabi–Yau for generic flux backgrounds" Nov 2015

Paris String Theory Seminar at Ecole Normale Supérieure

"Generalising Calabi–Yau for generic flux backgrounds" Oct 2015

String Theory Seminar at Mathematics Department, University of Oxford

References

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