Andrew Fowlie

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Born: 15 July, 1987
Nationality: British

Areas of specialization

- Beyond the Standard Model physics, including dark matter, supersymmetry, Higgs and collider phenomenology
- Fine-tuning, naturalness and the hierarchy problem
- International reputation for innovative Bayesian statistical analyses, including parameter fitting, model selection and software

Experience

2018 - Associate Professor, Nanjing Normal University, Nanjing, China

2015-2018 Post-doctoral researcher, Monash University, Melbourne, Australia
Particle phenomenology with a focus on Bayesian statistics with Prof. Csaba Balázs.

2014-2015 Post-doctoral researcher, KBFI, Tallinn, Estonia
Particle phenomenology under Prof. Martti Raidal.

2009-2013 Ph.D., University of Sheffield, UK
Supervised by Prof. Leszek Roszkowski.

Publications

- h-index of 16, over 800 citations
- See http://inspirehep.net/author/profile/A.Fowlie.1

Journal articles

2020 *Global fits of axion-like particles to XENON1T and astrophysical data*, *P. Athron et al.*, (2020), arXiv:2007.05517

Nested sampling cross-checks using order statistics, *A. Fowlie, W. Handley, and L. Su*, (2020), arXiv:2006.03371

PhaseTracer: tracing cosmological phases and calculating transition properties, P. Athron,

C. Balázs, A. Fowlie, and Y. Zhang, *Eur. Phys. J. C*, 80 (2020), p. 567, arXiv:2003.02859

2019 *Strong first-order phase transitions in the NMSSM — a comprehensive survey*, P. Athron, C. Balazs, A. Fowlie, G. Pozzo, G. White, and Y. Zhang, *JHEP*, 11 (2019), p. 151, arXiv:1908.11847

Bayesian and frequentist approaches to resonance searches, A. Fowlie, *JINST*, 14 (2019), p. P10031, arXiv:1902.03243

BubbleProfiler: finding the field profile and action for cosmological phase transitions, P. Athron, C. Balázs, M. Bardsley, A. Fowlie, D. Harries, and G. White, *Comput. Phys. Commun.*, 244 (2019), pp. 448–468, arXiv:1901.03714

2018 *Non-parametric uncertainties in the dark matter velocity distribution*, A. Fowlie, *JCAP*, 1901 (2019), p. 006, arXiv:1809.02323

Combined collider constraints on neutralinos and charginos, P. Athron et al., *Eur. Phys. J.*, C79 (2019), p. 395, arXiv:1809.02097

Global analyses of Higgs portal singlet dark matter models using GAMBIT, P. Athron et al., *Eur. Phys. J.*, C79 (2019), p. 38, arXiv:1808.10465

A fast C++ implementation of thermal functions, A. Fowlie, *Comput.Phys.Commun.*, (2018), arXiv:1802.02720

2017 *DAMPE squib? Significance of the 1.4 TeV DAMPE excess*, A. Fowlie, *Phys.Lett.B*, (2017), arXiv:1712.05089

Model-independent analysis of the DAMPE excess, P. Athron, C. Balazs, A. Fowlie, and Y. Zhang, *JHEP*, 02 (2018), p. 121, arXiv:1711.11376

Statistical Analyses of Higgs- and Z-Portal Dark Matter Models, *C. Balazs, J. Ellis, A. Fowlie, L. Marzola, and M. Raidal*, (2017), arXiv:1711.09912

Bayesian analysis and naturalness of (Next-to-)Minimal Supersymmetric Models, P. Athron, C. Balazs, B. Farmer, A. Fowlie, D. Harries, and D. Kim, *JHEP*, 10 (2017), p. 160, arXiv:1709.07895

Halo-independence with quantified maximum entropy at DAMA/LIBRA, A. Fowlie, *JCAP*, 1710 (2017), p. 002, arXiv:1708.00181

Minimal flavor-changing Z' models and muon $g-2$ after the R_{K^*} measurement, S. Di Chiara, A. Fowlie, S. Fraser, C. Marzo, L. Marzola, M. Raidal, and C. Spethmann, *Nucl. Phys.*, B923 (2017), pp. 245–257, arXiv:1704.06200

2016 *Gravitational waves at aLIGO and vacuum stability with a scalar singlet extension of the Standard Model*, C. Balazs, A. Fowlie, A. Mazumdar, and G. White, *Phys. Rev.*, D95 (2017), p. 043505, arXiv:1611.01617

Bayes factor of the ATLAS diphoton excess: Using Bayes factors to understand anomalies at the LHC, A. Fowlie, *Eur. Phys. J. Plus*, 132 (2017), p. 46, arXiv:1607.06608

Reconstruction of the Higgs mass in events with Higgs bosons decaying into a pair of τ leptons using matrix element techniques, L. Bianchini, B. Calpas, J. Conway, A. Fowlie, L. Marzola, C. Veelken, and L. Perrini, *Nucl. Instrum. Meth.*, A862 (2017), pp. 54–84, arXiv:1603.05910

Superplot: a graphical interface for plotting and analysing MultiNest output, A. Fowlie and

M. H. Bardsley, *Eur. Phys. J. Plus*, 131 (2016), p. 391, arXiv:1603.00555

Naturalness of the relaxion mechanism, A. Fowlie, C. Balazs, G. White, L. Marzola, and M. Raidal, *JHEP*, 08 (2016), p. 100, arXiv:1602.03889

2015 *Examining a right-handed quark mixing matrix with b-tags at the LHC*, A. Fowlie and L. Marzola, *Nucl. Phys.*, B894 (2015), pp. 588–601, arXiv:1412.5587

2014 *Testing quark mixing in minimal left–right symmetric models with b-tags at the LHC*, A. Fowlie and L. Marzola, *Nucl. Phys.*, B889 (2014), pp. 36–45, arXiv:1408.6699

Is the CNMSSM more credible than the CMSSM?, A. Fowlie, *Eur. Phys. J.*, C74 (2014), p. 3105, arXiv:1407.7534

CMSSM, naturalness and the "fine-tuning price" of the Very Large Hadron Collider, A. Fowlie, *Phys. Rev.*, D90 (2014), p. 015010, arXiv:1403.3407

Prospects for constrained supersymmetry at $\sqrt{s} = 33$ TeV and $\sqrt{s} = 100$ TeV proton-proton super-colliders, A. Fowlie and M. Raidal, *Eur. Phys. J.*, C74 (2014), p. 2948, arXiv:1402.5419

2013 *Dark matter and collider signatures of the MSSM*, A. Fowlie, K. Kowalska, L. Roszkowski, E. M. Sessolo, and Y.-L. S. Tsai, *Phys. Rev.*, D88 (2013), p. 055012, arXiv:1306.1567

2012 *The CMSSM Favoring New Territories: The Impact of New LHC Limits and a 125 GeV Higgs*, A. Fowlie, M. Kazana, K. Kowalska, S. Munir, L. Roszkowski, E. M. Sessolo, S. Trojanowski, and Y.-L. S. Tsai, *Phys. Rev.*, D86 (2012), p. 075010, arXiv:1206.0264

2011 *Bayesian Implications of Current LHC and XENON100 Search Limits for the Constrained MSSM*, A. Fowlie, A. Kalinowski, M. Kazana, L. Roszkowski, and Y. L. S. Tsai, *Phys. Rev.*, D85 (2012), p. 075012, arXiv:1111.6098

Reconstructing ATLAS SU3 in the CMSSM and relaxed phenomenological supersymmetry models, *A. Fowlie and L. Roszkowski*, (2011), arXiv:1106.5117

Grants

2019 Chinese Young Scientist Grant, 350,000 RMB

Talks & seminars

Invited

2020 *Nested sampling cross-checks using order statistics*, Monash University.
Nested sampling cross-checks using order statistics, Cambridge University.
2019 *Strong first-order phase transitions in the NMSSM and methods for finding them*, SJTU-U. Sydney Workshop on the Electroweak Phase Transition, Tsung-Dao Lee Institute.
Bayesian and frequentist approaches to resonance searches, Purple Mountain Observatory.
2018 *Statistical Analyses of Higgs- and Z-Portal Dark Matter Models*, Nanjing Normal University.
Statistical Analyses of Higgs- and Z-Portal Dark Matter Models, Melbourne University.
2017 *Fundamental Physics, Symmetry and Life*, Sydney.
Halo-independence with quantified maximum entropy, NTU, Taiwan.

Halo-independence with quantified maximum entropy, IPMU, Tokyo.
Halo-independence with quantified maximum entropy, NCTS Workshop on Dark Matter, Particles and Cosmos, Taiwan.

Other talks

2019 *Combined collider constraints on neutralinos and charginos*, The tenth Weihai New Physics Workshop, Shandong University.
Bayesian and frequentist approaches to resonance searches, Nanjing Normal University.
Bayesian and frequentist approaches to resonance searches, Fourteenth workshop on TeV physics, Nanjing.
2018 *Non-parametric uncertainties in the dark matter velocity distribution*, Auckland University.
Statistical Analyses of Higgs- and Z-Portal Dark Matter Models, Seol, ICHEP 2018.
Potential applications of machine learning in particle physics, Machine Learning Symposium, National Centre for Synchrotron Science.
2017 *Using Bayes factors to understand anomalies at the LHC*, Energy Frontier in Particle Physics: LHC and Future Colliders, NTU, Taiwan.
2016 *Naturalness of the relaxion mechanism*, Sheffield University.
Naturalness of the relaxion mechanism, Nottingham University.
The Jeffreys-Lindley's Paradox, CompStats Meeting, Monash University.
Bayesian approach to naturalness, Fine-tuning, the Multiverse and Life, Sydney.
Naturalness of the relaxion mechanism, CosPA, Sydney.
Bayesian naturalness of Next-to-Minimal and Minimal Supersymmetric Models, SUSY 2016, Melbourne.
Naturalness of the relaxion mechanism, SUSY 2016, Melbourne.
Naturalness of the relaxion mechanism, CoEPP Annual Theory Meeting, Melbourne.
2015- *Several informal seminars*, Monash University.
2015-2016 *Several informal seminars*, KBFI.
2014 *Prospects for constrained supersymmetry at* $\sqrt{s} = 33$ *TeV and* $\sqrt{s} = 100$ *TeV proton-proton super-colliders*, Deep Inelastic Scattering, Warsaw.
2013 *Bayesian reconstruction of SUSY parameters via the golden decay*, Theory Meets Experiment, Warsaw.
Status of CMSSM after LHC Run-I, HEP IOP, Liverpool.
2012 *The CMSSM after 2 years of the LHC*, Consortium for Fundamental Physics, Sheffield.
2011 *Bayesian Implications of Current LHC Limits for the Constrained MSSM*, Young Theorists' Forum, Durham.
Supersymmetry and the LHC, Sheffield (internal).

Relevant skills & experience

Teaching, Lecturing & Supervision

2019

Post-graduate course (about 25 hours) on physics beyond the Standard Model.

2017-2018 Supervising undergraduate project about the bounce equation and its connection to phase transitions and baryogensis.

2016-2018 Supervising (10%) Ph.D. student, Giancarlo Pozzo, on baryogensis in next-to-minimal supersymmetric models. My role includes QFT tutorials.

2015-2016 Supervised undergraduate Michael Bardsley's summer project. We developed statistical software resulting in a publication.

2015 Six hours of lectures on statistics for physicists at the University of Tartu.

2012-2013 First-year physics tutor, weekly tutorials.

2010-2012 Undergraduate physics problem class assistant.

Collaborations

2016- GAMBIT — Statistical analyses of new physics, including powerful software, lead by Dr. Pat Scott.

2011-2013 BayesFit — Bayesian analyses of supersymmetric models in light of first run of LHC, lead by Prof. Roszkowski.

Service

Referee for leading journals: *Nature Communications*, *Physical Review D*, *European Physical Journal C*, *Journal of Physics G: Nuclear and Particle Physics* and *International Journal of Modern Physics A*.
Editor for *Journal of Nanjing Normal University, Physical Sciences*.

Computing

Fortran, Python, C++, Bash, git and LaTeX, especially Python. I am a referee for *The Journal of Open Source Software*. Statistical tools, including MultiNest and my published software, SuperPlot. Physics tools including GAMBIT, micrOMEGAs and SoftSusy. I have several open source projects at github and made minor contributions to e.g., Scipy.

Education and other relevant experience

2009-2013 Ph.D., University of Sheffield, UK
Bayesian Approach to Investigating Supersymmetric Models. Supervised by Prof. Roszkowski. Viva passed with minor corrections, examined by Prof. King (University of Southampton) and Prof. van de Bruck (University of Sheffield).

2009-2010 Sissa, Trieste, Italy
Six-month placement studying advanced topics in particle physics and related subjects.

2005-2009 M. Phys, University of Durham, UK
First-class four-year undergraduate Master's in Physics. Final-year modules included Advanced Theoretical Physics (82%) and Particle Theory (90%). Master's project, *The Search for Dark Matter at the Linear Collider*, supervised by Prof. Moortgat-Pick (73%).

2006 & 2007 Summer placement at electricity supplier E-ON about numerical simulation of atmosphere with parallel computing.