

# 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 15, over 600 citations
- See <http://inspirehep.net/author/profile/A.Fowlie.1>

### JOURNAL ARTICLES

2019	<i>Bayesian and frequentist approaches to resonance searches</i> , A. Fowlie, (2019), <a href="#">arXiv:1902.03243</a> <i>BubbleProfiler: finding the field profile and action for cosmological phase transitions</i> , P. Athron, C. Balázs, M. Bardsley, A. Fowlie, D. Harries, and G. White, (2019), <a href="#">arXiv:1901.03714</a>
2018	<i>Non-parametric uncertainties in the dark matter velocity distribution</i> , A. Fowlie, JCAP, 1901 (2019), p. 006, <a href="#">arXiv:1809.02323</a>

- 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  $\tau$  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  $SU_3$  in the CMSSM and relaxed phenomenological supersymmetry models*, A. Fowlie and L. Roszkowski, (2011), [arXiv:1106.5117](#)

## Talks & seminars

### INVITED

2019 *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 *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*, Seoul, 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

- 2017-2018 Supervising undergraduate project about the bounce equation and its connection to phase transitions and baryogenesis.  
2016-2018 Supervising (10%) Ph.D. student, Giancarlo Pozzo, on baryogenesis 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.

### JOURNAL REFEREEING

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*.

## COMPUTING

Fortran, Python, C++, Bash and  $\text{\LaTeX}$ , 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.