

# JONATHAN ANDREW PEARSON

(as of November 6, 2013)

## Personal details

**Date of birth** March 1<sup>st</sup>, 1988

**Current age** 25

**Nationality** British

**Address** Centre for Particle Theory, Department of Mathematical Sciences, Durham University, South Road, Durham, DH1 3LE

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## Employment

2012-2014 **Durham University**: Research associate in the Centre for Particle Theory

- **Research** *Cosmology*: parameterizing dark sector perturbations – collaborations with Richard Battye (Manchester), Adam Moss (Nottingham), and Jolyon Bloomfield (MIT). *Numerical field theory*: constructing ferromagnetic rings and knots; domain wall junctions and their gravitational fields – collaborations with Ruth Gregory (Durham) and Paul Sutcliffe (Durham)
- **Teaching** Post-grad tutorials: General Relativity, Introductory Field Theory, and Quantum Field Theory
- **Duties** Organising HEP maths lunchtime seminar series

## Education

2009-2012 **Doctor of Philosophy**

- **The University of Manchester**, Jodrell Bank Centre for Astrophysics.
- **Supervisor** Prof. Richard A. Battye.
- **Thesis title** Generalized perturbations in modified gravity and dark energy.
- **Research** *Cosmology*: dark energy models, inhomogeneous models of the universe, parameterizing dark sector perturbations. *Numerical field theory*: topological defects, domain walls, cosmic strings and vortons in gauge field theory. Collaborations with Paul Sutcliffe (Durham) and Adam Moss (Nottingham/UBC).
- **Teaching & supervision** Joint supervision of four MPhys students; supervised an undergraduate student, summer 2011 (Peter Cuttell) – project on domain wall network evolution in  $SU(5) \times \mathbb{Z}_2$  theories. Tutoring small groups of 1<sup>st</sup> year undergraduates: Maths 1 & 2, Dynamics, Electricity and Magnetism, Introduction to Astronomy & Cosmology, Properties of Matter. Assisting Richard Battye with constructing comprehensive and complete lecture notes for 2<sup>nd</sup> year undergraduate electromagnetism course.
- **Awards** Springer thesis prize – “recognising outstanding Ph.D research”

2005 - 2009 **Undergraduate Masters Degree**

- **The University of Manchester** Physics with Theoretical Physics 1<sup>st</sup> class: MPhys (hons).
- **Selection of sub-disciplines studied** Advanced Statistical Physics (90%), Bose & Fermi Gases (95%), Complex Variables & Integral Transforms (90%), Early Universe (100%), Electrodynamics (92%), Fluid Mechanics (82%), Gravitation (90%), Lagrangian Dynamics (88%), Quantum Mechanics of Atoms & Molecules (81%), Relativistic Quantum Physics (82%), Solid State Physics (92%), Symmetries in Physics (88%).
- **Year long MPhys project** *Scaling dynamics of charged domain walls*. Grade: 88%.

## 2003 - 2004 **Diploma**

- **The Open University** Diploma in Mathematics (B): Dip.Maths(Open).

## 2001 - 2003 **A levels** (first three completed at age 14, the fourth at age 15)

- **Richmond College** Maths (A), Physics (A), Chemistry (D), Further Maths (B).

## Talks

### 2013

- NBMPS 39 (invited) – Durham, Nov 2013
- Cosmology and astrophysics seminar (invited) – Edinburgh, Oct 2013
- COSMO 2013 – DAMTP, Sept 2013
- Tales of Lambda – Nottingham, July 2013
- Oxford modified gravity workshop (invited) – Oxford, March 2013
- Cosmology group meeting – Perimeter Institute, Feb 2013
- Cosmology seminar – Perimeter Institute & CITA, Jan 2013

### 2012

- Topological defects seminar series – Durham University, Nov 2012
- HEP seminar series – Durham University, Oct 2012
- Lancaster-Manchester-Sheffield theory consortium, Sept 2012
- Cosmology seminar (invited) – Oxford University, March 2012
- NAM 2012 – Manchester, March 2012
- Recontres de Moriond, Cosmology, March 2012
- Cosmology seminar (invited) – Imperial College, Feb 2013

### 2011

- Young theorists forum – Durham, Dec 2011
- JBCA internal seminar, PhysSoc, particle physics “Bohr’s lunch”: Nov 2011
- Gravity and particles seminar series (invited) – Nottingham, Oct 2011
- JBCA theory seminar, Oct 2011
- PASCOS 2011 – DAMTP, July 2011
- UK Cosmology Meeting – DAMTP, May 2011
- JBCA theory seminar, May 2011
- University of Manchester’s PhysSoc “Random walks in physics”, April 2011

### 2010

- JBCA internal seminar, Nov 2010
- UK Cosmology Meeting – Durham, Sept 2010
- Recontres de Moriond – Cosmology, March 2010
- JBCA internal seminar, Feb 2010

### 2009

- UK Cosmology Meeting: King’s College London, Nov 2009

- PhD introductory classes: JBCA, Nov 2009

### Public outreach talks

- Cafe Scientifique (Headingly)
- Museum of Science and Industry (Manchester)
- “Ask an Expert” at Jodrell Bank Observatory Discovery Centre
- Interviewed on Jodcast, July and September 2010. Available for download at <http://www.jodcast.net/archive/201007Extra/> and <http://www.jodcast.net/archive/201009/>.
- Bright Club Manchester
- Faith and science: two sides of the same coin? (Wythall)

### Skills

- Competent at programming in C++ & Fortran77
- Use of mathematical, graphing & typesetting packages, including Matlab, Mathematica, GnuPlot, SuperMingo & L<sup>A</sup>T<sub>E</sub>X.
- Proven competency in learning mathematical, physical, computational methods; also in conveying complex ideas & techniques to peers.

### Academic achievements of note

- **Degree status** Exam mark average consistently above 80%. Started university 1 year early.
- **Online degree notes** Creating & maintaining an online physics resource ([www.jpoffline.com](http://www.jpoffline.com)), hosting original works & typeset lecture notes. Some notes are now used by lecturers as hand-outs. Website regularly receives more than 10,000 hits per month.
- **Summer 2008, 8 week research project** *Cosmic texture*. Project involved using Fortran77 and JPL’s HEALPix software to populate a sky map with texture “spots” having pre-determined temperature profiles, finding subsequent power spectrum; as well as literature research. Supervised by Dr.R.Battye at Jodrell Bank Centre for Astrophysics.
- **Summer 2007, summer school** Chosen as one of 30 world-wide delegates at *International Undergraduate Summer School*, hosted by the University of Sheffield, funded by PPARC. Lectures on particle physics & cosmology, with a 4 week project on *quintessence models of dark energy*. Numerical work used Maple.
- **Pre-university education** All qualifications gained before university were at least 3 years “early”. Delegate at Stanford University’s Education Program for Gifted & Talented Youth, summer 2002 (youngest & one of 3 nationwide to receive a full scholarship from Warwick University, UK).

PUBLICATIONS  
JONATHAN ANDREW PEARSON

1. **Simple numerical implementation of general dark energy models**  
J. Bloomfield and J.A. Pearson [arXiv:1310.6033; submitted to JCAP]
2. **Parameterizing dark sector perturbations via equations of state**  
R.A. Battye and J.A. Pearson [Phys.Rev.**D88** (2013) 061301; *astro-ph.CO/1306.1175*]
3. **Massive gravity, the elasticity of space-time and perturbations in the dark sector**  
R.A. Battye and J.A. Pearson [Phys.Rev.**D88** (2013) 084004; *astro-ph.CO/1301.5042*]
4. **Effective action approach to cosmological perturbations in dark energy and modified gravity**  
R.A. Battye and J.A. Pearson [JCAP**1207** (2012) 019; *hep-th/1203.0398*]
5. **X-type and Y-type junction stability in domain wall networks**  
R.A. Battye, J.A. Pearson and A. Moss [Phys.Rev.**D84** (2011) 125032; *hep-th/1107.1325*]
6. **Charge, junctions and the scaling of domain wall networks**  
R.A. Battye and J.A. Pearson [Phys.Rev.**D82** (2010) 125001; *hep-th/1010.2328*]
7. **Formation and evolution of kinky vortons**  
R.A. Battye, J.A. Pearson, S. Pike, and P.M. Sutcliffe [JCAP**0909** (2009) 039; *hep-th/0908.1865*]
8. **Computing model independent perturbations in cosmology**  
R.A. Battye and J.A. Pearson [in prep]
9. **Observational constraints on equations of state for dark sector perturbations**  
R.A. Battye, A. Moss, and J.A. Pearson [in prep]
10. **Stationary gauged vortons**  
R.A. Battye, J.A. Pearson, and P.M. Sutcliffe [in prep]
11. **The fate of random domain wall networks**  
R.A. Battye and J.A. Pearson [in prep]
12. **Domain walls in the  $S_5 \times \mathbb{Z}_2$  model**  
R.A. Battye, J.N. Bone, P.D. Cuttell, and J.A. Pearson [in prep]

*All publications which are "in preparation" have comprehensive drafts, available on request, and are due for submission within 6 months.*

*Generally, author lists are alphabetical.*

**Conference proceedings**

1. **Effective field theory for perturbations in dark energy and modified gravity**  
Rencontres de Moriond Cosmology 2012 [*astro-ph/1205.3611*]
2. **Domain walls, charge and dark energy**  
Recontres de Moriond Cosmology 2010 [*hep-th/1010.3195*]