

# Ciaran A. J. O'Hare

## Curriculum Vitae

Departamento de Física Teórica  
Universidad de Zaragoza, Pedro Cerbuna 12  
50009 Zaragoza, España  
✉ [ciaran.aj.ohare@gmail.com](mailto:ciaran.aj.ohare@gmail.com)  
📄 [cajoha.re](http://cajoha.re)  
🐦 [cajohare](https://twitter.com/cajohare)  
🌐 [cajohare](https://cajohare)

## Academic history

2017–2019 **Postdoctoral Researcher**, *Departamento de Física Teórica*, Universidad de Zaragoza, España.  
Supervisor: Javier Redondo

## Education

2013–2017 **Phd Physics**, *Particle Cosmology group*, University of Nottingham, United Kingdom.  
Supervisor: Anne Green  
Thesis: [WIMPs, neutrinos and axions in the next generation of dark matter experiment](#)

2009–2013 **Msc Physics**, University of Nottingham, 1st class (average: 92%).  
Supervisor: Adam Moss  
Thesis: [Dynamics of domain wall systems](#)

## Research Interests

### WIMPs

- Treatment of astrophysical uncertainties in direct detection experiments
- Implications of astronomical surveys and hydrodynamical simulations for direct detection
- Directional detector technologies, e.g. gaseous time projection chambers and nuclear emulsions
- Neutrinos in WIMP detectors, e.g. Solar, supernova, atmospheric, geological or reactor neutrinos
- Phenomenology of the 'neutrino floor' and methods to circumvent it
- Non-relativistic effective field theory of direct detection

### Axions

- Axion dark matter haloscope designs, e.g. resonant cavities and dielectric disks
- Measuring the local dark matter distribution with axion haloscopes
- Directional axion detection
- Axion miniclusters and implications for direct and indirect detection
- Axion helioscopes e.g. IAXO

### Classical fields

- Formation of topological defects: domain walls and cosmic strings
- Dark energy models with fifth forces
- Behaviour of screened fifth forces in galaxies

## Skills

Python, Fortran 95-, MATLAB, Mathematica, MULTINEST, HEALpix

## Languages

English (native), Spanish (working proficiency)

## Talks

### Invited talks

- 2019 **Cygnus directional detection workshop**, *Sapienza University of Rome*.  
'Physics case for the Cygnus experiment'
- 2019 **DMUK Meeting**, *Kings' College London*.  
'Gaia and direct dark matter detection'
- 2019 **Theoretical Physics Seminar**, *Instituto de Física Teórica, Madrid*.  
'Gaia and direct dark matter detection'

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2019 **Saturnalia Workshop**, *Universidad de Zaragoza*.

'Dark Matter Hurricane'

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2019 **Cygnus workshop**, *University of Hawaii (remote)*.

'Physics reach for the Cygnus experiment'

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2018

**MADMAX Collaboration Meeting**, *Max Planck Institute, Munich*.

'The axion velocity distribution'

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2018

**Mitchell Institute Seminar**, *Texas A&M University*.

'How to build an axion observatory'

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2018

**Workshop on ultralight dark matter and axions**, *University of Michigan*.

'Directional axion detection'

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2018

**Astroparticle Seminar**, *Max Planck Institute, Munich*.

'Axioastronomy'

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2017

**Theoretical Physics Seminar**, *Universidad de Zaragoza*.

'Directly detecting the Milky Way halo'

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2017

**Theoretical Physics Seminar**, *Kings' College London*.

'Directly detecting the Milky Way halo'

## Conferences & Workshops

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2019 **15th Patras workshop on axions**, *Freiburg, Germany*.

'Direct detection and *Gaia*'

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2018

**OAJ-LSC Synergies meeting**, *Universidad de Zaragoza*.

'*Gaia* and direct dark matter detection'

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2018

**14th Patras workshop on axions**, *DESY, Germany*.

'Directional axion detection'

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2017

**13th Patras workshop on axions**, *Thessaloniki, Greece*.

'Axion/WIMP astronomy in dark matter experiments'

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2017

**IOP Joint APP and HEP Conference**, *University of Sheffield*.

'Measuring the dark matter velocity distribution with WIMPs and axions'

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2016

**TeVPA**, *CERN*.

'Dark matter detection and the neutrino floor'

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2016

**IDM**, *University of Sheffield*.

'Dark matter detection and the neutrino floor'

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2016

**LINK'16 Interdisciplinary conference**, *East Midlands Conference Centre*.

'Detecting Dark Matter'

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2015

**11th Patras workshop on axions, WIMPs and WISPs**, *Universidad de Zaragoza*.

'Theoretical prospects for directional WIMP detection'

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2015

**DMUK**, *University of Liverpool*.

'Directional dark matter detection and the neutrino background'

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2014

**BUSSTEPP**, *University of Southampton*.

'Directional detection of dark matter substructure'

I upload slides for most talks at [cajoha.re/talks](http://cajoha.re/talks)

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## Event Organisation

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2018

**4th MADMAX Collaboration Meeting**, Zaragoza, Spain.

<https://indico.mpp.mpg.de/event/6018/overview>.

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2018

**Probing the dark universe (OAJ/LSC Synergies)**, Zaragoza, Spain.

<https://riastronomia.es/en/probing-the-dark-universe-oaj-lsc-synergies/>.

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## Teaching

2015  
2017

### MSci 4th year research supervision, *University of Nottingham*,

Supervised four MSc students with Prof. Anne Green over two academic years.

- Project 2015/2016: 'Simulating the direct detection of dark matter'
- Project 2016/2017: 'Distinguishing neutrino and WIMP signals in dark matter detection'

2013  
2016

### 2nd year Msci physics workshops, *University of Nottingham*,

Approximately three hours a week of workshop instruction in four 2nd year core modules.

- Quantum mechanics
- Thermal Physics and Statistical Mechanics
- Vector calculus and electromagnetism
- Optics and Fourier analysis

## Awards

2017

### DESY.

1st place science slam prize

2015

### Tessella.

University of Nottingham Postgraduate Poster Competition

2013

### University of Nottingham.

Salmon prize for top performance

2013

### University of Nottingham.

Project prize for best final year research project thesis

## Media coverage

This is a selection of articles based on *O'Hare et al. 2018*, which was covered by 49 media outlets.

Altmetric score of 496 (top 5% of all research outputs): <https://aps.altmetric.com/details/45496963>

2018

### CNN, *A dark matter hurricane is headed our way [sic]*.

<https://edition.cnn.com/2018/11/19/opinions/dark-matter-hurricane-headed-our-way-lincoln-opinion/index.html>

2018

### Astronomy magazine, *A 'dark matter hurricane' is storming past Earth* .

<http://www.astronomy.com/news/2018/11/a-dark-matter-hurricane-is-storming-past-earth>

2018

### Cosmos magazine, *Researchers brace for dark matter 'hurricane'* .

<https://cosmosmagazine.com/space/researchers-brace-for-dark-matter-hurricane>

2018

### CNET, *Scientists predict a 'dark matter hurricane' will collide [sic] with the Earth* .

<https://www.cnet.com/news/scientists-predict-a-dark-matter-hurricane-will-collide-with-the-earth/>

2018

### Discover Magazine, *A 'Dark Matter Hurricane'* .

<http://blogs.discovermagazine.com/d-brief/2018/11/12/dark-matter-hurricane/>

2018

### Gizmodo Magazine, *So What's Going on With That 'Hurricane of Dark Matter?'* .

<https://gizmodo.com/so-whats-going-on-with-that-hurricane-of-dark-matter-1830420899>

## Outreach

### Aimed at the public

2018

#### Science Slam, *DESY, Hamburg*.

'On safari in the Milky Way'

2017

#### Pint of Science festival, *Bunkers Hill pub, Nottingham*.

'The Cosmic Pint'

2017

#### Guest lecture, *Manchester Astronomy Society*.

'The Dark Side'

2015

#### TEDxUoN talk, *Portland Building, Nottingham*.

'Detecting Dark Matter'

2015

#### Pub.hD talk, *Vat and Fiddle pub, Nottingham*.

'Detecting Dark Matter'

2018

### Aimed at students

#### School visit, *Colegio Nuestra Señora del Pilar, Zaragoza*.

Aimed at 14-16 year old science and english students.



2017

**School visit, Chilwell school, Nottinghamshire.**

Aimed at students thinking of studying physics at university.

2015

2017

**Sutton Trust Summer School.**

An annual series of masterclasses and workshops for high school students. I was involved the organisation of the physics branch of the school. I also lectured and led computer based workshops on particle physics and astronomy.

2014

2017

**Ambition Nottingham.**

A series of programs at UoN aimed at local students from backgrounds under-represented at universities in the UK. I was heavily involved in the physics and astronomy 'course tasters' for the scheme as both an organiser and a lecturer.

2013

2017

**University of Nottingham open days.**

My roles involved guiding visitors around the School of Physics and giving information on research programs, undergraduate and postgraduate courses. I also ran drop-in sessions and demonstrations for the Particle Cosmology group.

# Ciaran A. J. O'Hare

## List of Publications

Inspire HEP: [C.A.J.Ohare.1](#)  
ORCID: [0000-0003-3803-9384](#)  
ResearchGate: [Ciaran\\_Ohare](#)

Citation records collected from the [inspireHEP](#) database

### In preparation

- Battat et al. in prep. **13.** 'CYGNUS: Feasibility of a nuclear recoil observatory with directional sensitivity to dark matter and neutrinos'  
J. B. R. Battat, B. Crow, C. Deaconu, C. Eldridge, K. J. Mack, K. Miuchi, C. A. J. O'Hare, K. Scholberg, N. Spooner, T. N. Thorpe, S. E. Vahsen  
[Under internal review, github page: <https://github.com/cajohare/CYGNUS>]

### Refereed

- Dafni et al. 2018. **12.** 'Weighing the Solar Axion'  
T. Dafni, C. A. J. O'Hare, J. Galán, I. G. Irastorza, F. J. Iguaz, K. Jakovčić, B. Lakić, G. Luzón, J. Redondo, E. Ruiz Chóliz  
Phys. Rev. D **99** 035037 (2019)  
[Cited by 3 records, github page: <http://cajohare.github.io/IAXOmass>]
- Evans et al. 2018 **11.** 'SHM++: A refinement of the Standard Halo Model for dark matter searches'  
N. W. Evans, C. A. J. O'Hare, C. McCabe  
Phys. Rev. D **99**, 023012 (2019)  
[Cited by 11 records]
- O'Hare et al. 2018 **10.** 'A dark matter hurricane: measuring the S1 stream with dark matter detectors'<sup>1</sup>  
C. A. J. O'Hare, C. McCabe, N. W. Evans, G. Myeong, V. Belokurov  
Phys. Rev. D **98**, 103006 (2018)  
[Cited by 9 records]
- Knirck et al. 2018 **9.** 'Directional axion detection'  
S. Knirck, A. Millar, C. A. J. O'Hare, J. Redondo, F. Steffen  
JCAP **11** 051 (2018)  
[Cited by 11 records]
- O'Hare & Burrage 2018 **8.** 'The symmetron field profile in the galactic disk'  
C. A. J. O'Hare & C. Burrage  
Phys. Rev. D **98** 064019 (2018)  
[Cited by 10 records]
- O'Hare et al. 2017 **7.** 'Time-integrated directional detection of dark matter'  
C. A. J. O'Hare, B. J. Kavanagh, A. M. Green  
Phys. Rev. D **96**, 083011 (2017)  
[Cited by 5 records]
- O'Hare & Green 2017 **6.** 'Axion astronomy with microwave cavity experiments'  
C. A. J. O'Hare & A. M. Green  
Phys. Rev. D **95** 063017 (2017)  
[Cited by 17 records]
- Kavanagh & O'Hare 2017 **5.** 'Reconstructing the three-dimensional local dark matter velocity distribution'  
B. J. Kavanagh & C. A. J. O'Hare  
Phys. Rev. D **94**, 123009 (2016)  
[Cited by 15 records]
- O'Hare 2016 **4.** 'Dark matter astrophysical uncertainties and the neutrino floor'  
C. A. J. O'Hare  
Phys. Rev. D **94**, 063527 (2016)  
[Cited by 26 records]

- Mayet et al. 2016 **3.** [‘A review of the discovery reach of directional Dark Matter detection’](#)<sup>2</sup>  
F. Mayet, A. M. Green, J. B. R. Battat, J. Billard, N. Bozorgnia, G. B. Gelmini, P. Gondolo, B. J. Kavanagh, S. K. Lee, D. Loomba, J. Monroe, B. Morgan, C. A. J. O’Hare, A. H. G. Peter, N. S. Phan, S. E. Vahsen  
Physics Reports **627** (2016) 1  
[Cited by 74 records]
- O’Hare et al. 2015 **2.** [‘Readout strategies for directional detection beyond the neutrino background’](#)<sup>3</sup>  
C. A. J. O’Hare, A. M. Green, J. Billard, E. Figueroa-Feliciano, L. E. Strigari  
Phys. Rev. D **92**, 063518 (2015)  
[Cited by 31 records]
- O’Hare & Green 2014 **1.** [‘Directional detection of dark matter streams’](#)<sup>4</sup>  
C. A. J. O’Hare & A. M. Green  
Phys Rev. D **90**, 123511 (2014)  
[Cited by 30 records]

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## Conferences

### [‘Terrestrial WIMP/Axion astronomy’](#)

Contributed to the 13th Patras Workshop on Axions, WIMPs and WISPs, Thessaloniki

### [‘US Cosmic Visions: New Ideas in Dark Matter 2017: Community Report’](#)<sup>5</sup>

M. Battaglieri et al., FERMILAB-CONF-17-282-AE-PPD-T (2017)

[Cited by 184 records]

### [‘Theoretical prospects for directional WIMP detection’](#)

Contributed to the 11th Patras Workshop on Axions, WIMPs and WISPs, Zaragoza

<sup>1</sup> Selected as a highlighted article in [American Physical Society news](#)

<sup>2</sup> Highlighted article in [Physics Reports](#)

<sup>3</sup> Contains figure selected for [PRD Kaleidoscope Sep 2015](#)

<sup>4</sup> Contains figure selected for [PRD Kaleidoscope Dec 2014](#)

<sup>5</sup> Contributed to as part of the CYGNUS collaboration