

# Bill Simcoe Wright

## CONTACT DETAILS

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## RESEARCH INTERESTS

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My research is focused on testing alternatives to Einstein's theory of gravity, General Relativity. To do so, I model the effects of modifying gravity on the clustering of matter on cosmological scales, the largest in the Universe. I am interested in both specific modified gravity theories and general parameterisations of gravity.

I also consider the potential degenerate impact of massive neutrinos on clustering and have identified ways to break this modified gravity–massive neutrino degeneracy with multiple upcoming astronomical surveys in which I am actively involved on the theoretical side.

I have investigated the astrophysics of supernovae in modified gravity and the consequences for measurements of the expansion of the Universe. I have also forecasted the ability of a combination of supernovae and gravitational wave observations to constrain deviations from General Relativity.

## RESEARCH EXPERIENCE

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**Postdoctoral Research Assistant** January 2020 – present  
*Queen Mary University of London*

**Summer Research Student** July – August 2015  
*Culham Centre for Fusion Energy*  
Supervisors: Prof. Ian Chapman and Dr Samuli Saarelma  
Project Title: Predicting tokamak fusion performance with a coupled core-pedestal system

**Summer Research Student** June 2014  
*Institute for Particle Physics Phenomenology, University of Durham*  
Supervisors: Prof. Frank Krauss and Dr Holger Schulz  
Project Title: Validating high energy experimental physics analyses

## EDUCATION

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**Ph.D. Cosmology and Gravitation** October 2016 – March 2020  
*Institute of Cosmology and Gravitation, University of Portsmouth*  
Supervisors: Prof. Kazuya Koyama, Prof. Gong-bo Zhao, and Prof. David Wands  
Thesis Title: Modelling non-linear structure formation with modified gravity and massive neutrinos

**MPhys Physics and Astronomy: First Class Honors** October 2012 – July 2016  
*Durham University, UK*  
Supervisor: Prof. Baojiu Li  
Project Title: Type Ia supernovae as standardisable candles in modified gravity

## PUBLICATIONS

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- [1] **B. S. Wright**, K. Koyama, H. A. Winther, and G.-B. Zhao, *Investigating the degeneracy between modified gravity and massive neutrinos with redshift-space distortions*, JCAP 06 040 (2019), [1902.10692], **Contribution: lead author, producing simulations, writing code, running code, producing all plots, writing all text.**
- [2] W. Zhao, **B. S. Wright**, B. Li, *Constraining the time variation of Newton's constant  $G$  with gravitational-wave standard sirens and supernovae*, JCAP 10 052 (2018), [1804.03066], **Contribution: running code, producing minority of plots, writing minority of text.**
- [3] **B. S. Wright** and B. Li, *Type Ia supernovae, standardisable candles, and gravity*, Phys. Rev. D 97 083505 (2018), [1710.07018], **Contribution: lead author, writing code, running code, producing all plots, writing all text.**
- [4] **B. S. Wright**, H. A. Winther, and K. Koyama, *COLA with massive neutrinos*, JCAP 10 054 (2017), [1705.08165], **Contribution: co-lead author, theoretical derivations, numerical validation, producing majority of plots, writing majority of text.**
- [5] H. A. Winther, K. Koyama, M. Manera, **B. S. Wright**, and G.-B. Zhao, *COLA with scale-dependent growth: applications to screened modified gravity models*, JCAP 08 006 (2017), [1703.00879], **Contribution: theoretical derivations, numerical validation.**

## SELECTED TALKS

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- Cosmology Seminar (Invited)** University of Sussex, 21st May 2018  
*Modified gravity and massive neutrinos in COLA*
- ICC Seminar (Invited)** Durham University, 4th Aug 2017  
*Type Ia supernovae in modified gravity and massive neutrinos in COLA*
- Texas Symposium on Relativistic Astrophysics** University of Portsmouth, 18th Dec 2019  
*Investigating the degeneracy between modified gravity and neutrino mass with redshift-space distortions*
- COSMO Conference** RWTH Aachen, 4th Sept 2019  
*Investigating the degeneracy between modified gravity and neutrino mass with redshift-space distortions*
- Britgrav Meeting** University of Durham, 16th April 2019  
*Investigating the degeneracy between modified gravity and neutrino mass with redshift space distortions*
- Euclid UK Meeting** University of Oxford, 17th Dec 2018  
*Breaking the degeneracy between modified gravity and massive neutrinos*
- Britgrav Meeting** University of Portsmouth, 19th April 2018  
*Modified gravity and massive neutrinos in COLA*
- Advances in HEP and Cosmology Conference** University of Southampton, 22nd Mar 2018  
*Massive neutrinos in COLA*
- Gravity Beyond Einstein Workshop** University of Edinburgh, 25th Jan 2018  
*Massive neutrinos in COLA*
- Euclid UK Meeting** University of Portsmouth, 19th Dec 2017  
*Massive neutrinos in COLA*
- South Coast Cosmology Meeting** University of Sussex, 9th Jun 2017  
*Massive neutrinos in COLA*

## TECHNICAL EXPERIENCE

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I code mostly in python, occasionally in C/C++, and have limited experience with FORTRAN. I have extensive experience in running cosmological  $N$ -body simulations and common public cosmological software such as CAMB, CLASS, and their extensions. I practise version control using Git.

## COLLABORATION MEMBERSHIPS

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**LSST Theory & Joint Probes Working Group Member** March 2020 – present  
*Active in parameterised gravity simulation project and development of CCL cosmology code.*

**Euclid Theory Working Group Member** March 2018 – present  
*Active in non-linear clustering modelling project.*

**Euclid Simulations Working Group Member** March 2018 – present  
*Active in massive neutrino code comparison project.*

## AWARDS AND GRANTS

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**PhD Studentship** Science and Technology Facilities Council, 2016-2020  
**Eliahou Dangoor Scholarship** Durham University, 2012

## TEACHING

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**Demonstrator** University of Portsmouth, 2017/18  
*Introduction to Computational Physics*

## REFERENCES

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**Prof. Kazuya Koyama**  
*University of Portsmouth  
Institute of Cosmology and Gravitation  
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Burnaby Road  
Portsmouth  
PO1 3FX  
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