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wevbarker

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British citizen, Dutch resident

Dr. Will Barker

Employment

- 2021
 Rosamund Chambers Junior Research Fellow (JRF) in Astrophysics, Girton College, Cambridge, Cavendish Astrophysics Group, Kavli Institute for Cosmology, Cambridge
- 2021
 [concurrently] College Lecturer in Astrophysics, Girton College, Cambridge
- 2021
 [concurrently] Part-time guest, Lorentz Institute, Leiden University

Education

- 2017
 2021
 Ph.D. Theoretical Physics: “Gauge theories of gravity”, Wolfson College, Cambridge, Cavendish Astrophysics Group, Kavli Institute for Cosmology, Cambridge
 - ❖ Advisors: Prof. A. N. Lasenby (principal), Prof. M. P. Hobson & Dr. W. J. Handley
 - ❖ Examiners: Prof. A. D. Challinor (internal) & Dr. T. Złóśnik (external)
- 2016
 2017
 M.Sc. Master of Natural Sciences, Queens’ College, Cambridge, 1st/(4.0 GPA)
 - ❖ Natural Science Tripos Part III: Quantum field theory, Gauge field theory, Particle physics, Relativistic astrophysics & cosmology, Formation of structure in the universe, General physics
 - ❖ Dissertation: Pushing electrons in one dimension
- 2013
 2016
 BA Bachelor of Arts, Queens’ College, Cambridge, 1st/(4.0 GPA)
 - ❖ Natural Science Tripos Part II: Theoretical physics 1 & 2, Relativity, Thermal & statistical physics, Advanced quantum physics, Optics & electrodynamics, Astrophysical fluid dynamics, Particle & nuclear physics, Quantum condensed matter physics, Research review
 - ❖ Natural Science Tripos Part IB: Physics A, Physics B, Mathematics
 - ❖ Natural Science Tripos Part IA: Mathematics, Physics, Materials science, Earth science
- 2011
 2013
 School, Truro and Penwith College, A-Level: 3A*, As-Level: 4A, GCSE: 10A*

Awards and funding

- 2021/11
 2021 Abdus Salam Prize in Theoretical Physics
- 2021/06
 Secured 1,800€ funding, Delta ITP Ph.D. visitor program.
- 2021/03
 University of Arizona Postdoctoral Fellowship (3 years), declined.
- 2021/02
 Vaidya–Raychaudhuri Postdoctoral Fellowship (3 years), declined.
- 2021/01
 KIAA Postdoctoral Fellowship (3 years), declined.
- 2020/03
 Secured 400,000¥ funding, Collaboration at Iwate University: geometric algebra techniques and transformation optics. On hold due to coronavirus pandemic.
- 2015
 2017
 Queens’ College Cambridge Foundation Scholarship, for high exam performance.

Research experience

- 2021
 Junior Research Fellow, Girton College, fully independent
- 2021
 2021
 Delta ITP Visitor (concurrently), Lorentz Institute, Prof. S. Patil

- 2017
2021
Ph.D. Student, *Cavendish Astrophysics Group*, Prof. A. N. Lasenby, Prof. M. P. Hobson & Dr. W. J. Handley
- 2016
2017
M.Sc. Thesis, *Cavendish Theory of Condensed Matter Group*, Prof. E. Artacho
Novel quantum description of fermionic fluid in quenched, one-dimensional systems, two-particle interactions via Hartree–Fock implemented in C++.
- 2016
2016
Summer Student, *Institute of Astronomy*, Prof. D. Lynden–Bell and Prof. J. Bičák
Gravitoelectromagnetic proof that the graviton has spin two, addressing Mach’s principle by gravitomagnetically rotating inertial frames.
- 2016
2016
Research Review, *Cavendish Quantum Optics Group*, Prof. U. Schneider
Literature review of the eigenstate thermalisation hypothesis.

Published software (github.com/wevbarker)

- 2023/9
Particle Spectrum for Any Tensor Lagrangian (PSALTER)
Predicting the propagating quantum particle states in any tensorial field theory, including (but not limited to) just about any theory of gravity
- 2023/7
xPlain
Formatting of unambiguous, lasting derivations in the Wolfram Language.
- 2022/6
Hamiltonian Gauge Gravity Surveyor (HiGGS)
Tools for Hamiltonian constraint, canonical and Dirac–Bergmann analysis of gravity theories with spacetime curvature and torsion
- 2020/12
BarXiv
Beamer arXiv citations aged with Matplotlib colormaps

Published papers ([INSPIRE HEP/W.E.V.Barker.2](https://inspirehep.net/literature/?q=W.E.V.Barker.2))

Reference	Contribution (%)	Citations
W. E. V. Barker , M. P. Hobson, and A. N. Lasenby. “Comment on Eur. Phys. J. C 77, 412 (2017) and Eur. Phys. J. C 81, 213 (2021)”. In: <i>Eur. Phys. J. C</i> 83.7, p. 611. DOI: 10.1140/epjc/s10052-023-11676-8	80	0
Will Barker and Sebastian Zell. “A Purely Gravitational Origin for Einstein-Proca Theory”. In: arXiv: 2306.14953 [hep-th]	75	1
W. E. V. Barker , M. P. Hobson, and A. N. Lasenby. “Does gravitational confinement sustain flat galactic rotation curves without dark matter?” In: arXiv: 2303.11094 [gr-qc]	70	3
A. N. Lasenby, M. P. Hobson, and W. E. V. Barker . “Gravitomagnetism and galaxy rotation curves: a cautionary tale”. In: arXiv: 2303.06115 [gr-qc]	30	3
C. Rew and W. E. V. Barker . “The effective inflationary potential of constant-torsion emergent gravity”. In: arXiv: 2302.07250 [gr-qc]	40	0
Mattia Varrone and William E. V. Barker . “Hausdorff dimension of fermions on a random lattice”. In: arXiv: 2212.07412 [hep-lat]	40	0
William Edward Vandeeper Barker . “Gauge theories of gravity”. PhD thesis. Cambridge U.. DOI: 10.17863/CAM.86972	95	0
W. E. V. Barker . “Supercomputers against strong coupling in gravity with curvature and torsion”. In: <i>Eur. Phys. J. C</i> 83.3, p. 228. DOI: 10.1140/epjc/s10052-023-11179-6 . arXiv: 2206.00658 [gr-qc]	100	3
W. E. V. Barker . “Geometric multipliers and partial teleparallelism in Poincaré gauge theory”. In: <i>Phys. Rev. D</i> 108.2, p. 024053. DOI: 10.1103/PhysRevD.108.024053 . arXiv: 2205.13534 [gr-qc]	100	3
W. E. V. Barker et al. “Nonlinear Hamiltonian analysis of new quadratic torsion theories: Cases with curvature-free constraints”. In: <i>Phys. Rev. D</i> 104.8, p. 084036. DOI: 10.1103/PhysRevD.104.084036 . arXiv: 2101.02645 [gr-qc]	95	7

W. E. V. Barker et al. "Mapping Poincaré gauge cosmology to Horndeski theory for emergent dark energy". In: <i>Phys. Rev. D</i> 102.8, p. 084002. DOI: 10.1103/PhysRevD.102.084002 . arXiv: 2006.03581 [gr-qc]	95	12
W. E. V. Barker et al. "Systematic study of background cosmology in unitary Poincaré gauge theories with application to emergent dark radiation and H_0 tension". In: <i>Phys. Rev. D</i> 102.2, p. 024048. DOI: 10.1103/PhysRevD.102.024048 . arXiv: 2003.02690 [gr-qc]	95	37
William E. V. Barker et al. "Static energetics in gravity". In: <i>J. Math. Phys.</i> 60.5, p. 052504. DOI: 10.1063/1.5082730 . arXiv: 1811.09844 [gr-qc]	95	2
W. Barker et al. "Rotation of inertial frames by angular momentum of matter and waves". In: <i>Class. Quant. Grav.</i> 34.20, p. 205006. DOI: 10.1088/1361-6382/aa8a34 . arXiv: 1710.10360 [gr-qc]	75	3
William Barker . "Effects of the circularly polarized beam of linearized gravitational waves". In: <i>Class. Quant. Grav.</i> 34.16, p. 167001. DOI: 10.1088/1361-6382/aa7da9 . arXiv: 1612.00905 [gr-qc]	100	2

Seminars, colloquia, conferences and talks

2023/6	Geometric Foundations of Gravity, contributed Particle spectrum for any metric affine gravity
2023/3	Rencontres de Moriond
2022/9	31st Texas Symposium on Relativistic Astrophysics, contributed Supercomputers against strong coupling in gravity with curvature and torsion
2022/5	Cosmology from Home, contributed Supercomputers against strong coupling in gravity with curvature and torsion
2022/2	IoA Wednesday Seminar Series, invited Torsion-squared gravity... and its multiplier extensions
2021/11	Cavendish Graduate Conference, invited plenary Torsion gravity
2021/9	Lorentz Institute Cosmology Seminar, invited Torsion-squared gravity... and its multiplier extensions
2020/12	Queen Mary London Cosmology Seminar, invited Exorcism of nonlinear ghosts in Hamiltonian gravity
2020/11	PITP Cosmology Seminar, invited Torsion cosmology and beyond
2020/8	Probing Effective Theories of Gravity in Strong Fields and Cosmology
2020/8	CEICO Cosmology Seminar, invited Dark energy in the novel gauge gravity theories
2020/5	Cosmology from Home, contributed Dark energy in the novel gauge gravity theories
2020/5	Cosmology from Home, invited panel Theoretical requirements of modified gravity
2020/2	DAMTP GR Seminar Series, invited Addressing Hubble tension with emergent dark radiation in unitary gravity
2020/1	Battcock Wednesday Seminar Series, invited Addressing Hubble tension with emergent dark radiation in unitary gravity
2019/12	KICC 10th Anniversary Symposium, invited Habitable tordion worlds
2019/12	30th Texas Symposium on Relativistic Astrophysics, contributed Habitable tordion worlds

Master's thesis Zhiyuan Wei and **Will Barker**. "Quantum propagator poles in quantum Weyl gravity and beyond". In: URL: <https://wevbarker.com/assets/pdf/2305.00008.pdf>

Academic service, teaching and outreach

Peer Review

2021

Springer Advances in applied Clifford algebras (Impact Factor 1.072)

2020

Elsevier Physics of the dark universe (Impact Factor 4.473)

Undergraduate teaching (wevbarker.com/teaching)

2021

2nd-year Oscillations, waves and optics (50 hours)

2021

2nd-year Quantum physics (50 hours)

2021

2nd-year Condensed matter physics (50 hours)

2021

2nd-year Experimental methods (25 hours)

2018

4th-year Relativistic astrophysics and cosmology (30 hours)

2022

2017

3rd-year Relativity (70 hours)

2021

1st-year Mathematics B (100 hours)

2017

2018

Outreach

2019/6

REACH Summer School Astronomy and Astrophysics (40 hours)

2013/12

Academic Life, *Truro and Penwith College*

Computing

OS Manjaro Linux, Arch Linux, CentOS Linux, Ubuntu Linux

Languages Wolfram Language, Maple, T_EX, TikZ, Python, C++, Bash

Tools Mathematica, xAct, Git, Vi, tmux

References

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Prof. Jiří Bičák

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Prof. Emilio Artacho

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Prof. Mike Hobson

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Prof. Eugene Terentjev

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