
N. Furey - CV

Citizenship Canadian **Languages** English, basic French, basic Spanish

Education PhD in theoretical physics, Perimeter Institute, U. of Waterloo, Dec 2015
Part III Mathematics, Cambridge University, UK (Master's) 2006
Honours B.Sc. in Mathematics and Physics, Simon Fraser University, 2005

Research Fellowships accepted

2020 Freigeist Fellowship, VolkswagenStiftung for Humboldt-Universität Berlin
2019 AIMS African Institute of Mathematical Sciences Fellowship, Cape Town
2015 Walter Grant Scott Fellowship in Physics, Trinity Hall, Cambridge University
2015 Canadian NSERC postdoctoral fellowship, held at Cambridge University

Research Experience

2016-19	Research Fellow	Cambridge	Algebraic particle physics
2015	PhD Student	Perimeter Institute	Algebraic particle physics
2006	Research Project	Cambridge	Machian causal sets
2004	Honours Thesis	Simon Fraser U.	Modified gravity

(Medical issues caused numerous interruptions, beginning 2004. Doctor's letter available.)

Publications

- N. Furey, **An algebraic roadmap of particle theories, Part I: General construction**, [arXiv:2312.12377](https://arxiv.org/abs/2312.12377) [hep-ph]
- N. Furey, **An algebraic roadmap of particle theories, Part II: Theoretical checkpoints**, [arXiv:2312.12799](https://arxiv.org/abs/2312.12799) [hep-ph]
- N. Furey, **An algebraic roadmap of particle theories, Part III: Intersections**, [arXiv:2312.14207](https://arxiv.org/abs/2312.14207) [hep-ph]
- N. Furey, M.J. Hughes, *Division algebraic symmetry breaking*, Phys. Lett. B, 831 (2022)
- N. Furey, M.J. Hughes, *One generation of standard model Weyl representations as a single copy of RCHO*, Phys. Lett. B, 827 (2022)
- C. Furey, **Three generations, two unbroken gauge symmetries, and one eight-dimensional algebra**, Phys. Lett. B, 785 (2018) p.84-89 arxiv.org/abs/1910.08395 [hep-th]
- C. Furey, *$SU(3)_C \times SU(2)_L \times U(1)_Y \times U(1)_X$ as a symmetry of division algebraic ladder operators*, Eur. Phys. J. C, 78 5 (2018) 375
- C. Furey, *A demonstration that electroweak theory could violate parity automatically (leptonic case)*, Int.J.Mod.Phys.A, (2018)
- C. Furey, *Standard model physics from an algebra?*, PhD thesis, University of Waterloo, [arXiv:1611.09182]
- C. Furey, *Charge quantization from a number operator*, Phys. Lett. B, 742 (2015), pp. 195–199
- C. Furey, *Generations: Three prints, in colour*, JHEP 10 (2014) 046 [arXiv:1405.4601 hep-th]
- C. Furey, *Towards a unified theory of ideals*, Phys. Rev. D 86 (2012) 025024, [arXiv:1002.1497 hep-th]
- Furey, DeBenedictis, *Wormhole throats in R^m gravity*, Class. Quantum Grav. 22 (2005) 313–322, [arXiv:gr-qc/0410088]

Conference talks

2023	Plenary Talk	Lie Theory and its Applications in physics	Varna, Bulgaria
2023	Lecture	International Conference on Clifford algebras	Holon, Israel
2023	Talk	International Conference on Clifford algebras	Holon, Israel
2023	Talk	Octonions, Standard model, Unification 2023	Oxford, Pune online
2022	Invited Talk	New Trends in Quaternions and Octonions	Covilhã, Portugal
2022	Talk	Joint Mathematics Meeting 2022	Seattle, USA

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2021	Talk	Octonions and Standard model, Perimeter Institute (II)	Waterloo, Canada
2021	Talk	Octonions and Standard model, Perimeter Institute (I)	Waterloo, Canada
2021	Talk	Humboldt-Universität zu Berlin, KMPB day	Berlin, Germany
2021	Talk	Women at the intersection of math/physics, Perimeter	Waterloo, Canada
2021	Talk	16th Marcel Grossmann Meeting	Rome, Italy
2019	Talk	Iris Adlershof Symposium, Humboldt University	Berlin, Germany
2018	Plenary Talk	14th Annual VCES conference	Vienna, Austria
2018	Talk	15th Marcel Grossmann Meeting	Rome, Italy
2017	Talk	Bangkok Workshop on Discrete Geometry	Bangkok, Thailand
2017	Talk	6th Bangkok Workshop on High Energy Theory	Bangkok, Thailand
2016	Talk	2016 Advances in Quantum Gravity conference	Hawaii, USA
2016	Talk	Algebraic Geometry and Math-Physics Conference	Tromso, Norway
2016	Talk	54th International School of Subnuclear Physics (won the Giulio Racah Diploma)	Erice, Italy
2015	Talk	2015 Advances in Quantum Gravity conference	Los Angeles, USA
2014	Talk	10th International Conference on Clifford Algebras and their Applications in Mathematical Physics (won best talk award)	Tartu, Estonia
2014	Talk	Frontiers of Fundamental Physics Conference	Marseille, France
2014	Talk	52nd International School of Subnuclear Physics (won the Eugene P. Wigner Diploma)	Erice, Italy
2014	Talk	Theory Canada 9 Conference	Waterloo, Canada
2007	Talk	Current challenges for causal set quantum gravity	Waterloo, Canada
2007	Talk	Graduate Student Conference, Perimeter Inst.	Waterloo, Canada
2003	Talk	40th Western Regional Nuclear and Particle Physics Conference, this trip was the prize for winning the TRIUMF competition, below.	Lk Louise, Canada
2002	Talk	TRIUMF Annual Research Student Competition (won the competition)	Vancouver, Canada

Selected seminars

2023	Talk	Prof. A.S. Tahvildar-Zadeh's group, Rutgers University	New Brunswick, US
2023	Talk	QFT and strings group, Humboldt-Universität	Berlin, Germany
2022	Talk	Prof. Denjoe O'Connor's group, DIAS	Dublin, Ireland
2021	Talk	Prof. José Figueroa-O'Farrill's group, U of Edinburgh	Edinburgh, UK
2020	Talk	Prof. Jan Plefka's group, Humboldt-Universität	Berlin, Germany
2020	Talk	Nikhef National Institute for Subatomic Physics	Amsterdam, NL
2020	Talk	Prof. A.S. Tahvildar-Zadeh's group, Rutgers University	New Brunswick, US
2019	Talk	Prof. Dirk Kreimer's group, Humboldt-Universität	Berlin, Germany
2019	Talk	Prof. K-H Rehren's group, University of Göttingen	Göttingen, Germany
2019	Talk	Prof. Dieter Lust's group, LMU	Munich, Germany
2018	Talk	Perimeter Institute for Theoretical Physics	Waterloo, Canada
2018	Talk	Prof. S. Majid's group, Queen Mary University	London, UK
2017	Talk	Prof B. Coecke's group, Oxford University	Oxford, UK
2017	Talk	Quantum fields and strings group, DAMTP	Cambridge, UK
2017	Talk	Prof. M. Sakamoto's group, Kobe University	Kobe, Japan
2017	Talk	Prof. N. Maekawa's group, Nagoya University	Nagoya, Japan
2017	Talk	Prof. K. Yoshida's group, Kyoto University	Kyoto, Japan
2017	Talk	Center for Theoretical Physics of the Universe, IBS	Daejeon, S. Korea
2017	Talk	Prof. H.L. Yu's group, Academia Sinica	Taipei, Taiwan
2017	Talk	National Tsing Hua University	Hsinchu, Taiwan
2017	Talk	Prof M.C. Tan's group, National U. of Singapore	Singapore
2016	Talk	Prof. A. Lasenby's group, Cavendish Laboratory	Cambridge, UK
2016	Talk	Prof. Ed Copeland's group, University of Nottingham	Nottingham, UK
2016	Talk	Mathematical physics group, DAMTP	Cambridge, UK
2016	Talk	Particle Theory group, University of Sussex	Brighton, UK
2015	Talk	Prof. John Barrett's group, University of Nottingham	Nottingham, UK

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2014	Talk	Prof. Pierre Ramond's group, University of Florida	Florida, USA
2014	Talk	Prof. Jorge Pullin's group, Louisiana State University	Louisiana, USA
2014	Talk	Centre de Physique Theorique	Marseille, France
2014	Talk	Quantum gravity research group, Perimeter Inst.	Waterloo, Canada
2014	Talk	Dept Mathematics, University of Waterloo (x2)	Waterloo, Canada
2014	Talk	Dept Physics, University of Waterloo (x2)	Waterloo, Canada
2013	Talk	For department of theoretical physics INFN	Naples, Italy

Colloquia

2019	Colloquium	Dept Physics, University of British Columbia	Vancouver, Canada
2019	Colloquium	Dept Physics, Simon Fraser University	Vancouver, Canada
2018	Colloquium	Department of Mathematics, Rutgers	New Brunswick, US
2017	Colloquium	School of Mathematics, Trinity College	Dublin, Ireland

International online seminar series (creator)

2021-2022 [Algebra, Particles, and Quantum Theory](#)

Speakers	Lucien Hardy (Perimeter Institute)	Anna Pachol (Queen Mary)
	A. Shadi Tahvildar-Zadeh (Rutgers)	Howard Barnum
	Shahn Majid (Queen Mary)	Peter Woit (Columbia)
	Andreas Trautner (Max Planck)	Jorge Zanelli (CECS)
	Corinne Manogue (Oregon State)	Tevian Dray (Oregon State)
	Markus Müller (IQOQI)	Sean Carroll (Caltech)

2022-2023 [Algebra, Particles, and Quantum Theory](#)

Speakers	Denjoe O'Connor (DIAS)	Shogo Tanimura (Nagoya)
	John Baez (U.C. Riverside)	Aiyalam Balachandran (Syracuse)
	L Glaser (Vienna)	John Huerta (Lisbon)
	Kasia Rejzner (York)	Lev Vaidman (Tel Aviv)
	John Baez (U.C. Riverside)	Roger Penrose (Oxford)

New Scientist article: [Octonions: The strange maths that could unite the laws of nature](#), by M. Brooks
Our work featured, front cover of New Scientist

Quanta article: [The Peculiar Math that could Underlie the Laws of Nature](#), by N. Wolchover
Second most-read article in Quanta Magazine for that year

Wired article: [10 Women in Science and Tech who should be Household Names](#), by E. Dreyfuss

Video series: [Division algebras and the standard model](#)
Channel now at > 9,000 subscribers

Students	2022	Talk	Women in Physics series, Humboldt-Universität zu Berlin
	2021	Mentor, Perimeter Institute, Women in mathematical physics	
	2020	Mentor for several AIMS graduate students, South Africa (ongoing)	
			proofreading of CVs and emails, mock interviews, moral support
	2019	Panel Speaker, AIMS Women in Science, Cape Town, South Africa	
	2019	Lecture for AIMS students, Cape Town, South Africa	
	2019	Supervised research project for Part III grad student, Cambridge	
	2019	Talk for Women in Maths, Murray Edwards College, Cambridge	
	2019	Lecture for TRIUMF physics students, UBC, Vancouver, Canada	

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2018 Informally mentoring a small number of graduate students
2017 Panel Speaker Trinity Hall Women in Science, Cambridge
2017 Trinity Hall Outreach: for students in less aristocratic districts
2016 Interviewed students for entrance into the Math Tripos, Cambridge
2016 Talk Natural Sciences Society, Trinity Hall, Cambridge
2016 Talk Natural sciences first-years Trinity Hall, Cambridge

Outreach 2022 Essay Assoc. of Women Mathematicians, Interviewee of B. Cannon
2019 Film Consulting for [educational video](#) on division algebras, Seeker
2019 Podcast Quanta Magazine, Octonions and particle physics
2017 Talk British Science Association, SciBar public talk, Cambridge

Leadership / Community Co-spokesperson (co-director) for the [Kolleg Mathematik Physik Berlin](#)
Secured Humboldt funding for a pan-African science video competition
Junior group leader, supervising postdoc
Creator of the Algebra, Particles, and Quantum Theory seminar series
Scientific advisor for the OSMU 2023 conference
First aid certified, 12 August, 2022
Referee for *Journal of Mathematical Physics (JMP)*
Referee for *Journal of High Energy Physics (JHEP)*
Referee for *Nuclear Physics B*
Referee for *Physics Letters B*
Referee for *European Physical Journal C*
Referee for *Int. J. Mod. Phys. A*
Referee for *Advances in Applied Clifford Algebras*, Springer
Referee for *Commentationes Mathematicae Universitatis Carolinae*, Prague
(Offered) Guest Editor in Chief, *Adv. in Applied Clifford Algebras*
2016-9 Member of governing body, Trinity Hall Cambridge
Member of Perimeter Institute's Environmental Committee

Funding 2024-2029 Kolleg Mathematik Physik Berlin (co-spokesperson)
2020-2026 VW Freigeist Fellowship, Humboldt University, Berlin
2019-2023 Royal Commission 1851 Fellowship (offered), U. Edinburgh
2019-2022 Rutgers University postdoctoral fellowship (offered)
2019-2020 AIMS African Institute of Mathematical Sciences
Fellowship, Cape Town
2016-2019 Walter Grant Scott Fellowship in Physics, Cambridge
2016-2018 NSERC Postdoctoral Fellowship, Cambridge
2016-2018 Newton International Fellowship (offered) Imperial College
2015 PhD Completion award, Dept Physics, U. of Waterloo
2014-2015 NSERC grant (through supervisor)
2012-2014 John Templeton Foundation (through supervisor)
2006-2010 NSERC Alexander Graham Bell PGS-D and CGS-D awards
2006-2010 President's Graduate Scholarships, U. of Waterloo
2009 NSERC Michael Smith Foreign Study Supplement, M.I.T.
2005 Rudi Haering Award in Physics, Simon Fraser University