

Jonathan Hickman

CONTACT

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EMPLOYMENT

2019 - Lecturer, University of Edinburgh, UK.
2018 - 2019 Research fellow, University of St Andrews, UK.
 3 year postdoctoral position.
2017 Postdoctoral researcher, Mathematical Sciences Research Institute, Berkeley, US.
 Visiting Fellowship.
2015 - 2018 L. E. Dickson Instructor, The University of Chicago, US.
 3 year postdoctoral position.

EDUCATION

2011 - 2015 PhD in Mathematical Analysis, The University of Edinburgh, UK.
 Thesis: *Topics in affine and discrete harmonic analysis*
 Advisor: Prof. Jim Wright

2010 - 2011 MASt Mathematics (Part III), The University of Cambridge, UK.
 Passed with Distinction
 Part III Essay: *Szemerédi's Theorem via ergodic theory*
 Advisor: Prof. Ben Green

2006 - 2010 MA in Pure Mathematics, The University of Edinburgh, UK.
 First class degree
 Honours project: *Fourier analysis and isoperimetric inequalities*
 Advisor: Prof. Tony Carbery

MATHEMATICAL INTERESTS

Euclidean harmonic analysis, in particular questions pertaining to operators whose definition depends on some submanifold (or family of submanifolds) of Euclidean space such as Fourier restriction or extension operators and generalised Radon transforms. I am also interested in certain discrete analogues of these objects, the analysis of which typically involves number theoretic considerations.

PUBLICATIONS

Submitted

- *Sharp L^p bounds for the helical maximal function* (with David Beltran, Shaoming Guo and Andreas Seeger), submitted. Preprint: [arXiv:2102.08272](#)
- *A non-archimedean variant of Littlewood–Paley theory for curves* (with Jim Wright), submitted. Preprint: [arxiv:2203.13644](#)

Accepted

- *A note on Fourier restriction and nested polynomial Wolff axioms* (with Joshua Zahl), to appear J. d'Analyse Math. Preprint: [arXiv:2010.02251](#)
- *Improved bounds for the Kakeya maximal conjecture in higher dimensions* (with Keith Rogers and Ruixiang Zhang), to appear Amer. J. Math. Preprint: [arXiv:1908.05589](#)
- *The circular maximal function on the Heisenberg group for radial functions* (with David Beltran, Shaoming Guo and Andreas Seeger), Ann. Sc. Norm. Super. Pisa Cl. Sci. (5) 23 (2022), no. 2, 501–568.

- *Sharp L^p estimates for oscillatory integral operators of arbitrary signature* (with Marina Iliopoulou), Math. Z. 301, no. 1, 1143-1189, (2022).
- *Sobolev improving for averages over curves in \mathbf{R}^4* (with David Beltran, Shaoming Guo and Andreas Seeger), Adv. Math. 393, 108089, (2021).
- *Uniform L^p resolvent estimates on the torus*, Mathematics Research Reports, Volume 1 (2020), pp. 31-45.
- *Variable coefficient Wolff-type inequalities and sharp local smoothing estimates for wave equations on manifolds* (with David Beltran and Christopher D. Sogge), Anal. PDE 13, no. 2, pp. 403-433, (2020).
- *On a higher dimensional version of the Benjamin-Ono equation* (with Felipe Linares, Oscar G. Riaño, Keith Rogers and Jim Wright), SIAM J. Math. Anal. 51, no. 6, pp. 4544-4569, (2019).
- *Sharp estimates for oscillatory integral operators via polynomial partitioning* (with Larry Guth and Marina Iliopoulou), Acta Math., Vol. 223, No. 2 (2019), pp. 251-376.
- *Counting factorisations of monomials over rings of integers modulo N* (with Jim Wright), J. Théor. Nr. Bordx. Vol. 31, No. 1, pp. 255-282, (2019).
- *An abstract L^2 Fourier restriction theorem* (with Jim Wright), Math. Res. Lett. 26, no. 1, 75100, (2019).
- *Improved Fourier restriction estimates in higher dimensions* (with Keith Rogers), Camb. J. Math., vol. 7, no. 3, pp. 219-282, (2019).
- *Some remarks on the Lipschitz regularity of Radon transforms* (with Jonas Azzam and Sean Li), Proc. Amer. Math. Soc., v. 146, no. 10, pp. 4331-4337, (2018).
- *The Fourier restriction and Kakeya problems over rings of integers modulo N* (with Jim Wright), Discrete Analysis 2018:11, 54 pp (2018).
- *Maximal operators and Hilbert transforms along variable non-flat homogeneous curves* (with Shaoming Guo, Victor Lie and Joris Roos), Proc. Lond. Math. Soc. (3), volume 115, pp. 177-219 (2017).
- *Uniform $L_x^p-L_{x,r}^q$ improving for dilated averages over polynomial curves*, J. Funct. Anal., volume 270, issue 2, pp. 560-608 (2016).
- *An affine Fourier restriction theorem for conical surfaces*, Mathematika, volume 60, issue 02, pp. 374-390 (2014).

Expository

- *Local smoothing for Fourier integral operators* (with David Beltran and Christopher D. Sogge), Geometric aspects of harmonic analysis, 29-105, Springer INdAM Ser., 45, Springer, Cham, (2021).

TALKS

Conferences and workshops

JUL 2022	<i>Littlewood-Paley theory for space curves</i> Real Analysis, Harmonic Analysis and Applications, Oberwolfach Workshop, Germany.
JUN 2022	<i>Littlewood-Paley theory for Space Curves</i> Harmonic analysis and partial differential operators, Loughborough University, UK.
JUN 2022	<i>On convergence of Fourier integrals</i> British Mathematical Colloquium, King's College London, UK.
APR 2022	<i>Littlewood-Paley theory for space curves</i> HIM Seminar (as part of the Interactions between Geometric measure theory, Singular integrals, and PDE Hausdorff Trimester Program), HIM, Bonn, Germany.
JUN 2021	<i>The helical maximal function</i> HIM Seminar (as part of the Harmonic Analysis and Analytic Number Theory Hausdorff Trimester Program), HIM, Bonn, Germany.
MAR 2021	<i>Restriction estimates for hyperbolic paraboloids</i> Fourier restriction online 2021, online conference.
MAR 2021	<i>On convergence of Fourier integrals</i> British Early Career Mathematicians Colloquium, online conference.
FEB 2020	<i>Sobolev improving estimates for averages over space curves</i> Recent Advances in Harmonic Analysis, University of Kent, Canterbury, UK.
JUN 2019	<i>The circular maximal function for Heisenberg radial functions</i> Workshop on Bourgain-Demeter Decoupling Method, Chern Institute of Mathematics, Nankai University, Tianjin, China.
MAY 2019	<i>The circular maximal function for Heisenberg radial functions</i> Postdoc symposium, Madison Lectures in Fourier Analysis, University of Wisconsin, Madison, US.

- MAY 2018 *Anisotropic Fourier decay and L^2 Fourier restriction for surfaces of intermediate dimension.*
RTG Workshop in Fourier Analysis, University of Wisconsin, Madison, US.
- JUL 2017 *Sharp estimates for oscillatory integral operators I*
Harmonic analysis and its interactions: in honour of Tony Carbery, University of Edinburgh, UK.
- FEB 2017 *Harmonic analysis over $\mathbb{Z}/N\mathbb{Z}$*
Postdoctoral Seminar (as part of the Spring 2017 Harmonic Analysis program), MSRI, Berkeley, US.
- AUG 2015 *Harmonic Analysis over local fields*
George Boole Mathematical Sciences Conference, University College Cork, Ireland.
- JUL 2014 *Uniform Estimates for Dilated Averages over Curves*
HIM Seminar (as part of the Harmonic Analysis and Partial Differential Equations Hausdorff Trimester Program), HIM, Bonn, Germany.

Seminars

- JUN 2022 *The helical maximal function*
Analysis Seminar, University of Warwick.
- FEB 2022 *Keakeya maximal estimates via real algebraic geometry*
Seminari di Analisi Armonica, online seminar series.
- JAN 2022 *Keakeya estimates via real algebraic geometry*
Analysis Seminar (online), University of Connecticut, US.
- NOV 2021 *Keakeya estimates via real algebraic geometry*
Analysis Seminar (online), Loughborough University, UK.
- APR 2021 *The helical maximal function*
Analysis Seminar (online), UBC, Canada.
- MAR 2021 *The helical maximal function*
Analysis-PDE-Geometry seminar (online), Lunds universitet, Sweden.
- FEB 2021 *Restriction estimates via real algebraic geometry*
Graduate Seminar on Advanced Topics in PDE (online), Universität Bonn, Germany.
- DEC 2020 *Sobolev improving estimates for averages over space curves*
Analysis Seminar (online), University of Wisconsin, Madison, US.
- NOV 2020 *Keakeya estimates via real algebraic geometry*
Calderón–Zygmund Seminar (online), University of Chicago, US.
- JAN 2020 *Keakeya maximal estimates via real algebraic geometry*
Discrete Analysis Seminar, University of Cambridge, Cambridge, UK.
- DEC 2019 *Keakeya maximal estimates via real algebraic geometry*
Analysis Seminar, Cardiff University, Cardiff, UK.
- OCT 2019 *High dimensional Keakeya maximal estimates*
Analysis Seminar, Heriot–Watt University, Edinburgh, UK.
- MAR 2019 *High dimensional Keakeya maximal estimates*
Analysis Seminar, KTH Royal Institute of Technology, Stockholm, Sweden.
- MAR 2019 *On convergence of Fourier integrals*
Analysis and geometry Seminar, University of Bristol, Bristol, UK.
- FEB 2019 *On convergence of Fourier integrals*
Mathematics Seminar, University College Cork, Cork, Ireland.
- DEC 2018 *High dimensional Keakeya maximal estimates*
Analysis Seminar, Université de Nantes, Nantes, France.
- NOV 2018 *High dimensional Keakeya maximal estimates*
Analysis Seminar, University of St Andrews, St Andrews, UK.
- OCT 2018 *Fourier restriction in high dimensions*
Analysis Seminar, University of Birmingham, Birmingham, UK.
- OCT 2018 *Fourier restriction in high dimensions*
Analysis Seminar, University of Edinburgh, Edinburgh, UK.
- SEPT 2018 *Improved Fourier restriction estimates*
Analysis Seminar, Basque Center for Applied Mathematics, Bilbao, Spain.
- JULY 2018 *New estimates oscillatory integral operators*
Analysis Seminar, Universidad Autónoma de Madrid, Madrid, Spain.
- JUN 2018 *On convergence of Fourier integrals*
Analysis Seminar, Stockholms Universitet, Stockholm, Sweden.
- APR 2018 *Sharp estimates for oscillatory integral operators*
Analysis Seminar, Johns Hopkins University, Baltimore, US.
- MAR 2018 *Topics in harmonic analysis on curved spaces*
Analysis Seminar, MIT, Cambridge, US.
- FEB 2018 *Factorising X^n*

	Analysis Seminar, Caltech, Pasadena, US.
NOV 2017	<i>Factorising X^n</i>
	Analysis Seminar, Virginia Tech, Blacksburg, US.
OCT 2017	<i>Sharp estimates for oscillatory integral operators via polynomial partitioning</i>
	Calderón–Zygmund Seminar, University of Chicago, US.
OCT 2017	<i>Factorising X^n</i>
	Analysis Seminar, University of Wisconsin, Madison, US.
OCT 2016	<i>Fourier restriction over rings of integers modulo N</i>
	Analysis Seminar, University of Wisconsin, Madison, US.
JAN 2016	<i>Fourier restriction over rings of integers modulo N</i>
	Calderón–Zygmund Seminar, University of Chicago, US.
OCT 2015	<i>Uniform Estimates for Dilated Averages over Curves</i>
	Analysis Seminar, University of Wisconsin, Madison, US.
NOV 2014	<i>Uniform Estimates for Dilated Averages over Curves</i>
	Analysis Seminar, University of Birmingham, UK.
JAN 2014	<i>L^p Improving for Dilated Averages</i>
	Analysis Seminar, The University of Edinburgh, UK.
DEC 2013	<i>L^p Improving for Dilated Averages</i>
	Analysis Seminar, Christian–Albrechts–Universität zu Kiel, Germany.

Invited lecture series

JUN 2019	<i>The Kakeya conjecture</i> (8 hour mini-course)
	Institute of Applied Physics and Computational Mathematics, Beijing, China.

Colloquia

APR 2020	<i>Continuum incidence geometry</i>
	Maxwell Online Colloquium, Maxwell Institutue, Edinburgh, UK.
JAN 2019	<i>On convergence of Fourier integrals</i>
	University of Edinburgh, Edinburgh, UK.
SEPT 2018	<i>Convergence of Fourier integrals</i>
	Pure Colloquium, University of St Andrews, UK.
JAN 2018	<i>Sharp estimates for oscillatory integral operators</i>
	Department colloquium, Indiana University, US.

Informal talks and working groups

APR 2019	<i>Families of Circles</i>
	De Leidsche Flesch visit, University of St Andrews, UK.
JAN 2019	<i>Life as a postdoctoral researcher</i>
	Postgraduate Students Meeting, The Burn, Edzell, UK.
JAN 2019	<i>Factorising X^n</i>
	Research day, University of St Andrews, UK.
NOV 2017	<i>Magnitude</i>
	Barn lunch, University of Chicago, US.
NOV 2017	<i>Kakeya sets</i>
	Undergraduate math club, University of Chicago, US.
OCT 2017	<i>Dimensions of sums of planar sets and curves</i>
	GMT working group, University of Chicago, US.
NOV 2016	<i>Affine measures on curves and surfaces</i>
	GMT working group, University of Chicago, US.
FEB 2016	<i>Multilinear harmonic analysis</i>
	GMT working group, University of Chicago, US.
OCT 2015	<i>L^p estimates for generalised Radon transforms</i>
	GMT working group, University of Chicago, US.
NOV 2014	<i>ℓ^2 decoupling inequalities for the paraboloid and applications</i>
	Harmonic analysis working group, University of Edinburgh, UK.
SEP 2014	<i>Roth’s theorem on arithmetic progressions</i>
	PG Colloquium, University of Edinburgh, UK.
JUN 2014	<i>Kakeya Sets</i>
	EMS Postgraduate Students Meeting, The Burn, Edzell, UK.

JAN 2014	<i>Takeya sets</i> PG Colloquium, University of Edinburgh, UK.
NOV 2013	<i>Geometric and Combinatorial Aspects of Harmonic Analysis</i> CMS Research in the UK afternoon, University of Cambridge, UK.
OCT 2013	<i>Affine-invariant generalised Radon transforms</i> Harmonic analysis working group, University of Edinburgh, UK.
FEB 2013	<i>Fourier analysis on groups</i> PG Colloquium, University of Edinburgh, UK.
NOV 2012	<i>Multi-linear determinant functionals</i> Harmonic analysis working group, University of Edinburgh, UK.
MAR 2012	<i>Szemerédi's theorem</i> PG Colloquium, University of Edinburgh, UK.

WORKSHOPS, SCHOOLS AND CONFERENCES

Invited speaker

JUL 2022	Real Analysis, Harmonic Analysis and Applications, Oberwolfach Workshop, Germany.
JUN 2022	Harmonic analysis and partial differential operators, Loughborough University, UK.
JUN 2022	British Mathematical Colloquium, King's College London, UK.
JUN 2021	Analysis and Applications, Wrocław, Poland (Cancelled).
JUN 2021	Harmonic Analysis and Analytic Number Theory Hausdorff Trimester Program, HIM, Bonn, Germany.
MAR 2021	Fourier restriction online 2021, online conference.
JUN 2020	Bilbao meeting on Harmonic Analysis and PDEs, BCAM, Bilbao, Spain. (Cancelled)
APR 2020	British Early Career Mathematicians Colloquium (BECMC), University of Birmingham, Birmingham, UK. (Online due to Covid 19)
FEB 2020	Recent Advances in Harmonic Analysis, University of Kent, Canterbury, UK.
JUN 2019	Workshop on Bourgain–Demeter Decoupling Method, Chern Institute of Mathematics, Nankai University, Tianjin, China.
MAY 2019	Postdoc symposium, Madison Lectures in Fourier Analysis, University of Wisconsin, Madison, US.
MAY 2018	RTG Workshop in Harmonic Analysis, University of Wisconsin, Madison, US.
JUL 2017	Harmonic Analysis and its Interactions: in Honour of Tony Carbery, University of Edinburgh, UK.
FEB 2017	Spring 2017 Harmonic Analysis program, MSRI, Berkeley, US.
AUG 2015	George Boole Mathematical Sciences Conference, University College Cork, Ireland.
JUL 2014	Harmonic Analysis and PDEs Hausdorff Trimester Program, HIM, Bonn, Germany.

Invited participant

JUL 2022	Real Analysis, Harmonic Analysis and Applications, Oberwolfach, Germany.
MAY 2021	Arithmetic (and) Harmonic Analysis, Institut Mittag-Leffler, Stockholm, Sweden.
APR 2020	Restriction, Takeya, and Carleson-Type Problems, BIRS, Banff, Canada. (Cancelled)
MAY 2019	Madison Lectures in Fourier Analysis, University of Wisconsin, Madison, US.
JUN 2018	Geometric Aspects of Harmonic Analysis, Cortona, Italy.
JUL 2017	Real Analysis, Harmonic Analysis and Applications, Oberwolfach, Germany.
MAY 2017	Closing Workshop: Harmonic Analysis, MSRI, Berkeley, US.
MAY 2017	Closing Workshop: Analytic Number Theory, MSRI, Berkeley, US.
JAN 2017	Introductory Workshops: Harmonic Analysis, MSRI, Berkeley, US.
JAN 2017	Introductory Workshops: Analytic Number Theory, MSRI, Berkeley, US.
MAY 2016	Conference in Harmonic Analysis in Honor of Michael Christ, University of Wisconsin, Madison, US.
JUN 2013	Young Researchers in Mathematics Conference, Edinburgh, UK.

Participant: international conferences

OCT 2018	Fractal Geometry and Stochastics 6, Bad Herrenalb, Germany.
JUN 2018	British Mathematical Colloquium, University of St. Andrews, UK.
SEP 2017	Analysis and Applications: Conference in Honor of Elias Stein, Wrocław, Poland.
JUN 2016	10th International Conference on Harmonic Analysis and Partial Differential Equations, El Escorial, Spain.
MAY 2014	Takeya problem, Restriction Problem and Sum-product Theory Workshop, UCLA, US.

APR 2013	Research Term on Real Harmonic Analysis and Applications to PDE, ICMAT, Spain.
JUN 2012	9th International Conference on Harmonic Analysis and Partial Differential Equations, El Escorial, Spain.

Participant: regional and student meetings

JAN 2019	Postgraduate Student Meeting, The Burn, Edzell, UK.
OCT 2018	Meeting of the UK Harmonic Analysis and PDE Research Network, University of Edinburgh, UK.
OCT 2015	AMS Central Fall Sectional Meeting, Loyola University, Chicago, US.
MAR 2015	Meeting of the UK Harmonic Analysis and PDE Research Network, University of Birmingham, UK.
APR 2015	Joint PG Colloquium, Edinburgh, UK.
JUN 2014	EMS Postgraduate Student Meeting, The Burn, Edzell, UK.
APR 2014	Joint PG Colloquium, Edinburgh, UK.
DEC 2013	Meeting of the UK Harmonic Analysis and PDE Research Network, University of Edinburgh, UK.
NOV 2013	Meeting of the UK Harmonic Analysis and PDE Research Network, University of Birmingham, UK.
DEC 2012	Meeting of the UK Harmonic Analysis and PDE Research Network, University of Edinburgh, UK.
NOV 2012	Meeting of the UK Harmonic Analysis and PDE Research Network, University of Birmingham, UK.

FINANCIAL SUPPORT AWARDED

EMS COVID recovery scheme, *Topics in continuum incidence geometry*, 2022.

£850 award, used to facilitate collaboration with M. Iliopoulou.

ICMS Workshop Grant (EPSRC), *Fourier Analysis @200*, 2022.

£24,000 award, to fund Fourier Analysis @200 workshop (principal organiser).

Heilbronn Institute Grant, *Fourier Analysis @200*, 2022.

£8000 award, to fund Fourier Analysis @200 workshop (principal organiser).

GMJT L&R Support, *Fourier Analysis @200*, 2022.

£2250 award, to fund Fourier Analysis @200 workshop (principal organiser).

EMS Research Support Fund, *Fourier Analysis 200*, 2022.

£1500 award, to fund Fourier Analysis @200 workshop (principal organiser).

SQuaREs, American Institute of Mathematics, 2019–2022.

Travel funding for three week-long meetings at AIM, San Jose, US.

Co-principal investigators: D. Beltran, L. Cladek, S. Guo, A. Seeger.

LMS scheme 4: research in pairs, 2019.

£550 award, used to facilitate collaboration with D. Beltran.

Dr. Laura Wisewell Travel Scholarship, University of Edinburgh, 2014.

£1000 award, used to attend the *Keakeya problem, Restriction Problem and Sum-product Theory* workshop, UCLA, US.

Principal's Career Development Scholarship, University of Edinburgh, 2011–2015.

Each scholarship covers the UK/EU rate of tuition fee as well as a stipend of £15,000 per annum.

MEMBERSHIPS

- Edinburgh Mathematical Society.
- London Mathematical Society.

LECTURING EXPERIENCE

University of Edinburgh: undergraduate

Fourier Analysis, Spring 2022.

Facets of Mathematics (cotaught with Dr. James Maddison and Dr. Torben Sell), Autumn 2021.

Real Analysis, Spring 2021.

Facets of Mathematics (cotaught with Dr. James Maddison and Dr. Debby Lipschutz), Autumn 2020.

Honours Algebra (cotaught with Prof. Iain Gordon), Spring 2020.

University of Edinburgh: postgraduate

SMSTC Fourier and Harmonic Analysis, Autumn 2021.

Incidence geometry: continuous and discrete, Spring 2021

Modern Developments in Fourier Analysis, Spring 2020.

SMSTC Measure and Integration, Autumn 2019, 2020, 2021.

University of Chicago: undergraduate

Math 163 - Honours Calculus, Spring 2016, Spring 2018
Math 162 - Honours Calculus, Winter 2016, Winter 2018.
Math 273 - Basic Theory of Ordinary Differential Equations, Autumn 2016.
Math 153 - Calculus, Autumn 2016.
Math 256 - Basic Algebra, Spring 2016.
Math 161 - Honours Calculus, Autumn 2015.

ADDITIONAL EXPERIENCE

Conference and workshop organisation

Fourier Analysis @200, ICMS, Edinburgh, July 2022. Principal organiser.
LMS HAnPDE network meeting, Bayes Centre, Edinburgh, April 2022. Co-organiser.
Heriot-Watt/Edinburgh University Joint PG Colloquium, ICMS, Edinburgh, April 2014. Co-organiser.

Seminar and colloquia organisation

Virtual Maxwell Analysis Seminar (online, co-organiser), 2020 – 2022.
Virtual Harmonic Analysis Seminar (online, co-organiser), 2020 – 2021.
Analysis Seminar, University of Edinburgh, 2019 – 2020, 2022.
Mathematics Colloquium, University of Edinburgh, 2019 – 2020.
Edinburgh School of Mathematics PG Colloquium, 2013 – 2014.

Referee work

Advances in Mathematics	Israel Journal of Mathematics
American Journal of Mathematics	Journal of the American Mathematical Society
Analysis and PDE	Journal of the European Mathematical Society
Annals of Mathematics	Journal of Fourier Analysis and Applications
Bulletin of the Hellenic Mathematical Society	Journal of Functional Analysis
Bulletin of the London Mathematical Society	Journal of Mathematical Analysis and Applications
Confluent Mathematici	Math. Proc. of the Cambridge Philosophical Society
Duke Mathematical Journal	Mathematika
Forum of Mathematics, Sigma	Mathematische Annalen
Geometric and Functional Analysis	Proceedings of the American Mathematical Society
Indiana University Mathematics Journal	Proceedings of the London Mathematical Society
Inventiones Mathematicae	

Outreach

Tutor for the LEAPS summer school for high school students, University of Edinburgh, 2013, 2014, 2015.