Alexander Betts

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Academic positions held

2020–	Postdoctoral Research Scientist at Harvard University as part of the Simons Collaboration in Arithmetic Geometry, Number Theory and Computation
2018–2020	Postdoctoral Guest at Max Planck Institut für Mathematik, Bonn
2017–2018	Research Assistant at King's College London (supported by EPSRC grant EP/M016838/2: *Arithmetic of hyperelliptic curves* held by Vladimir Dokchitser)

Education

2014–2018	Doctor of Philosophy (DPhil) at Merton College, Oxford *Heights via anabelian geometry and local Bloch–Kato Selmer sets* Supervised by Minhyong Kim Funded by the Wang Scholarship
2013–2014	Certificate of Advanced Study in Mathematics (Part III) at Trinity College, Cambridge Distinction (second in year)
2010–2013	BA in Mathematics at Trinity College, Cambridge First class in all three years Appointed Junior Scholar in 2011, Senior Scholar in 2012

Published papers

- *Galois sections and p-adic period mappings.* With J. Stix. Ann. of Math. arXiv:2204.13674 (accepted 2024, in press)
- *Bounds on the Chabauty–Kim locus of hyperbolic curves.* With D. Corwin and M. Leonhardt. Int. Math. Res. Not. IMRN **2024**(12), pp. 9705–9727. 10.1093/imrn/rnae067 (2024)
- *Refined Selmer equations for the thrice-punctured line in depth two.* With A.J. Best, T. Kumpitsch, M. Lüdtke, A.W. McAndrew, L. Qian, E. Studnia and Y. Xu. Math. Comp. **93**, pp. 1497–1527. doi:10.1090/mcom/3898 (2024)
- *Local constancy of pro-unipotent Kummer maps.* Proc. Lond. Math. Soc. **127**(3), pp. 836–888. doi:10.1112/plms.12554 (2023)
- *Weight filtrations on Selmer schemes and the effective Chabauty–Kim method.* Compos. Math., **159**(7), pp. 1531–1605. doi:10.1112/S0010437X2300725X (2023)
- *Semisimplicity of the Frobenius action on π_1.* With D. Litt. In Proceedings of the Simons Symposium on p-adic Hodge Theory, Singular Varieties and Non-Abelian Aspects, Springer–Verlag, pp. 17–64. doi:10.1007/978-3-031-21550-6 (2023)
- *The motivic anabelian geometry of local heights on abelian varieties.* Mem. Amer. Math. Soc. arXiv:1706.04850 (in press, accepted 2022)

- *A user's guide to the local arithmetic of hyperelliptic curves.* With A. Best, M. Bisatt, R. van Bommel, V. Dokchitser, O. Faraggi, S. Kunzweiler, A. Morgan, S. Muselli and S. Nowell. Bull. Lond. Math. Soc., **54**(3), pp. 825–867. doi:10.1112/blms.12604 (2022)
- *Variation of Tamagawa numbers of Jacobians of hyperelliptic curves with semistable reduction.* J. Number Theory, **231**, pp. 158–213. doi:10.1016/j.jnt.2020.09.021 (2022)
- *Variation of Tamagawa numbers of semistable abelian varieties in field extensions.* With V. Dokchitser. Math. Proc. Cam. Phil. Soc., **116**, pp. 487–521. doi:10.1017/S0305004118000075 (2019)

Submitted papers and preprints

- *Local heights on hyperelliptic curves and quadratic Chabauty.* With J. Duque-Rosero, S. Hashimoto and P. Spelier. arXiv:2401.05228
- *Chabauty–Kim and the Section Conjecture for locally geometric sections.* With T. Kumpitsch and M. Lüdtke. arXiv:2305.09462
- *The local theory of unipotent Kummer maps and refined Selmer schemes.* With N. Dogra. arXiv:1909.05734

Academic talks

2024

- *Chabauty–Kim theory: retrospectives and prospects*, The Mordell Conjecture 100 years later, MIT.
- *Unexpected points in quadratic Chabauty loci*, Tufts University Number Theory Seminar
- *Unexpected points in quadratic Chabauty loci*, Simons Collaboration on Arithmetic Geometry, Number Theory and Computation Annual Meeting

2023

- *Unexpected points in quadratic Chabauty loci*, Washington University Algebraic and Arithmetic Geometry Seminar
- *Cubic structures and quadratic Chabauty*, UVA Number Theory Seminar
- *A relative Oda's Criterion*, Ohio State University Algebraic Geometry Seminar
- *A relative Oda's Criterion*, Harvard Number Theory Seminar
- *p-adic Hodge theory and obstructions to rational points*, Oberwolfach Workshop on Arithmetic Homotopy and Galois Theory
- *Chabauty–Kim and the Section Conjecture for locally geometric sections*, Rational Points Workshop, Schney
- *p-adic obstructions and Grothendieck's section conjecture*, Arithmetic & Homotopic Galois Theory IRN Seminar (online)
- *p-adic obstructions and Selmer sections*, PKU/BICMR Number Theory Seminar (online)
- *Chabauty–Kim and the Section Conjecture for locally geometric sections*, 'Selminar' on Selmer Schemes, 2nd edition (online)

- *Computing Local Heights for Quadratic Chabauty*, Simons Collaboration on Arithmetic Geometry, Number Theory, and Computation Annual Meeting (lightning talk)

2022

- *A Faltings–Mordell Theorem for Selmer Sections*, Rice University Number Theory Seminar
- *Refined Chabauty–Kim for the thrice-punctured line*, Dartmouth College Number Theory Seminar
- *A Faltings–Mordell Theorem for Selmer sections*, Boston University Number Theory Seminar
- *Grothendieck's section set and the Lawrence–Venkatesh method*, Connecticut Conference in Number Theory
- *A partial finiteness theorem for the Selmer section set*, ADDING Conference, Athens Georgia
- *Galois sections and the Lawrence–Venkatesh method*, Harvard Number Theory Seminar

2021

- *Weights of Coleman functions and effective Chabauty–Kim*, Workshop on Rational Points and Galois Representations, Pittsburgh (online)
- *Galois sections and the Lawrence–Venkatesh method*, Berkeley Number Theory Seminar (online)

2020

- *Galois sections and the Lawrence–Venkatesh method*, Queen Mary University Number Theory Seminar (online)
- *Weight filtrations on Selmer schemes and effective non-abelian Chabauty*, 'Selminar' on Selmer Schemes (online)
- *Finite descent and the Lawrence–Venkatesh method*, Max-Planck Institute Number Theory Seminar (online)
- *Growth of Tamagawa numbers of semistable hyperelliptic curves in field extensions*, MIT Number Theory Seminar
- *Effective Chabauty–Kim for the thrice-punctured line*, Boston University Number Theory Seminar
- *Weight–monodromy and canonical paths on varieties*, Paris 6 & 7 Number Theory Seminar

2019

- *Non-abelian Kummer maps for curves*, Max-Planck Institute Number Theory Seminar
- *Non-abelian Kummer maps for curves*, Frankfurt Number Theory Seminar
- *Local non-abelian Kummer maps for curves*, Cambridge Number Theory Seminar

2017

- *Iterated integrals, Green's functions and fundamental groups*, Bristol Linfoot Number Theory Seminar
- *Heights and anabelian geometry*, Oxford Number Theory Seminar
- *Computing Tamagawa numbers of hyperelliptic curves*, ICTP Summer School on hyperelliptic curves
- *Local heights on abelian varieties via non-abelian Bloch–Kato Selmer sets*, BIRS Workshop on Nilpotent Fundamental Groups
- *Non-abelian Bloch–Kato Selmer sets and heights on abelian varieties*, Warwick Number Theory Seminar
- *Non-abelian Bloch–Kato Selmer sets and an application to heights on abelian varieties*, 3rd Workshop on Interactions between Arithmetic and Homotopy, Imperial College London

2015

- *The first-order theory of geometric points of schemes: Chevalley's theorem and quantifier elimination*, Oxford Logic Advanced Class (2015)

Other academic experience

- Master's essay *Derived categories and Grothendieck duality*, under M. Gross (2014)
- Research project *Explicit reduction modulo p of certain* 2*-dimensional crystalline Galois representations*, under K. Buzzard (2013)
- Supplied the proof of Proposition 6.4. in *On sets defining few ordinary lines.* B. Green and T. Tao, Discrete and Computational Geometry, **50**(2), pp. 409–468 (2013)

Taught courses (US)

- Math 283Z *Foundations of non-abelian Chabauty* (Harvard, 2023, designed the course)
- Math 1A *Introduction to Calculus* (Harvard, 2022, one section)

Student projects supervised

- Reading project *The Prime Number Theorem* (Harvard, 2023, one student)
- Research project *Refined Selmer equations for the thrice-punctured line in depth* 2 (Arizona Winter School, 2020, seven students, see also under Published Papers)
- BSc & MSc essay project *Counterexamples to the Hasse principle* (King's College London, 2017–2018, two students)

Small group tutoring

- Tutor for *Analysis for Economists* (Oxford, 2017, created lectures and problems sheets, four students)
- Tutor for *Geometry*, *Number Theory* and *Rings and Modules* (Oxford, 2015–2016, groups of 2–3 students)
- Supervisor for *Galois Theory* (Cambridge, 2014, groups of 2–3 students)

Other teaching experience

- Mini-course *The Chabauty–Kim method* (Université de Jussieu, 2018, three lectures)
- Volunteer at UKMT (UK Mathematics Trust) training camps (2011–2017)
- Teaching Assistant for *Elliptic Curves* and *Lie Algebras* (Oxford, 2014–2015)
- Mentor for the UKMT Senior Mentoring Scheme (2010–2012)

Academic service

- Co-host for graduate professional development session on *Pictures and Talks* (Harvard 2024, upcoming)
- Referee for Compos. Math. (twice), J. Eur. Math. Soc., Math. Comp., Mathematika, Mem. Amer. Math. Soc., Proc. Amer. Math. Soc., Trans. London Math. Soc. and Algebra Number Theory (2018–)
- Co-organised Harvard Number Theory Seminar on Ax–Schanuel and O-Minimality (2022)
- Panellist on *Applying for postdoc positions*, People Online In Number Theory (2021)
- Co-organised Kleine Arbeitsgruppe *Siegel's Theorem, after Lawrence–Venkatesh* (Bonn, 2019)
- Co-organised workshop *Arithmetic of Curves*, Baskerville Hall (2018)
- Organised study groups on étale cohomology (Oxford, 2014), on anabelian geometry (Oxford, 2016), and on motives (London, 2018)
- Organised the Oxford Junior Number Theory Seminar (2015–2016)

Mathematics enrichment

- Composed problems for international competitions: Romanian Master of Mathematics (2011 problem 5, 2013 problem 2 and 2015 problem 3) and Balkan Mathematical Olympiad (2021 problem 4, joint with S. Bealing)
- British Mathematical Olympiad Problem Selection Committee (2012–2021)
- Marker for rounds 1 & 2 of the British Mathematical Olympiad (2011–2020, Problem Captain from 2012)
- Member of International Mathematical Olympiad Problem Selection Committee (2019)
- Chair of the UKMT International Problem Selection Committee (2011–2016)
- UKMT Advanced Mentoring Scheme Coordinator (2012–2013)
- Marker for the European Girls' Mathematical Olympiad (2012)

Diversity, equity and inclusion

- Mentor for Harvard's Math Includes programme (seven mentees, mostly international students)
- LGBT+ representative on the Trinity College Student Welfare Committee (2013–2014)
- Secretary/President of 1TQ, LGBT+ society in Trinity College, Cambridge (2011–2014)
- Schools outreach work with Just Like Us (2012–2013)
- Campaigns Officer, Cambridge University Student Union LGBT+ Society (2011-2012)

Other

- German language at CEFR level C1 (proficient user).