

Alexander Betts

Full name Luke Alexander Betts
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Academic positions held

2020– 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 (simultaneous with the final year of my DPhil)

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

- *Weight filtrations on Selmer schemes and the effective Chabauty–Kim method.* Compos. Math. arXiv:2106.01218 (in press, accepted 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, pages 17–64. (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), pages 825–867. doi:10.1112/blms.12604 (2022)
- *Variation of Tamagawa numbers of Jacobians of hyperelliptic curves with semistable reduction.* J. Number Theory, **231**, pages 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**, pages 487–521. doi:10.1017/S0305004118000075 (2019)

Submitted papers

- *Chabauty–Kim and the Section Conjecture for locally geometric sections*. With T. Kumpitsch and M. Lüdtkke. arXiv:2305.09462
- *Towards Uniform Chabauty–Kim*. With D. Corwin and M. Leonhardt. arXiv:2206.11085 (to be resubmitted)
- *Local constancy of pro-unipotent Kummer maps*. arXiv:2203.03701 (submitted 2022)
- *Galois sections and p -adic period mappings*. With J. Stix. arXiv:2204.13674 (submitted 2022)
- *Refined Selmer equations for the thrice-punctured line in depth two*. With A.J. Best, T. Kumpitsch, M. Lüdtkke, A.W. McAndrew, L. Qian, E. Studnia and Y. Xu. arXiv:2106.10145 (submitted 2021)
- *The local theory of unipotent Kummer maps and refined Selmer schemes*. With N. Dogra. arXiv:1909.0573 (to be resubmitted)

Selected academic talks

- 2023 *Title TBC*, Arithmetic & Homotopic Galois Theory IRN Seminar
Title TBC, PKU/BICMR Number Theory Seminar
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
- 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 GA
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 *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
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
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

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), pages 409–468 (2013)

Teaching experience

- Lecturer for Math 283Z *Foundations of non-abelian Chabauty* (Harvard 2023, forthcoming)
- Teaching Fellow for Math 1A *Introduction to Calculus* (Harvard 2022)
- Gave a three-lecture mini-course *The Chabauty–Kim method* (Université de Jussieu, 2018)
- Supervisor for BSc & MSc essay project *Counterexamples to the Hasse principle*, for which I created a syllabus and supervised two students (King's College London, 2017–2018)
- Tutor for *Analysis for Economists*, for which I delivered six lectures to a small group and created accompanying problems sheets (Oxford, 2017)
- Tutor for *Geometry, Number Theory and Rings and Modules*, for which I gave small-group tutorials to supplement the lecture courses (Oxford, 2015–2016)
- Volunteer at UKMT (UK Mathematics Trust) training camps, for which I gave lectures and wrote problems sheets tailored to an audience of exceptional under-18s on subjects including *Euler Characteristic* and *Polynomials over Finite Fields* (2011–2017)
- Teaching Assistant for *Elliptic Curves* and *Lie Algebras*, for which I gave students feedback on their problems sheets and assisted a member of faculty in problems classes (Oxford, 2014–2015)
- Supervisor for *Galois Theory*, for which I gave small-group tutorials to supplement the lecture course (Cambridge, 2014)
- Mentor for the UKMT Senior Mentoring Scheme (2010–2012)
- Private tutor for A-level Mathematics (2009–2010)

Academic service

- Peer-reviewer for *Compos. Math.* (twice), *J. Eur. Math. Soc.*, *Math. Comp.*, *Mathematika* and *Mem. Amer. Math. Soc.* (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)
- Project group leader for Arizona Winter School, *Refined Chabauty–Kim for the thrice-punctured line* (2020)
- 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

- 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)