

## HARALD ANDRÉS HELFGOTT - List of Publications

### Pure mathematics

38. Dimensional estimates for growth in  $SL_n$  (avec. J. BAJPAI et D. DONA), in preparation.
37. Expansion in a prime divisibility graph (avec M. RADZIWIŁŁ), preprint. Available at <https://arxiv.org/abs/2103.06853>.
36. Summing  $\mu(n)$ : a faster elementary algorithm (avec L. THOMPSON), preprint. Available at <https://arxiv.org/abs/2101.08773>.
35. Optimality for the two-parameter quadratic sieve (avec E. CARNEIRO, A. CHIRRE et J. MEJÍA-CORDERO), submitted. Available at <https://arxiv.org/abs/2005.03162>.
34. Explicit  $L^2$  bounds for the Riemann  $\zeta$  function (with D. DONA and S. ZÚÑIGA ALTERMAN), submitted. Available at <https://arxiv.org/abs/1906.01097>.
33. *The ternary Goldbach problem*, to appear in *Ann. of Math. Studies*. This book (currently 561pp.+xvii) should replace articles 21, 25 and 26 below.
32. An improved sieve of Eratosthenes, *Math. Comp.* **89** (2020), no. 321, 333–350.
31. Growth in linear algebraic groups and permutation groups: towards a unified perspective, in: *Groups St Andrews 2017 in Birmingham. Selected papers of the conference, Birmingham, UK, August 5–13, 2017*, Cambridge University Press, 2019.
30. *Isomorphismes de graphes en temps quasi-polynomial (d’après Babai et Luks, Weisfeiler-Leman,...)* (mainly expository), *Astérisque* **407** (2019), Séminaire Bourbaki 2016/2017, 135–182. A translation (*Graph isomorphisms in quasi-polynomial time*) by J. Bajpai and D. Dona (with solutions and some supplementary exercises) is available at <https://arxiv.org/abs/1710.04574>.
29. Soficity, short cycles and the Higman group (with K. JUSCHENKO), *Trans. Am. Math. Soc.*, **371.4** (2019): 2771–2795.
28. On the dimension of additive sets (with P. CANDELA), *Acta Arith.* **167** (2015), 91–100.
27. Random generators of the symmetric group: diameter, mixing time and spectral gap (with Á. SERESS et A. ZUK), *J. of Algebra* **421** (2015), 349–368.
26. The ternary Goldbach conjecture is true, available at <https://arxiv.org/abs/1312.7748>.
25. Major arcs for Goldbach’s problem, available at <https://arxiv.org/abs/1305.2897>.
24. Numerical verification of the ternary Goldbach conjecture up to  $8.875e30$  (with D. PLATT), *Experiment. Math.* **22** (2013), no. 4, 406–409.
23. Growth in groups: ideas and perspectives, *Bull. Am. Math. Soc.* **52** (2015), no. 3, 357–413.
22. On growth in an abstract plane (with N. GILL and M. RUDNEV), *Proc. Amer. Math. Soc.* **143** (2015), no. 8, 3593–3602.
21. Minor arcs for Goldbach’s problem, <https://arxiv.org/abs/1205.5252>.
20. Bounds on the diameter of Cayley graphs of the symmetric group (with J. BAMBERG, N. GILL, T. HAYES, Á. SERESS, P. SPIGA), *J. Algebraic Combin.* **40** (2014), no. 1, 1–22.
19. Square-free values of  $f(p)$ ,  $f$  cubic, *Acta Math.* **213** (2014), no. 1, 107–135.
- Th3. Groupes, courbes et croissance, habilitation thesis, Paris-Sud (Orsay).
18. On the diameter of permutation groups (with Á. SERESS), *Annals of Math.* **179** (2014), no. 2, 611–658.
17. Deterministic methods to find primes (as *D. H. J. Polymath*, with T. TAO et E. CROOT), *Math. Comp.* **81** (2012), no. 278, 1233–1246.
16. Growth in solvable subgroups of  $GL_r(\mathbb{Z}/p\mathbb{Z})$  (with N. GILL), *Math. Annalen* **360** (2014), no. 1–2, 157–208.
15. Growth of small generating sets in  $SL_n(\mathbb{Z}/p\mathbb{Z})$  (with N. GILL), *Int. Math. Res. Notices*, Vol. 2011, 4226–4251.
14. An explicit incidence theorem in  $\mathbb{F}_p$  (with M. RUDNEV), *Mathematika*, 57 (2011), no. 1, 135–145.
13. Improving Roth’s theorem in the primes (with A. DE ROTON), *Int. Math. Res. Notices*, Vol. 2011, 767–783.

12. Growth in  $SL_3(\mathbb{Z}/p\mathbb{Z})$ , *J. Eur. Math. Soc. (JEMS)*, vol. 13, no. 3, pp. 761–851.
11. Power-free values, repulsion between points, different beliefs and the existence of error, *Anatomy of Integers*<sup>1</sup>, 81–88, Amer. Math. Soc., Providence, RI, 2008.
10. How small must ill-distributed sets be? A two-dimensional large sieve (with A. VENKATESH), *Analytic number theory: essays in honor of Klaus Roth*, 224–234, Cambridge U. Press, 2009.
9. Growth and generation in  $SL_2(\mathbb{Z}/p\mathbb{Z})$ , *Annals of Math.* **167** (2008), no. 2, 601–623.
8. Power-free values, large deviations and integer points on irrational curves, *J. Théor. Nombres Bordeaux* **19** (2007), 433–472.
7. The parity problem for irreducible polynomials, 11 pp., <https://arxiv.org/abs/math/0501177>.
6. The parity problem for reducible polynomials, *J. London Math. Soc. (2)* **73** (2006), no. 2, 415–435.
5. Integral points on elliptic curves and 3-torsion in class groups (with A. VENKATESH), *J. Amer. Math. Soc.* **19** (2006), no. 3, 527–550.
4. Root numbers and ranks over global function fields (with B. CONRAD and K. CONRAD), *Adv. Math.* **198** (2005), 684–731.
3. On the square-free sieve, *Acta Arith.* **115** (2004), 349–402.
2. On the behaviour of root numbers in families of elliptic curves, 65 pp., <https://arxiv.org/abs/math/0408141>.
- Th2. *Root numbers and the parity problem*, PhD thesis, Princeton University, May 2003.
1. Enumeration of tilings of diamonds and hexagons with defects (with I. M. GESSEL), *Electron. J. Combin.* **6** (1999), no. 1, R16, 26 pp.
- Th1. *Edge effects on local statistics in lattice dimers*, B.A. thesis, Brandeis University, May 1998.

*Pure mathematics – popularization and exposition*

*Note: while PE2–PE4 are not identical, they have a considerable intersection.*

- PE7. Primos, paridad y análisis (with A. UBIS), to appear in *Actas de la escuela AGRA III*.
- PE6. Growth and expansion in algebraic groups over finite fields, to appear in the proceedings of the Arizona Winter School 2016.
- PE5. Crecimiento y expansión en  $SL_2$ , to appear in *Actas de la escuela AGRA II: Aritmética, grupos y análisis*, Publications of IMPA.
- PE4. The ternary Goldbach problem, *Proceedings of the International Congress of Mathematicians – Seoul 2014*, Vol. II, 391–418, Kyung Moon Sa, Seoul, 2014.
- PE3. La conjecture de Goldbach ternaire. Translated by M. Bilu, revised by the author. *Gaz. Math.* no. 140 (2014), 5–18.
- PE2. La conjetura débil de Goldbach, *Gac. R. Soc. Mat. Esp.* **16** (2013), no. 4.
- PE1. *Azar y aritmética*, *Monografías del Instituto de Matemática y Ciencias Afines*, 50. Instituto de Matemáticas y Ciencias Afines (IMCA), Lima, Peru, 2010.

*Pedagogy and history*

- PH3. A modern vision of the work of Cardano and Ferrari on quartics, (with M. HELFGOTT) *CONVERGENCE, an online journal of the Mathematical Association of America*, July 2009.
- PH2. A noncalculus proof that Fermat’s principle of least time implies the law of refraction (with M. HELFGOTT), *Am. J. Phys.* **70** (2002), no. 12, 1224–1225.
- PH1. Maxima and minima before Calculus (with M. HELFGOTT), *Pro Mathematica XII* (1998), nos. 23–24, 135–158.

*Computer Science*

*Note: I am no longer active in this field. My work in algorithmic number theory can be found under the heading of “pure mathematics” above.*

- I3. Lossless image compression by block matching (with J. A. STORER), *Comput. J.* **40** (1997), no. 2/3,

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<sup>1</sup>Conference proceedings.

137–145.

I2. Asymmetry in Ziv/Lempel '78 Parsing (with M. COHN), 320–328, in: *Compression and complexity of sequences: proceedings, 1997*, IEEE, Los Alamitos, CA, IEEE Computer Society Press, 1997.

I1. On Maximal Parsings of Strings (with M. COHN), 291-299, in: *Proceedings DCC '1997: Data Compression Conference*, IEEE, Los Alamitos, CA, 1997.