Raphael Sebastian Steiner

Curriculum Vitae

Positions

2020–2023 **Postdoc (Hermann-Weyl-Instructorship)**, *Federal Institute of Technology (ETH)*, Zürich, CH.

2018–2020 **Postdoc (Member)**, *Institute for Advanced Study*, Princeton, USA.

Education

2014–2018 **Ph.D. in Mathematics**, *University of Bristol*, Bristol, UK.
Three months were spent as a visitor at the MSRI programme "Analytic Number Theory" in Berkeley, CA, USA.

2012–2014 **M.Sc. in Mathematics**, *Federal Institute of Technology (ETH)*, Zürich, CH, *GPA – 5.74 / 6*.

2009–2013 **B.Sc. in Mathematics with Distinction**, *Federal Institute of Technology (ETH)*, Zürich, CH, *GPA – 5.85 / 6*.

Awarded Grants

2020 **Postdoc.Mobility**, *Swiss National Science Foundation*, (declined).

Honours & Awards

2019 **Faculty of Science Commendation**, Bristol, UK.

2014 **Heilbronn Excellence Award**, Bristol, UK.

2009 **Best Interdisciplinary Achievement at Swiss Science Olympiads**, Bern, CH.

2009 **Bronze Medal at the International Mathematical Olympiad**, Bremen, DE.

2009 **Gold Medal at the Swiss Mathematical Olympiad**, Zürich, CH.

2009 **Gold Medal at the Swiss Physics Olympiad**, Zürich, CH.

2008 **Contestant at the International Mathematical Olympiad**, Madrid, ES.

2008 **Silver Medal at the Swiss Mathematical Olympiad**, Zürich, CH.

2007 **Contestant at the International Mathematical Olympiad**, Hanoi, VN.

2007 **Bronze Medal at the Swiss Mathematical Olympiad**, Zürich, CH.

Publication List

Publications in peer-reviewed scientific journals

- (with E. H. El Abdalaoui and I. E. Shparlinski) *Chowla and Sarnak Conjectures for Kloosterman Sums*, Mathematische Nachrichten 00 (2023), 1–20.

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- *Small diameters and generators for arithmetic lattices in* $\mathrm{SL}_2(\mathbb{R})$ *and certain Ramanujan graphs*, The Ramanujan Journal (2023).
- *Sup-norm of Hecke–Laplace Eigenforms on* S^3, Mathematische Annalen 377 (2020), 543-553.
- *Near Counterexamples to Weil's Converse Theorem*, Journal de Théorie des Nombres de Bordeaux, Volume 31 (2019) no. 2, 313-321.
- *Effective Vinogradov's mean value theorem via efficient boxing*, Journal of Number Theory 204 (2019), 354-404.
- *On a twisted version of Linnik and Selberg's conjecture*, Mathematika 65 (2019), 437-474.
- (with T. D. Browning and V. Vinay Kumaraswamy) *Twisted Linnik implies optimal covering exponent for* S^3, Int. Math. Res. Not. IMRN, 2019 1 (2019), 140-164.
- (with S. Bettin, J. W. Bober, A. R. Booker, B. Conrey, M. Lee, G. Molteni, T. Oliver, and D. J. Platt) *A conjectural extension of Hecke's converse theorem*, The Ramanujan Journal, 2017 47 (2018), 659-684.
- *Supnorm of Modular Forms of half-integral Weight in the Weight Aspect*, Acta Arithmetica 177 (2017), 201-218.
- *Uniform bounds on sup-norms of holomorphic forms of real weight*, Int. J. Number Theory 12 (2016), 1163-1185.

Submitted but not yet accepted / published publications

- (with I. Khayutin) *Theta functions, fourth moments of eigenforms, and the sup-norm problem I*, arXiv 2009.07194, submitted to Compositio Mathematica.
- (with I. Khayutin and P. D. Nelson) *Theta functions, fourth moments of eigenforms, and the sup-norm problem II*, arXiv 2207.12351, submitted to Forum of Mathematics, Pi.
- *Kloosterman sums do not correlate with periodic functions*, arXiv 2302.06409, submitted to Mathematika.
- Appendix to *Sums of Cusp Form Coefficients Along Quadratic Sequences* by C. I. Kuan, D. Lowry-Duda, and A. Walker, arXiv 2301.11901, submitted to International Mathematics Research Notices.

Theses

Ph.D. Thesis — *The harmonic conjunction of automorphic forms and the Hardy–Littlewood circle method*, University of Bristol, Bristol, UK.
Under the supervision of Professor Tim D. Browning & Professor Andrew R. Booker.

M.Sc. Thesis — *Sup-norms of Modular Forms of real and half-integral Weight*, University of Bristol, Bristol, UK, & Federal Institute of Technology (ETH), Zürich, CH.
Under the supervision of Professor Abhishek Saha & Professor Emmanuel Kowalski.

B.Sc. Thesis — *A theorem of Runge – On the finiteness of integral points of certain irreducible rational curves*, Federal Institute of Technology (ETH), Zürich, CH.
Under the supervision of Professor Clemens Fuchs.

Teaching

Education

2021–2022 **Professional Development Course**, *Foundations of Teaching and Learning*, Federal Institute of Technology (ETH), Zürich, CH.
Participants use core teaching and learning concepts in higher education to analyse their teaching experience within and beyond their own disciplines. Throughout the course, they plan their own teaching based on these insights.

Experience

2021 **Lecturer**, *Federal Institute of Technology (ETH)*, Zürich, CH.
For a seminar in algebraic number theory and sums of squares, a self-designed course.

2018 **Teacher**, *International Mathematics Competition (IMC) preparation*, Bristol, UK.
For analysis, linear algebra, and polynomials.

2015 **Marker**, *University of Bristol*, Bristol, UK.
For group theory.

2014–2015 **Teaching Assistant**, *University of Bristol*, Bristol, UK.
For analysis, foundations & proof, and introduction to group theory.

2011 **Teaching Assistant**, *Federal Institute of Technology (ETH)*, Zürich, CH.
For analysis III.

2010 **Teaching Assistant**, *Federal Institute of Technology (ETH)*, Zürich, CH.
For linear algebra.

2010–2014 **Teacher and Marker**, *Swiss Mathematical Olympiad*, CH.
For number theory and algebra.

Mentoring

B.Sc. Theses

2022 **Lorenzo Mombelli**, *Federal Institute of Technology (ETH)*, Zürich, CH.

2021 **Benjamin Reinhard**, *Federal Institute of Technology (ETH)*, Zürich, CH.

Administration

2017– **Reviewer for various journals**, *e.g. Compositio Mathematica; Forum of Mathematics, Sigma; International Mathematics Research Notices; Journal of Number Theory; MathSciNet*.

2019–2020 **Co-organiser of the Joint IAS/PU Number Theory Seminar**, *Institute for Advanced Study*, Princeton, USA.

2015–2018 **Typewriting Professor C. Hooley's papers**, *Heilbronn Institute*, Bristol, UK.

2017 **Member of the problem selection committee and problem captain at the European Girls Math Olympiad**, Zürich, CH.

2014 **Leader at the International Math Olympiad**, Cape Town, ZA.

2011–2014 **Treasurer of the Swiss Mathematical Olympiad**.

2013 **Leader at the International Math Olympiad**, Santa Marta, CO.

2012 **Coordinator at the Middle European Math Olympiad**, Solothurn, CH.

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2012 **Deputy leader at the European Girls Math Olympiad**, Cambridge, UK.

2011 **Observer B at the International Math Olympiad**, Amsterdam, NL.

Languages

German **Mothertongue**

English **FCE, IELTS (GPA – 8.0)**

French **Matura (Secondary School Degree)**

Swedish **A2**

Conference & Seminar Talks

Invited Speaker

2023 Jul. **1st Analytic Number Theory & Automorphic Forms Conference in Patras**, *University of Patras*, Patras, GR.

May **Analytic Number Theory**, *Stanford University*, Stanford, USA.

Mar. **Rencontres de théorie analytique et élémentaire des nombres**, *Institut Henri Poincaré*, Paris, FR.

Mar. **Séminaires de Géométrie Arithmétique et Motivique**, *Université Sorbonne Paris Nord*, Paris, FR.

2022 Nov. **Lecture series on analytic aspects of automorphic forms in London**, *Queen Mary University of London*, London, UK.

Oct. **Number Theory Seminar**, *Stanford University*, Stanford, USA.

Sep. **Automorphic Forms Conference** , *Erdős Center*, Budapest, HUN.

Mar. **Fantasy (Young Scholars in the Analytic Theory of Numbers and Automorphic Forms)**, *University of Bonn*, Bonn, DE.

2021 Mar. **Number Theory Seminar**, *Federal Institute of Technology (ETH)*, Zürich, CH.

Feb. **Linfoot Seminar**, *University of Bristol*, Bristol, UK.

Jan. **London Number Theory Seminar**, *Imperial College London / King's College London / University College London*, London, UK.

2020 Oct. **Séminaire Théorie des Nombres**, *Université de Bordeaux*, Bordeaux, FR.

Feb. **UNSW Number Theory Seminar**, *University of New South Wales*, Sydney, AUS.

Feb. **Number Theory Seminar**, *University of New South Wales*, Canberra, AUS.

2019 Oct. **Number Theory Seminar**, *Northwestern University*, Evanston, USA.

Sep. **Joint IAS/PU Number Theory Seminar**, *Institute for Advanced Study*, Princeton, USA.

Aug. **Browning Group Working Seminar**, *Institute for Science and Technology Austria*, Klosterneuburg, AT.

Feb. **Analytic Number Theory**, *Stanford University*, Stanford, USA.

Feb. **Number Theory Seminar**, *Stanford University*, Stanford, USA.

Jan. **The Quebec–Vermont Number Theory Seminar**, *Concordia University*, Montreal, CA.

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Jan. **Mathematics Seminar**, *Insitute for Advanced Study*, Princeton, USA.

2018 Oct. **Philadelphia Area Number Theory Seminar**, *Bryn Mawr College*, Bran Mawr, USA.

Oct. **Number Theory Seminar**, *Rutgers University*, New Brunswick, USA.

2017 Nov. **Göttingen-Hannover Number Theory Workshop**, *University of Göttingen*, Göttingen, DE.

Oct. **Number Theory Seminar**, *University of Warwick*, Warwick, UK.

Mar. **Workshop on Efficient Congruencing and Translation-invariant Systems**, *The Fields Institute*, Toronto, CA.

2016 Oct. **Séminaire de théorie de nombres**, *Université de Nantes*, Nantes, FR.

Oct. **Rencontres de théorie analytique et élémentaire des nombres**, *Institut Henri Poincaré*, Paris, FR.

2014 Nov. **ITS informal Analytic Number Theory Seminar**, *Federal Institute of Technology (ETH)*, Zürich, CH.

Contributed Talks

2022 Mar. **34-th Automorphic Forms Workshop**, Provo, USA.

2019 Oct. **Short Talks by Postdoctoral Members**, *Institute for Advanced Study*, Princeton, USA.

2018 Oct. **Short Talks by Postdoctoral Members**, *Institute for Advanced Study*, Princeton, USA.

2017 May **Analytic Number Theory Graduate Student Seminar**, *MSRI*, Berkeley, USA.

Apr. **Analytic Number Theory Graduate Student Seminar**, *MSRI*, Berkeley, USA.

2016 Sep. **Elementary and Analytic Number Theory**, Strobl am Wolfgangsee, AT.

2015 Aug. **Young Researcher in Mathematics**, Oxford, UK.

Jul. **Journées Arithmétiques**, Debrecen, HU.

Mar. **Linfoot Seminar**, *University of Bristol*, Bristol, UK.

References

- *Prof. Peter Sarnak*, Institute for Advanced Study (IAS) & Princeton University, Princeton, USA, sarnak@math.princeton.edu, +1 609 258 4229
- *Prof. Emmanuel Kowalski*, Federal Institute of Technology (ETH), Zürich, CH, kowalski@math.ethz.ch, +41 44 632 3441
- *Prof. Tim D. Browning*, Institute for Science and Technology (IST), Klosterneuburg, AUT, timdanielbrowning@gmail.com, +43 2243 9000 2103
- *Prof. Paul D. Nelson*, Aarhus University, Aarhus, DK, paul.nelson@math.au.dk, +45 8715 5100
- *Prof. Matthew Young*, Texas A&M University, College Station, USA, myoung@math.tamu.edu, +1 979 845 7554