Ariel Weiss

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Education

Ph.D. in Mathematics, The University of Sheffield, UK 2015–2019
Thesis: *On Galois representations associated to low weight Hilbert–Siegel modular forms*
Advisor: Dr. Tobias Berger

MMath in Mathematics, University of Cambridge, UK 2014–2015

B.A. in Mathematics, University of Cambridge, UK 2011–2014

Employment

Zassenhaus Assistant Professor, The Ohio State University 2/2023–present

Postdoctoral Research Fellow, Ben-Gurion University of the Negev, Israel 10/2021–2/2023

Postdoctoral Research Fellow, The Hebrew University of Jerusalem, Israel 10/2019–9/2021

Research Areas

My work focuses on **algebraic number theory** and **arithmetic geometry**, with two main threads:

1. **Arithmetic statistics**: heuristics for elliptic curves, distribution of ranks of abelian varieties, twist families, rank growth of elliptic curves and Hilbert's 10th problem.
2. **Images of Galois representations**: Galois representations attached to automorphic forms and applications, including to the Tate and Lang Trotter conjectures. Ribet's Lemma and its generalisations, and applications, including to class groups and isogenies of elliptic curves.

Grants and awards

2023 AMS-Simons Travel grant from 2023–2025, $6000

2023 Noriko Sakurai Award for outstanding postdoctoral research, Ben-Gurion University

2019 T.M. Flett Prize in pure mathematics, The University of Sheffield.
Prize awarded to the best postgraduate thesis or paper published in 2018-19.

2018 London Mathematical Society postgraduate conference grant, £4000.
Heilbronn Institute of Mathematics Research conference grant, £2000.
Grants to fund Y-RANT, a young researchers' conference in algebraic number theory.

Publications and preprints

Submitted publications

1. **Polylogarithmic motivic Chabauty–Kim for $\mathbb{P}^1 \setminus \{0, 1, \infty\}$: the geometric step via resultants,**
With David Jarossay, David Lilienfeldt, Francesco Maria Saettone and Sa'ar Zehavi.
Preprint arxiv:2408.07400, code repository: `https://github.com/Ariel-Z-Weiss/polylog-chabauty-kim`.
Submitted.
2. **Five-dimensional compatible systems and the Tate conjecture for elliptic surfaces,**
With Lian Duan and Xiyuan Wang. Preprint arxiv:2406.03617.
Submitted.

3. **Maximal stable lattices in representations over discretely valued fields,**
With Amit Ophir. Preprint arxiv:2401.10183.
Submitted.

4. **On the Lang–Trotter conjecture for Siegel modular forms,**
With Arvind Kumar and Moni Kumari. Preprint arxiv:2201.09278.
Submitted.

Accepted publications

5. **Ranks of abelian varieties in cyclotomic twist families**.
With Ari Shnidman. Preprint arxiv:2107.06803. To appear in *Algebra and Number Theory.*

6. **On Ribet's Lemma for GL_2 modulo prime powers**.
With Amit Ophir. *Research in the Mathematical Sciences*, **11**, 9 (2024)

7. **Rank growth of elliptic curves over N-th root extensions**.
With Ari Shnidman. *Transactions of the AMS, Series B* 10 (2023), 482-506.

8. **Elements of prime order in Tate–Shafarevich groups of abelian varieties over $\mathbb{Q}$**.
With Ari Shnidman. *Forum of Mathematics, Sigma* 10 (2022): e98.

9. **Lafforgue pseudocharacters and parities of limits of Galois representations**.
With Tobias Berger, *manuscripta mathematica* **168**, 225-256 (2022).

10. **On the images of Galois representations attached to low weight Siegel modular forms**.
J. London Math. Soc., **106**: 358-387 (2022).

Teaching experience

The Ohio State University

- Autumn 2024, Math 3345, Foundations of Higher Mathematics (intro to proof, elementary number theory, elementary set theory), Instructor of Record
- Spring 2024, Math 3345, Foundations of Higher Mathematics, Instructor of Record
- Autumn 2023, Math 6111, Graduate Algebra. TA (two sections)

The University of Sheffield

- Spring 2019, MAS442/631, Galois Theory, Instructor of Record
- Spring 2019, MAS221, Analysis, TA
- Spring 2019, MAS114, Numbers and Groups II (introduction to group theory), TA
- Spring 2019, MAS140, Mathematics for Engineers II (linear algebra), TA
- Autumn 2018, MAS140, Mathematics for Engineers I (calculus), TA
- Autumn 2018, MAS220, Algebra (groups and rings), TA
- Autumn 2018, MAS114, Numbers and Groups I (elementary number theory), TA
- Autumn 2017, MAS220, Algebra, TA
- Autumn 2017, MAS114, Numbers and Groups I, TA (two sections)
- Spring 2017, MAS114, Numbers and Groups II, TA (two sections)
- Autumn 2016, MAS114, Numbers and Groups I, TA (two sections)
- Spring 2016, MAS111 Mathematics Core I (geometry, calculus, linear algebra), TA

Service and Outreach

Mentoring and undergraduate research

- *Ohio State Math Cycle, Fall* 2024–*Spring* 2025. I am supervising an OSU undergraduate student in a project on arithmetic statistics and elliptic curves.
- *Ohio State University, Summer* 2024–*present* I co-organise a directed reading group for two second year graduate students who are interested in number theory.
- *Hebrew University, Fall* 2022 I supervised a Masters student for a Semester while her faculty advisor was on Sabbatical.

Seminar organisation

- *OSU arithmetic statistics seminar.* I currently co-organise a learning seminar for graduate students on Bhargavology and arithmetic statistics.
- *BGU Chabauty–Kim seminar.* I organised a learning seminar on Chabauty–Kim theory for graduate students and postdocs at Hebrew University, Tel Aviv University and Ben-Gurion University. This seminar culminated in a publication, *Polylogarithmic motivic Chabauty–Kim for* $\mathbb{P}^1 \setminus \{0, 1, \infty\}$*: the geometric step via resultants.*
- *BGU number theory learning seminar.* I organised Ben-Gurion University's number theory learning seminar from 2021-2022.
- *Sheffield graduate seminar (ShEAF).* I co-founded and organised the ShEAF seminar a Sheffield, as a platform for graduate students to give expository talks on topics relating to their research in a friendly environment.
- *Sheffield number theory learning seminar.* I organised Sheffield's number theory learning seminar from 2016–2018.

Conference organisation

- *Young Researchers in Algebraic Number Theory (Y-RANT).* In November 2018, I co-founded and organised Y-RANT, the first young researchers' conference in algebraic number theory in the UK. The conference welcomed over 60 participants, and hosted keynote talks by Dr. Ana Caraiani and Prof. Minhyong Kim. The conference is now an annual event, taking place at a different university each year. I continue to serve in an advisory capacity, and assist with grant writing.

Committee participation

- *University of Sheffield postgraduate committee,* postgraduate representative from 2017–2019.
- *Sheffield undergraduate research.* In 2019 I was part of a committee to recruit postgraduate mentors for a Summer research program, and match them with undergraduate mentees.

Paper review

- I have refereed manuscripts for the following journals and conference proceedings:
  - Bulletin of the LMS
  - Journal of the Institute of Mathematics of Japan
  - Journal of Number Theory
  - LMFDB, Computation, and Number Theory
  - Research in Number Theory
- I am a reviewer for AMS Mathematical Reviews (MathSciNet)

High school education

- *Target Oxbridge,* Mentor. Since 2018, I have volunteered as a mentor for Target Oxbridge, an organisation that provides free application coaching for Black African and Caribbean students who are applying to the Universities of Oxford and Cambridge. So far, I have mentored 6 students through their applications to study mathematics and computer science.
- *Extra curricular mathematics classes*, Teaching Assistant. While in Sheffield, between 2015 and 2018, I assisted with mathematics classes for students in their last two years of secondary school. These classes focused on problem solving, learning new mathematics, and preparation for university entrance exams.

Adult education

- *Prison Mathematics Project,* Mentor. I mentor a student who is currently in prison. We correspond by email and mail, and I send him mathematics resources, provide feedback on his work, answer his questions about mathematics—in particular about mathematics research, and help make him feel part of the mathematics community.

Invited Talks

- University of Sheffield, Number theory seminar, November 2024 (upcoming)
- The Ohio State University, Number theory and algebraic geometry seminar, November 2023
- Day of Excellence in Mathematics, Ben Gurion University, Be'er Sheva, Israel, May 2023
- Annual meeting of the Israel Mathematical Union, Be'er Sheva, Israel, September 2022
- University of Bristol, Linfoot number theory seminar, June 2022
- One day symposium in Number Theory, Hebrew University, March 2022
- FRAGMENT seminar, Colorado State university, February 2022
- Hebrew University, Number theory and algebraic geometry seminar, December 2021
- Ben-Gurion University, Number theory and algebraic geometry seminar, November 2021
- The Ohio State University, Number theory and algebraic geometry seminar, October 2021
- Bar-Ilan University, Algebra Seminar, January 2021
- University of Luxembourg, Number theory seminar, December 2020
- University of Sheffield, Number theory seminar, November 2020
- The HUJI-BGU Workshop in Arithmetic, Be'er Sheva, Israel, December 2019
- Ben-Gurion University, Number theory and algebraic geometry seminar, December 2019
- p-adic modular forms and Galois representations, University of Sheffield, July 2019
- Bar-Ilan University, Algebra Seminar, January 2019
- Hebrew University, Number theory and algebraic geometry seminar, December 2018
- University of Warwick, Number theory seminar, October 2018
- Johns Hopkins University, Number theory seminar, September 2018
- CUNY Graduate Center, Collaborative number theory seminar, September 2018
- University of Sheffield, Number theory seminar, December 2017

Contributed talks

- Sixteenth Algorithmic Number Theory Symposium (ANTS XVI), MIT, July 2024
- 34th automorphic forms workshop, Utah/Online, March 2022
- Young Researchers in Algebraic Number Theory III, Bristol/Online, October 2021
- Explicit and computational approaches to Galois representations, Luxembourg, July 2018
- 32nd automorphic forms workshop, Tufts, MA, March 2018

Miscellaneous

- **Languages:** English (native), Hebrew (reading and conversational), French (reading)
- **Technical skills:** Python, Sage, Magma, web design (HTML, PHP, Javascript, JQuery, etc.)
- **Other employment:** Three Summers working as a software engineering intern at Metaswitch Networks