Steven Sivek

CONTACT INFORMATION

Huxley 623
Department of Mathematics
Imperial College London
180 Queen's Gate
London SW7 2AZ, UK

Email: s.sivek@imperial.ac.uk
WWW: www.ma.imperial.ac.uk/∼ssivek

RESEARCH INTERESTS

Low-dimensional topology, contact and symplectic geometry, Floer homology, gauge theory

EDUCATION

Ph.D. in Mathematics, Massachusetts Institute of Technology 6/2006–6/2011

- Thesis: Bordered Legendrian knots and sutured Legendrian invariants
- Advisor: Tomasz Mrowka

S.B. in Mathematics, Massachusetts Institute of Technology 9/2002–6/2006

S.B. in Computer Science, Massachusetts Institute of Technology 9/2002–6/2006

EMPLOYMENT

Reader, Department of Mathematics, Imperial College London 9/2022–present

Research Group Leader (tenured), Max Planck Institute for Mathematics 9/2022–8/2023

Senior Lecturer, Department of Mathematics, Imperial College London 9/2019–8/2022

Lecturer, Department of Mathematics, Imperial College London 8/2017–8/2019

Professurvertreter, Mathematical Institute, University of Bonn 10/2016–3/2017

Instructor / NSF Postdoctoral Fellow, Department of Mathematics, Princeton University 9/2013–7/2016

NSF Postdoctoral Fellow, Department of Mathematics, Harvard University 7/2012–8/2013

Postdoctoral Fellow, Department of Mathematics, Harvard University 7/2011–6/2012

VISITING POSITIONS

Max Planck Institute for Mathematics, Bonn 9/2016, 4/2017–7/2017

Chinese University of Hong Kong 6/2014

Simons Center for Geometry and Physics 5/2013

PUBLICATIONS

1. Torus knots, the A-polynomial, and $\mathrm{SL}(2,\mathbb{C})$ (with John A. Baldwin), arXiv:2405.19197, 21 pp.
2. Rational homology 3-spheres and $\mathrm{SL}(2,\mathbb{C})$ representations (with Sudipta Ghosh and Raphael Zentner), arXiv:2310.17965, 70 pp.
3. Small Heegaard genus and SU(2) (with John A. Baldwin), *Algebr. Geom. Topol*, to appear; arXiv:2309.09780, 19 pp.
4. Thurston norm and Euler classes of tight contact structures (with Mehdi Yazdi), *Bull. Lond. Math. Soc.* 55 (2023), no. 6, 2976–2990.
5. Zero-surgery characterizes infinitely many knots (with John A. Baldwin), *Math. Res. Lett.*, to appear; arXiv:2211.04280, 9 pp.
6. An instanton take on some knot detection results (with John A. Baldwin), *Frontiers in geometry and topology*, 99–116, Proc. Sympos. Pure Math. 109, Amer. Math. Soc., Providence, RI, 2024.
7. Characterizing slopes for 5_2 (with John A. Baldwin), *J. Lond. Math. Soc.* 109 (2024), no. 6, Paper no. e12951, 64 pp.
8. Floer homology and non-fibered knot detection (with John A. Baldwin), *Forum of Math. Pi*, to appear; arXiv:2208.03307, 65 pp.

9. Framed instanton homology and concordance, II (with John A. Baldwin), *Trans. Amer. Math. Soc.*, to appear; arXiv:2206.11531, 41 pp.
10. Floer homology and right-veering monodromy (with John A. Baldwin and Yi Ni), *J. Reine Angew. Math.*, to appear; arXiv:2204.04093, 29 pp.
11. Small Dehn surgery and $SU(2)$ (with John A. Baldwin, Zhenkun Li, and Fan Ye), *Geom. Topol.* 28 (2024), no. 4, 1891–1922.
12. Khovanov homology and the cinquefoil (with John A. Baldwin and Ying Hu), *J. Eur. Math. Soc.*, to appear; arXiv:2105.12102, 20 pp.
13. Instanton L-spaces and splicing (with John A. Baldwin), *Ann. Henri Lebesgue* 5 (2022), 1213–1233.
14. Instanton Floer homology of almost rational plumbings (with Antonio Alfieri, John A. Baldwin, and Irving Dai), *Geom. Topol.* 26 (2022), no. 5, 2237–2294.
15. Framed instanton homology and concordance (with John A. Baldwin), *J. Topology* 14 (2021), no. 4, 1113–1175.
16. Surgery obstructions and character varieties (with Raphael Zentner), *Trans. Amer. Math. Soc.* 375 (2022), no. 5, 3351–3380.
17. L-space knots are fibered and strongly quasipositive (with John A. Baldwin), *Gauge theory and low-dimensional topology: progress and interaction*, 81–94, Open Book Series 5, Math. Sci. Publ., Berkeley, CA, 2022.
18. Instantons and L-space surgeries (with John A. Baldwin), *J. Eur. Math. Soc.* 25 (2023), no. 10, 4033–4122.
19. A menagerie of $SU(2)$-cyclic 3-manifolds (with Raphael Zentner), *Int. Math. Res. Not.* 2022, no. 11, 8038–8085.
20. Khovanov homology detects the Hopf links (with John A. Baldwin and Yi Xie), *Math. Res. Lett.* 26 (2019), no. 5, 1281–1290.
21. Representations, sheaves, and Legendrian $(2, m)$ torus links (with Baptiste Chantraine and Lenhard Ng), *J. Lond. Math. Soc.* 100 (2019), no. 1, 41–82.
22. Khovanov homology detects the trefoils (with John A. Baldwin), *Duke Math. J.* 171 (2022), no. 4, 885–956.
23. $SU(2)$-cyclic surgeries and the pillowcase (with Raphael Zentner), *J. Differential Geom.* 121 (2022), no. 2, 101–185.
24. On the complexity of torus knot recognition (with John A. Baldwin), *Trans. Amer. Math. Soc.* 371 (2019), no. 6, 3831–3855.
25. Stein fillings and $SU(2)$ representations (with John A. Baldwin), *Geom. Topol.* 22 (2018), no. 7, 4307–4380.
26. On the equivalence of contact invariants in sutured Floer homology theories (with John A. Baldwin), *Geom. Topol.* 25 (2021), no. 3, 1087–1164.
27. The cardinality of the augmentation category of a Legendrian knot (with Lenhard Ng, Dan Rutherford, and Vivek Shende), *Math. Res. Lett.* 24 (2017), no. 6, 1845–1874.
28. Fillings of unit cotangent bundles (with Jeremy Van Horn-Morris), *Math. Ann.* 368 (2017), no. 3–4, 1063–1080.
29. Quasi-alternating links with small determinant (with Tye Lidman), *Math. Proc. Cambridge Philos. Soc.* 162 (2017), no. 2, 319–336.
30. Augmentations are sheaves (with Lenhard Ng, Dan Rutherford, Vivek Shende, and Eric Zaslow), *Geom. Topol.* 24 (2020), no. 5, 2149–2286.
31. Obstructions to Lagrangian concordance (with Christopher R. Cornwell and Lenhard Ng), *Algebr. Geom. Topol.* 16 (2016), no. 2, 797–824.

32. Contact structures and reducible surgeries (with Tye Lidman), *Compositio Math.* 152 (2016), no. 1, 152–186.
33. Instanton Floer homology and contact structures (with John A. Baldwin), *Selecta Math.* 22 (2016), no. 2, 939–978.
34. Invariants of Legendrian and transverse knots in monopole knot homology (with John A. Baldwin), *J. Symplectic Geom.* 16 (2018), no. 4, 959–1000.
35. A contact invariant in sutured monopole homology (with John A. Baldwin), *Forum of Math. Sigma* 4 (2016), e12, 82 pp.
36. Sutured ECH is a natural invariant (with Çağatay Kutluhan; appendix by C. H. Taubes), *Mem. Amer. Math. Soc.* 275 (2022), no. 1350, iii+136pp.
37. Naturality in sutured monopole and instanton homology (with John A. Baldwin), *J. Differential Geom.* 100 (2015), no. 3, 395–480.
38. Donaldson invariants of symplectic manifolds, *Int. Math. Res. Not.* 2015, no. 6, 1688–1716.
39. Monopole Floer homology and Legendrian knots, *Geom. Topol.* 16 (2012), no. 2, 751–779.
40. The contact homology of Legendrian knots with maximal Thurston-Bennequin invariant, *J. Symplectic Geom.* 11 (2013), no. 2, 167–178.
41. A bordered Chekanov-Eliashberg algebra, *J. Topology* 4 (2011), no. 1, 73–104.
42. On the $\mathcal{S}_n$-modules generated by partitions of a given shape (with Daniel Kane), *Electron. J. Combin.* 15 (2008), #R111.
43. Some plethysm results related to Foulkes' conjecture, *Electron. J. Combin.* 13 (2006), #R24.

PhD advising

- Angela Wu, "Obstructing Lagrangian concordance for closures of 3-braids" 2021
- Roberto Ladu, "Protocorks and monopole Floer homology" 2022
- Bruno Roso, "Seiberg–Witten Floer spectra and contact structures" 2022
- Laura Wakelin, "A hyperbolic perspective on the Dehn surgery characterisation problem" 2023
- Lucy Phillips In progress
- Maartje Wisse In progress
- Xander Povey In progress

Postdoctoral mentoring

- Sudipta Ghosh, Max Planck Institute for Mathematics 2022–23

Awards and honors

- Fellowship of the Higher Education Academy (FHEA) August 2019
- NSF grant DMS-1506157 ($159,464) 2015–2016
- NSF Mathematical Sciences Postdoctoral Research Fellowship (DMS-1204387) 2012–2015
- Charles and Jennifer Johnson Prize, MIT Department of Mathematics 2011
  Awarded for an outstanding publication by a graduate student
- NSF Graduate Research fellow 2006–2011
- National Defense Science and Engineering Graduate (NDSEG) fellow 2006–2009
- MIT Phi Beta Kappa 2006
- Rank 17–24, William Lowell Putnam Mathematics Exam 2005
  Honorable mention in 2002 and 2004
- Bronze medal, International Olympiad in Informatics 2001

Teaching

- Supervised 6 PhD mini-projects, 13 MSc projects, 2 bachelor theses, and 1 UROP (Imperial) — 2017–present
- Algebraic Curves (MATH60033/70033), Imperial College — Autumn 2023
- Involutions and branched covers in knot theory (3-hour minicourse), MPIM — October 2022
- Analysis 1 (MATH40002), Imperial College — Spring 2020, 2021, 2022
- Geometry 2: Algebraic Topology (MATH96033/97042/97151), Imperial College — Spring 2021
- The Geometry of Curves and Surfaces (M3P5), Imperial College — Autumn 2017
- Symplectic Geometry (V5D3, graduate), University of Bonn — Winter 2016–17
- Mapping Class Groups (S4D3, graduate seminar), University of Bonn — Winter 2016–17
- Linear Algebra (MAT202), Princeton University (two sections) — Spring 2016
- Calculus II (MAT104), Princeton University (co-course head) — Fall 2015
- Morse Theory (MAT983, junior seminar), Princeton University — Spring 2015
- Algebra I (MAT345), Princeton University — Fall 2014
- Contact 3-manifolds (3-week minicourse), Chinese University of Hong Kong — June 2014
- Multivariable Calculus (MAT201), Princeton University (co-course head) — Spring 2014
- Multivariable Calculus (MAT201), Princeton University — Fall 2013
- Contact Geometry in 3 Dimensions (Math 273, graduate), Harvard University — Spring 2012
- Linear Algebra (18.06), MIT (recitation instructor) — Fall 2009

Internal service

- Heilbronn Institute for Mathematical Research, London associate chair — September 2024–present
- White City research space committee — Summer 2024–present
- Academic Probations and Promotions Panel — January 2024–present
- Mental Health First Aid accreditation — November 2023–present
- Imperial "geometry selector" for LSGNT applications — 2021, 2024
- Chapman Fellowship selection panel (Pure section) — 2018, 2024
- Interview panel for Reader in Pure Mathematics — November 2020
- Interview panel for Lecturer / Senior Lecturer in Pure Mathematics — September 2023
- PhD milestone panels: Ananya Satoskar (KCL, 2024), Inés García-Redondo, Diego Artacho (2023)

External service

- Referee for Adv. Math., Ann. of Math., Ann. Henri Lebesgue, Compositio Math., Duke Math. J., Geom. Topol., IMRN, Invent. Math., J. Differential Geom., J. Eur. Math. Soc., J. Knot Theory Ramifications, J. Symplectic Geom., J. Topology, Mat. Proc. Cambridge Philos. Soc., Math. Res. Lett., Notices Amer. Math. Soc., Proc. Gökova Geom. Topol. Conf., Proc. Lond. Math. Soc., Quantum Topol., Quart. J. Math., Trans. Amer. Math. Soc.
- Reviewer for *Mathematical Reviews*
- Grant reviews for EPSRC (UK), Leverhulme Trust (UK), NSERC (Canada)
- Co-organizer, Gauge Theory Virtual — 2020–present
- External examiner for PhD theses:
  - Alexandru Cioba (UCL) — January 2018
  - Sungkyung Kang (Oxford) — March 2019
  - Fan Ye (Cambridge) — May 2022
- Mentor, Kylerec 2017 (graduate student workshop on symplectic fillings) — May 19–25, 2017

· Co-organizer, Princeton Low-Dimensional Topology Workshop 2015 — June 15–19, 2015

Invited talks

· Gauge Theory Virtual (online seminar) — September 6, 2024
· New structures in low-dimensional topology, Budapest — July 12, 2024
· Combinatorial and gauge theoretical methods in low dimensional topology and geometry, Pisa — June 5, 2024
· Gauge theory and low-dimensional topology, Miami — April 8, 2024
· Imperial College, Geometry and topology seminar — March 8, 2024
· Scottish Topology Seminar 25, University of Edinburgh — March 4, 2024
· Louisiana State University, Geometry and topology seminar (virtual) — February 7, 2024
· University of Vienna, Geometry and topology seminar — January 9, 2024
· King's College London, Geometry seminar — November 21, 2023
· University of Southampton, Topology seminar — October 27, 2023
· Gauge theory and topology: in celebration of Peter Kronheimer's 60th birthday, University of Oxford — July 24, 2023
· Universität zu Köln, Oberseminar Geometrie, Topologie, und Analysis — May 12, 2023
· Workshop on interactions of 3- and 4-dimensional topology, Beijing (virtual) — March 10, 2023
· Morphisms in low dimensions, Oberwolfach — January 24, 2023
· Knot Online Seminar — December 15, 2022
· Max Planck Institute for Mathematics, Topology seminar — December 12, 2022
· Floer homotopical methods in low dimensional and symplectic topology, MSRI — Nov. 14, 2022
· Symplectic Monday Seminar, IBS Center for Geometry and Physics (virtual) — May 16, 2022
· Braids in low-dimensional topology, ICERM — April 29, 2022
· Workshop on gauge theory, Miami — April 19, 2022
· Differential Geometry and Topology Seminar, University of Cambridge — March 2, 2022
· The Archimedeans (maths society), University of Cambridge (virtual) — February 18, 2022
· Geometry and topology seminar, CIRGET, Montreal (virtual) — December 3, 2021
· ECM mini-symposium on low-dimensional topology (virtual) — June 21, 2021
· Symplectix seminar, Institut Henri Poincaré / Nantes–Orsay (virtual) — June 18, 2021
· Universität Bonn, colloquium (virtual) — May 4, 2021
· British Mathematical Colloquium 2021 (virtual), workshop on topology — April 6, 2021
· AMS Spring Eastern Virtual Sectional Meeting, Special session on gauge theory, geometry, and low-dimensional topology — March 20–21, 2021
· FIM Lecture, ETH Zürich — October 16, 2020
· Nearly Carbon Neutral Geometric Topology 2020 (conference), `ncngt.org` — June 1–14, 2020
· Low-dimensional topology, University of Oxford — January 7, 2020
· Arbeitstagung on foliations and 3-manifolds, Universität Regensburg — October 25, 2019
· Pseudoholomorphic curves and gauge theory in low-dimensional topology (LMS Durham symposium), Durham University — August 23, 2019
· Frontiers in Floer homology, Boston College — July 29, 2019
· Institut Camille Jordan (Lyon), Séminaire Géométries — June 7, 2019
· California Institute of Technology, Geometry and topology seminar — April 17, 2019

- Symplectix seminar, Institut Henri Poincaré, Paris — February 8, 2019
- Clifford Lectures (conference), Tulane University — January 25, 2019
- Gauge Theory and Applications (conference), Regensburg, Germany — July 23, 2018
- Gauge Theory and Applications (summer school), 4-hour minicourse, Regensburg, Germany — July 17–20, 2018
- Université libre de Bruxelles, Geometry seminar — March 6, 2018
- University of Glasgow, Geometry and topology seminar — February 5, 2018
- Computation in geometric topology, University of Warwick — December 15, 2017
- Nantes-Orsay seminar on symplectic and contact geometry, Nantes — December 8, 2017
- Imperial College, Geometry and topology seminar — December 1, 2017
- University of Oxford, Topology seminar — November 27, 2017
- University of Cambridge, Differential geometry and topology seminar — November 15, 2017
- Universität Regensburg, LKS-Seminar — November 9, 2017
- Durham University, Pure maths colloquium — October 30, 2017
- Low dimensional topology and gauge theory, Casa Matemática Oaxaca — August 9, 2017
- Max Planck Institute for Mathematics, Mini-workshop on instantons (2 talks) — July 25, 2017
- Low dimensional topology on Skye, Isle of Skye, Scotland — June 16, 2017
- University at Buffalo, Geometry and topology seminar — May 12, 2017
- Berlin-Hamburg symplectic geometry seminar, HU Berlin — April 24, 2017
- Universität Heidelberg, Über-Seminar "Physikalische Mathematik" — February 13, 2017
- Workshop on contact and symplectic topology (CAST), Université de Nantes — January 28, 2017
- Universität München, Oberseminar Geometrie — December 13, 2016
- Universität Regensburg, Oberseminar Globale Analysis — November 9, 2016
- Max Planck Institute for Mathematics, Bonn, Topology seminar — October 24, 2016
- 12th William Rowan Hamilton Geometry & Topology Workshop, Hamilton Mathematics Institute, Trinity College Dublin — August 25, 2016
- Interactions of gauge theory with contact and symplectic topology in dimensions 3 and 4, Banff International Research Station — March 24, 2016
- University of Wisconsin, Colloquium — January 28, 2016
- University of Washington, Colloquium — January 25, 2016
- University of Toronto, Colloquium — January 21, 2016
- Michigan State University, Colloquium — January 18, 2016
- University of California, San Diego, Colloquium — January 12, 2016
- University of Illinois at Urbana-Champaign, Colloquium — January 11, 2016
- Boston College, Colloquium — December 17, 2015
- University of Texas at Austin, Geometry seminar — December 15, 2015
- University of Michigan, Geometry seminar — December 11, 2015
- University of Pennsylvania, Colloquium — December 9, 2015
- Rice University, Colloquium — December 8, 2015
- University of Minnesota, Colloquium — December 3, 2015
- University of Southern California, Colloquium — November 23, 2015

- University of Notre Dame, Colloquium — November 17, 2015
- AMS Fall Central Sectional Meeting, Special session on geometric perspectives in knot theory, Chicago, IL — October 3, 2015
- Rutgers University, Seminar on geometry, symmetry, and physics — September 24, 2015
- Columbia University, Symplectic Geometry, Gauge Theory, and Categorification Seminar — September 18, 2015
- Conference on "Geometry and topology of symplectic 4-manifolds", University of Massachusetts Amherst — April 24–26, 2015
- Brandeis University, Topology seminar — April 23, 2015
- AMS Spring Western Sectional Meeting, Special session on contact geometry and low-dimensional topology, Las Vegas, NV — April 18–19, 2015
- LA Topology Seminar (joint seminar for Caltech, UCLA, and USC), UCLA — April 6, 2015
- AMS Spring Eastern Sectional Meeting, Special session on geometric structures on low-dimensional manifolds and their invariants, Washington, DC — March 7–8, 2015
- Stony Brook University, Topology seminar — February 19, 2015
- Princeton University, Topology seminar — February 12, 2015
- Rutgers University, Geometric analysis seminar — February 3, 2015
- PATCH seminar (joint seminar for Bryn Mawr, Haverford, Penn, Temple) — November 21, 2014
- University of Texas at Austin, Geometry seminar — November 13, 2014
- University of Virginia, Geometry seminar — October 7, 2014
- Chinese University of Hong Kong (6-hour minicourse plus 3 research talks) — June 9–27, 2014
- AMS Spring Eastern Sectional Meeting, Special session on invariants in low-dimensional topology, Baltimore, MD — March 29–30, 2014
- Institute for Advanced Study, Princeton U./IAS Symplectic Geometry Seminar — March 5, 2014
- Harvard University, Gauge Theory and Topology Seminar — January 31, 2014
- Duke University, Duke–UNC Topology Seminar — December 3, 2013
- University at Buffalo, Geometry and Topology Seminar — November 1, 2013
- Princeton University, Topology Seminar — September 26, 2013
- Canadian Undergraduate Mathematics Conference, Montreal, plenary speaker — July 13, 2013
- Simons Center for Geometry and Physics, Topology Seminar — May 16, 2013
- University of Massachusetts Amherst, Geometry and Topology Seminar — February 26, 2013
- Louisiana State University, Topology Seminar — January 30, 2013
- AMS Fall Eastern Sectional Meeting, Special session on symplectic and contact topology, Rochester, NY — September 23, 2012
- CAST Summer School and Conference, Rényi Institute of Mathematics, Budapest, Hungary — July 9–20, 2012
- Gökova Geometry/Topology Conference, Gökova, Turkey — May 28–June 2, 2012
- 2012 Georgia Topology Conference — May 9–13, 2012
- Stony Brook University, Topology Seminar — May 3, 2012
- Boston College, Geometry/Topology Seminar — March 22, 2012
- Duke University, Geometry/Topology Seminar — February 27, 2012
- Columbia University, Symplectic Geometry, Gauge Theory, and Categorification Seminar — November 11, 2011

- Université de Montréal, Symplectic Topology Seminar — October 10, 2011
- LA Topology Seminar (joint seminar for Caltech, UCLA, and USC), California Institute of Technology — September 30, 2011
- UCLA, Topology Seminar — September 28, 2011
- Harvard University, Gauge Theory and Topology Seminar — September 23, 2011
- AMS Spring Southeastern Section Meeting, Special session on low dimensional topology and contact and symplectic geometry, Statesboro, GA — March 12, 2011
- University of Massachusetts Amherst, Geometry and Topology Seminar — March 1, 2011
- Harvard University, Gauge Theory and Topology Seminar — February 18, 2011

Conferences attended

- Symplectic geometry - celebrating the work of Simon Donaldson, Newton Institute, Cambridge — August 14–18, 2017
- Kylerec 2017: Symplectic fillings of contact manifolds, Truckee, CA — May 19–25, 2017
- Engel structures, American Institute of Mathematics, San Jose, CA — April 17–21, 2017
- Summer school on symplectic topology, sheaves and mirror symmetry, Institut de Mathématiques de Jussieu — June 27–July 8, 2016
- Perspectives in topology and geometry of 4-manifolds, Dubrovnik, Croatia — June 6–10, 2016
- Summer school on moduli problems in symplectic geometry, IHES — July 6–17, 2015
- Texas Geometry and Topology Conference, University of Texas at Austin — November 14–16, 2014
- Combinatorial link homology theories, braids, and contact geometry, ICERM, Providence, RI — August 4–8, 2014
- SQuaRE research group on "Sheaf theory and Legendrian knots", American Institute of Mathematics, Palo Alto, CA — April 21–25, 2014
- Low-dimensional topology after Floer, Université de Montréal — July 8–12, 2013
- Low dimensional topology, Simons Center for Geometry and Physics — May 20–24, 2013
- Mapping class groups and categorification, Banff International Research Station — April 7–12, 2013
- Contact and symplectic topology, Université de Nantes — June 14–18, 2011
- Interactions between contact symplectic topology and gauge theory in dimensions 3 and 4, Banff International Research Station — March 20–25, 2011
- Research workshop: Homology theories of knots and links, MSRI — March 15–19, 2010
- Introductory workshop: Homology theories of knots and links, MSRI — January 25–29, 2010
- Georgia International Topology Conference, University of Georgia — May 18–29, 2009
- Contact structures, dynamics and the Seiberg-Witten equations in dimension 3, MSRI — June 9–13, 2008
- Knot theory: Fifty years since Fox and Milnor, Brandeis University — June 2–5, 2008