

# Steven Sivek

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CONTACT INFORMATION	Huxley 623 Department of Mathematics Imperial College London 180 Queen's Gate London SW7 2AZ, UK	<i>Email:</i> s.sivek@imperial.ac.uk <i>WWW:</i> wwwf.imperial.ac.uk/~ssivek
RESEARCH INTERESTS	Low-dimensional topology, contact and symplectic geometry, Floer homology, gauge theory	
EDUCATION	<b>Ph.D. in Mathematics</b> , Massachusetts Institute of Technology • Thesis: Bordered Legendrian knots and sutured Legendrian invariants • Advisor: Tomasz Mrowka	6/2006–6/2011
	<b>S.B. in Mathematics</b> , Massachusetts Institute of Technology	9/2002–6/2006
	<b>S.B. in Computer Science</b> , Massachusetts Institute of Technology	9/2002–6/2006
EMPLOYMENT	<b>Senior Lecturer</b> , Department of Mathematics, Imperial College London <b>Lecturer</b> , Department of Mathematics, Imperial College London <b>Professurvertreter</b> , Mathematical Institute, University of Bonn <b>Instructor / NSF Postdoctoral Fellow</b> , Department of Mathematics, Princeton University <b>NSF Postdoctoral Fellow</b> , Department of Mathematics, Harvard University <b>Postdoctoral Fellow</b> , Department of Mathematics, Harvard University	9/2019–present 8/2017–8/2019 10/2016–3/2017 9/2013–7/2016 7/2012–8/2013 7/2011–6/2012
VISITING POSITIONS	Max Planck Institute for Mathematics, Bonn Chinese University of Hong Kong Simons Center for Geometry and Physics	9/2016, 4/2017–7/2017 6/2014 5/2013
PUBLICATIONS	<ol style="list-style-type: none"><li>1. Framed instanton homology and concordance (with John A. Baldwin), arXiv:2004.08699, 61 pp.</li><li>2. Surgery obstructions and character varieties (with Raphael Zentner), arXiv:1912.01866, 30 pp.</li><li>3. L-space knots are fibered and strongly quasipositive (with John A. Baldwin), arXiv:1911.01866, 12 pp.</li><li>4. Instantons and L-space surgeries (with John A. Baldwin), arXiv:1910.13374, 79 pp.</li><li>5. A menagerie of <math>SU(2)</math>-cyclic 3-manifolds (with Raphael Zentner), arXiv:1910.13270, 36 pp.</li><li>6. Khovanov homology detects the Hopf links (with John A. Baldwin and Yi Xie), <i>Math. Res. Lett.</i> 26 (2019), no. 5, 1281–1290.</li><li>7. Representations, sheaves, and Legendrian <math>(2, m)</math> torus links (with Baptiste Chantraine and Lenhard Ng), <i>J. Lond. Math. Soc.</i> 100 (2019), no. 1, 41–82.</li><li>8. Khovanov homology detects the trefoils (with John A. Baldwin), arXiv:1801.07634, 52 pp.</li><li>9. <math>SU(2)</math>-cyclic surgeries and the pillowcase (with Raphael Zentner), arXiv:1710.01957, 62 pp.</li><li>10. On the complexity of torus knot recognition (with John A. Baldwin), <i>Trans. Amer. Math. Soc.</i> 371 (2019), no. 6, 3831–3855.</li><li>11. Stein fillings and <math>SU(2)</math> representations (with John A. Baldwin), <i>Geom. Topol.</i> 22 (2018), no. 7, 4307–4380.</li></ol>	

12. On the equivalence of contact invariants in sutured Floer homology theories (with John A. Baldwin), *Geom. Topol.*, to appear; arXiv:1601.04973, 63 pp.
13. 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.
14. Fillings of unit cotangent bundles (with Jeremy Van Horn-Morris), *Math. Ann.* 368 (2017), no. 3–4, 1063–1080.
15. Quasi-alternating links with small determinant (with Tye Lidman), *Math. Proc. Cambridge Philos. Soc.* 162 (2017), no. 2, 319–336.
16. Augmentations are sheaves (with Lenhard Ng, Dan Rutherford, Vivek Shende, and Eric Zaslow), *Geom. Topol.*, to appear; arXiv:1502.04939, 109 pp.
17. Obstructions to Lagrangian concordance (with Christopher R. Cornwell and Lenhard Ng), *Algebr. Geom. Topol.* 16 (2016), no. 2, 797–824.
18. Contact structures and reducible surgeries (with Tye Lidman), *Compositio Math.* 152 (2016), no. 1, 152–186.
19. Instanton Floer homology and contact structures (with John A. Baldwin), *Selecta Math.* 22 (2016), no. 2, 939–978.
20. Invariants of Legendrian and transverse knots in monopole knot homology (with John A. Baldwin), *J. Symplectic Geom.* 16 (2018), no. 4, 959–1000.
21. A contact invariant in sutured monopole homology (with John A. Baldwin), *Forum of Math. Sigma* 4 (2016), e12, 82 pp.
22. Sutured ECH is a natural invariant (with Çağatay Kutluhan; appendix by C. H. Taubes), *Mem. Amer. Math. Soc.*, to appear; arXiv:1312.3600, 62 pp. + appendix.
23. Naturality in sutured monopole and instanton homology (with John A. Baldwin), *J. Differential Geom.* 100 (2015), no. 3, 395–480.
24. Donaldson invariants of symplectic manifolds, *Int. Math. Res. Not.* 2015, no. 6, 1688–1716.
25. Monopole Floer homology and Legendrian knots, *Geom. Topol.* 16 (2012), no. 2, 751–779.
26. The contact homology of Legendrian knots with maximal Thurston-Bennequin invariant, *J. Symplectic Geom.* 11 (2013), no. 2, 167–178.
27. A bordered Chekanov-Eliashberg algebra, *J. Topology* 4 (2011), no. 1, 73–104.
28. On the  $\mathcal{S}_n$ -modules generated by partitions of a given shape (with Daniel Kane), *Electron. J. Combin.* 15 (2008), #R111.
29. Some plethysm results related to Foulkes’ conjecture, *Electron. J. Combin.* 13 (2006), #R24.

AWARDS AND  
HONORS

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|--|-------------|
| · 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

- Analysis 1 (MATH40002), Imperial College Spring 2020
- 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

## INVITED TALKS

- Nearly Carbon Neutral Geometric Topology 2020 (conference), [ncngt.org](http://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

#### SERVICE

- Referee for Adv. Math., Ann. Henri Lebesgue, Compositio Math., Geom. Topol., IMRN, Invent. Math., J. Differential Geom., J. Eur. Math. Soc., J. Symplectic Geom., J. Topology, Mat. Proc. Cambridge Philos. Soc., Proc. Gökova Geom. Topol. Conf., Proc. Lond. Math. Soc., Quantum Topol., Quart. J. Math., Trans. Amer. Math. Soc.
- Reviewer for *Mathematical Reviews*
- Wrote Sage program (approx. 2500 lines) for computations in Legendrian contact homology, available publicly at <http://www.imperial.ac.uk/~ssivek/code/lch.sage>
- Co-organizer, Princeton Low-Dimensional Topology Workshop 2015 June 15–19, 2015
- Advisor, junior paper by Joane Joseph (Princeton) on Gröbner bases Spring 2015
- Mentor, Kylerec 2017 (graduate student workshop on symplectic fillings) May 19–25, 2017
- Supervised 6 MSc projects and 2 bachelor theses 2017–present
- Supervised UROP project for Andreas Swerdlow (2nd year undergraduate) Summer 2019
- External examiner for PhD thesis of Alexandru Cioba (UCL) January 2018
- External examiner for PhD thesis of Sungkyung Kang (Oxford) March 2019

#### MISCELLANEOUS

- Languages: Romanian, Spanish