

SILVIA DE TOFFOLI

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Updated: August 2019

I am a *Postdoctoral Research Associate* at the philosophy department of Princeton University.

AOS: Philosophy of Mathematics, Epistemology

AOC: Philosophy of Science, Logic, Philosophy and Literature

[EDUCATION]

PhD, philosophy, Stanford University (2019)

Dissertation: *Epistemic Roles of Mathematical Diagrams*

Committee: Thomas Ryckman (advisor), Michael Friedman, Marcus Giaquinto, Krista Lawlor

PhD Minor, philosophy, literature, and the arts (2019)

Advisor: R. Lanier Anderson

Thesis Summary

My thesis has three main aims. I first provide a general epistemological framework to make sense of mathematics as a human activity. I show that the norms governing doxastic mathematical justification enable us to achieve success notwithstanding our human fallibility. Second, I offer tools to individuate and analyze mathematical notations, paying special attention to diagrammatic notations. Third, using multiple case studies, I analyze the roles played by diagrams in contemporary mathematics. Contrary to traditional views that relegate diagrams to the context of discovery, I identify the features of diagrams that underwrite their ability to enter the inferential structure of proofs, and thus show that they in fact can play a justificative role.

MA, philosophy, Stanford University (2016)

PhD, mathematics, Technical University of Berlin, Germany (2013)

Dissertation: *Degrees of Essentiality for Secants of Knots*

Advisor: John M. Sullivan

MS, mathematics, University of Bologna, Italy (2009)

Thesis: *Different Flavors of the Poincaré Homology Sphere*

Advisors: Luca Migliorini (Bologna) and Patrick Popescu-Pampu (Paris 7)

Exchange student, University of Paris7-Denis Diderot, 2007-2008

BS, mathematics, University of Bologna, Italy (2006)

Thesis: *Il Gruppo Fondamentale di uno Spazio di Orbite (The Fundamental Group of an Orbit Space)*

Advisor: Mirella Manaresi

Exchange student, University of Calgary, Canada, 2004-2005

[PUBLICATIONS]

JOURNAL ARTICLES

“Chasing’ The Diagram – The Use of Visualizations in Algebraic Reasoning,” *The Review of Symbolic Logic*, Volume 10, Number 1, pp. 158-186, 2017.

*Nominated for inclusion in the *Philosopher’s Annual*, as one of the ten best philosophy papers published in 2017.

“Forms and Roles of Diagrams in Knot Theory” (with V. Giardino), *Erkenntnis*, Volume 79, pp. 829-842, 2014.

BOOKS SECTIONS

“Leopardi: ‘Everything is Evil’,” in: *Evil—A history*, Ed: A. P. Chignell. Oxford University Press, pp. 350-357, 2019.

“Envisioning Transformations – The Practice of Topology” (with V. Giardino), in: *Mathematical Cultures*, Ed: B. Larvor. Birkhäuser, pp. 25-50, 2016.

“An Inquiry into the Practice of Proving in Low-Dimensional Topology” (with V. Giardino), in: *From Logic to Practice*, Eds: G. Lolli, M. Panza, G. Venturi. *Boston Studies in the Philosophy and History of Science*, Volume 308, pp. 315-336, 2015.

EDITORIAL WORK

Special issue of *Endeavour* (with P. Findlen and G. Priest), 2018. With a co-authored introduction: “Tools of Reason: The Practice of Scientific Diagramming from Antiquity to the Present,” *Endeavour*, Volume 42 (2-3), pp. 49–59, 2018.

OTHERS

Degrees of Essentiality for Secants of Knots, Ph.D. Thesis, Universitätsbibliothek der Technischen Universität Berlin, 2013.

“Einführung in Meta-Vermeer: Experimentelle Studien über originale und manipulierte Bilder” (with Y. Sakamoto), in: *Das Licht im Zeitalter von Rembrandt und Vermeer*, Ein Handbuch der Forschungsgruppe Historische Lichtgefüge, pp. 50-53, Jovis, 2012.

“Meta-Vermeer: A Topological Reinterpretation of a Masterpiece” (with Y. Sakamoto), *Proceedings of Bridges 2012: Mathematics, Music, Art, Architecture, Culture*, pp. 499-502, 2012.

[Popular mathematics book] Silvia De Toffoli, Dario De Toffoli, Dario Zaccariotto [book, pp. 246]: *Numeri. Divagazioni, calcoli, giochi*. (introduction by Stefano Bartezzaghi), Stampa Alternativa, Viterbo, 2008. 2nd Edition (preface by Furio Honsell and introduction by Stefano Bartezzaghi), Kangourou editions, 2017.

WORK IN PROGRESS

- Mathematical Diagrams
- Mathematical Justification: A Fallibilist Account
- The Epistemological Subject of Mathematics
- Aspects of Diagrammatic Reasoning in Category Theory (with Isar Goyvaerts)
- Fruitful Over-Determination: the Case of Knot Diagrams
- Knots and Embeddings: New Tools for Incongruent Counterpart
- The Useful Myth of Logic – Nietzsche’s View of Logic from a Fictionalist Standpoint

[TEACHING]

AS INSTRUCTOR

Philosophy of Mathematics (with John Burgess), PHIL 314 Fall Semester 2019-2020, Princeton University

Philosophy of Mathematics, PHIL 162, MATH 162, (TA: Declan Thompson) Winter Quarter 2018, Stanford University

Introduction to Philosophy, PHIL 102, Fall Semester 2016, City College New York

Algebraic Topology, MA 512, Spring Semester 2014, Montana State University, Bozeman

AS TEACHING ASSISTANT

Philosophy and Literature, PHIL 81, (Instructors: R. Lanier Anderson and Joshua Landy) Winter Quarter 2017, Stanford University

Epistemology, PHIL 184, (Instructor: Eli Alshanetsky) Spring Quarter 2016, Stanford University

Introduction to Philosophy of Science, PHIL 60, (Instructor: Helen Longino) Winter Quarter 2016, Stanford University

Topology (Instructor: John Sullivan), Berlin Mathematical School Master course, Winter Semester 2010-11, Technical University of Berlin

[ORGANIZATION OF EVENTS]

UPCOMING

- With John Burgess: *The End of Philosophy of Mathematics?*, Conference at Princeton University (3-5 April 2020)
- *Association for the Philosophy of Mathematical Practice* symposium, 16th Congress of Logic, Methodology and Philosophy of Science and Technology, Prague (5-10 August 2019), <http://clmpst2019.flu.cas.cz>

PAST

- *Association for the Philosophy of Mathematical Practice* symposium, XXIV World Congress of Philosophy, Beijing (13-20 August 2018)
- With Rebecca Morris: [Mathematical Reasoning](#), Workshop at Stanford University (9-10 February 2018)
- *Varieties of Visualization in Mathematics*, Workshop as part of the Fourth International Meeting of the Association for the Philosophy of Mathematical Practice, Salvador, Brazil (23-27 October 2017)
- With Paula Findlen and Greg Priest: [Tools of Reason: The Practice of Scientific Diagramming from Antiquity to the Present](#), Workshop at Stanford University (10-11 February 2017)

[PROFESSION]

Organizing the **Princeton Philosophy of Mathematics Reading Group**: spring 2019-present

Referee for: *Dialectica*, *Erkenntnis*, *Journal of Humanistic Mathematics*, *Manuscrito*, *Synthese*, *Theoria*

PhilPapers Editor of the categories “Mathematical Practice” and “Visualization in Mathematics”

Member of the Directive Committee of the [Association for the Philosophy of Mathematical Practice](#) (APMP)

Organizing Committee Member: 5th International Meeting of the APMP, ETH, Zurich (18-21 January 2020)

Program Committee Member: [upcoming] *Diagrams 2020*, 11th International Conference on the Theory and Application of Diagrams, Philosophy Track, Tallin (24-28 August 2020)

Diagrams 2018, 10th International Conference on the Theory and Application of Diagrams, Philosophy Track, Edinburgh (18-22 June 2018)

Memberships: American Philosophical Association (APA), European Society for Analytic Philosophy (ESAP), Association for the Philosophy of Mathematical Practice (APMP), Italian Network for the Philosophy of Mathematics (FilMat), Italian Society of Analytic Philosophy (SIFA), Francophone Society for Analytic Philosophy (SOPHA)

[GRANTS AND AWARDS]

2019-2022: Postdoctoral Research Associate Fellowship, Princeton University

2017-2019: Ric Weiland Graduate Fellow in the Humanities & Sciences, Stanford University

2018 (spring): Visiting Scholar at Goethe University Frankfurt

2017 (fall): Visiting Scholar at University of Pennsylvania

2017 (spring): France-Stanford Visiting Student Researcher Fellowship (IHPST, Institute for History and Philosophy of Sciences and Technology), sponsor: Marco Panza, CNRS, Paris

2016 (fall): Visiting Scholar at Columbia University, sponsor: Achille Varzi

2016 (fall): CCNY-Stanford Exchange (to teach for a semester at City College New York, CUNY)

2015 (summer): Stanford language training for first year graduate students in Berlin, Germany

2013: Certificate of Distinction from the Berlin Mathematical School for the Ph.D. thesis "Degrees of essentiality for secants of knots"

2012-2013: Wissenschaftlicher Mitarbeiter (Research Fellow) of the research group Discretization in Geometry and Dynamics at the TU-Berlin

2007-2008: *Erasmus* scholarship, to study at Paris 7 University

2005-2006: Grant for academic achievements from the University of Bologna ("Incentivi studenti terzo anno, per merito")

2004-2005: TASSEP (Transatlantic Science Student Exchange Program) exchange support grant (student for one academic year at Calgary University, Canada)

[PRESENTATIONS]

UPCOMING

Fifth International Conference of the Association for the Philosophy of Mathematical Practice, ETH, Zurich (18-21 January 2020)

“A Fallibilist Account of Mathematical Justification”

Carnegie Mellon University, department colloquium (8 November 2019)

TBD

Rutgers University, Talk at the Proof Comprehension Research Group (1 November 2019)

TBD

PAST

16th Congress of Logic, Methodology and Philosophy of Science and Technology, Prague (5-10 August 2019)

“The Epistemic Basing Relation in Mathematics”

Masterclass in the Philosophy of Mathematical Practice, Vrije Universiteit Brussel (19-21 June 2019)

“Mathematical Justification in Practice”

Explanatory and Heuristic Power of Mathematics (invited paper), Roma La Sapienza (13-14 June 2019)

“Grasping How a Proof Supports its Conclusion”

Intersem Talk, organized by Mic Detlefsen, Paris 7, Sphere, (6 June, 2019)

“Rigorous Diagrammatic Proofs”

Big Proofs Workshop, International Centre for Mathematical Sciences—ICMS (invited paper), Edinburgh (26-31 May 2019)

“Diagrammatic Notations in Mathematical Proofs”

Macalester College, department colloquium (April 25, 2019)

“Mathematical Justification in Practice”

Pacific APA, Society for Realist-Antirealist Discussion, Vancouver (April 17-20, 2019)

“Proof, Simil-Proofs, and Mathematical Justification”

Mathematics in Action (invited paper), Henri Poincaré Archives, Nancy (13-14 December 2018)

“Mathematical Justification in Practice”

Association for the Philosophy of Mathematical Practice session, XXIV World Congress of Philosophy, Beijing (13-20 August 2018)

“What is a Mathematical Diagram”

XXIV World Congress of Philosophy, Beijing (13-20 August 2018)

“Fruitful Over-determination for Mathematical Notations”

Proofs and Representations Workshop (invited paper), Munich Center for Mathematical Philosophy (6-8 July 2018)

“Heterogenous Notations for Mathematical Proofs”

Diagrams 2018, 10th International Conference on the Theory and Application of Diagrams, Philosophy Track (18-22 June 2018)

“Fruitful Over-Determination in Knot Diagrams”

Stanford University, Psychology Department, Jay McClelland Laboratory (6 March 2018)

“Diagrams in Mathematics”

University of British Columbia, Okanagan campus, department colloquium (23 February 2018)

“Diagrams in Mathematical Practice”

Eastern APA, Society for Realist-Antirealist Discussion, Savannah (3-7 January 2018)

“Proofs and Diagrams in Mathematics”

Fourth International Conference of the Association for the Philosophy of Mathematical Practice, Varieties of Visualization Workshop, Salvador, Brazil (23-27 October 2017)

“Varieties of Mathematical Diagrams”

Visual Reasoning and Intuition in Mathematics. From Kant’s Euclidicity to Digitalization conference (invited paper), Free University of Berlin, (29 June-1 July 2017)

“Knots and Embeddings: New Tools for Incongruent Counterparts”

Logic in Question 7 conference (invited paper), Paris Sorbonne (13-14 June 2017)

“Thinking with Diagrams: The Case of Mathematics”

PhilMath seminar series (invited paper), IHPST, Paris (12 June 2017)

“Varieties of Mathematical Diagrams”

PROOFS workshop (invited paper), IHPST, Paris (1-2 June 2017)

“The Notion of Proof in the Practice of Mathematics”

Mathématiques en action seminar series, Archives Henri Poincaré, Nancy (24 April 2017)

“What is a Mathematical Diagram?”

Tools of Reason workshop, Stanford University (10-11 February 2017)

“Thinking with Diagrams: The Case of Mathematics”

Midwest PhilMath Workshop 17, Notre Dame University (12-13 November 2016)

“Thinking with Diagrams: The Case of Mathematics”

City College New York, department colloquium (22 September 2016)

“Aspects of Diagrammatic Reasoning in Mathematics”

Vrije Universiteit Brussel, colloquium (08 July 2016)

“Aspects of Diagrammatic Reasoning in Category Theory” (with I. Goyvaerts)

University of Udine, mathematics and computer science colloquium (29 June 2016)

“Pensare con i Diagrammi: il caso dei Nodi”

Five Years MCMP: Quo Vadis, Mathematical Philosophy? conference (invited paper), Munich Center for Mathematical Philosophy (2-4 June 2016)

“Varieties of Visualizations in Mathematics”

43rd philosophy of science conference in Dubrovnik (invited paper), Croatia (11-15 April 2016)

“Diagrams in Algebra”

Third International Conference of the Association for the Philosophy of Mathematical Practice (keynote speaker), Institut Henri Poincaré, Paris (2-4 November 2015)

“‘Chasing’ The Diagram – The Use of Visualizations in Algebraic Reasoning”

Proofs and Pictures conference, University of South Carolina, Columbia (20 March 2015)

“‘Diagram Chase’ Techniques – The Use of Space in Algebraic Reasoning”

What is? Seminar, Berlin Mathematical School (8 February 2013)

“What is a Rational Tangle?”

Filosofia della matematica: dalla logica alla pratica conference, Scuola Normale Superiore, Pisa, Italy (24-36 September 2012)

“La dinamica dei diagrammi in teoria dei nodi” (with V. Giardino)

Società Italiana di Filosofia Analitica (SIFA) conference, Alghero, Italy (13-15 September 2012)

“Roles and Forms of Diagrams in Knot Theory” (with V. Giardino)

Mathematical Cultures conference, London (10-13 September 2012)

“Low-dimensional topology as visual mathematics” (with V. Giardino)

Free University of Berlin, Sybille Krämer’s colloquium (19 June 2012)

“Die epistemische Rollen von Diagrammen in der Topologie”

Société de philosophie analytique (SOPHA) conference, École Normale Supérieure, Paris (5 May 2012)

“Diagrammes et Illustrations en Topologie: Le Cas des Nœuds”

Work in Progress Seminar, Munich Center of Mathematical Philosophy, Munich (19 January 2012)

“The Knot Moves: A Case Study on Diagram Dynamics”

University of Sevilla, philosophy colloquium (15 November 2011)

“Use and Epistemic Roles of Diagrams in Knot Theory”

What is? Seminar, Berlin Mathematical School (4 December 2009)

“What is a Seifert Surface?”

[GRADUATE COURSES]

FOR CREDIT AT STANFORD UNIVERSITY

- Proseminar (Mark Crimmins)
- Mathematical Logic (Thomas Icard)
- Nietzsche (R. Lanier Anderson)
- The Stoics on Freedom and Determinism (Alan Code)
- Philosophy of Mathematics (Tom Donaldson)
- Ethical Theory (Jorah Dannenberg)
- Montaigne (R. Lanier Anderson)
- Kant's *Critique of Pure Reason* (Graciela De Pierris)
- Teaching Methods in Philosophy x 2 (Blake Francis, Huw Duffy)
- Aesthetics (Kendall Walton)
- Wittgenstein (David Hills)
- Individual Work for Graduate Students x 2 (Tom Donaldson, Eli Alshanetsky)
- Philosophy of Mind (Eli Alshanetsky)
- Poetic Thinking Across Media (Amir Eshel and Lucy Alford)
- Philosophy of Language (Krista Lawlor)
- German Literature 3: Myth and Modernity (Amir Eshel)
- Philosophy, Literature, And the Arts, Core Seminar (Adrian Daub and David Hills)
- Seminar in Philosophy of Physics (Thomas Ryckman)
- Topics in Metaphysics and Epistemology (John Perry)
- Philosophical Issues in Quantum Mechanics (Thomas Ryckman)

AUDITED AT UNIVERSITY OF PENNSYLVANIA

- Normativity in Formal and Traditional Epistemology (Daniel Singer)
- Topics in Philosophy of Science: Values and Objectivity in Science (Michael Weisberg)

AUDITED AT PRINCETON UNIVERSITY

- Epistemology after the Modal Turn (Tom Kelly)
- Non-Classical Logics (John Burgess)

SUMMER SCHOOLS

- 3rd Urbino Summer School in Epistemology (August 2019), with Jessica Brown, Hilary Kornblith, and Ernest Sosa

[LANGUAGES]

- Italian: mother tongue
- English: excellent
- French: fluent
- German: fluent
- Spanish: beginner

[REFERENCES]

RESEARCH

Thomas Ryckman, Stanford University, tryckman@stanford.edu

Marcus Giaquinto, University College London, m.giaquinto@ucl.ac.uk

Paolo Mancosu, UC Berkeley, mancosu@socrates.berkeley.edu

Krista Lawlor, Stanford University, klawlor@stanford.edu

Michael Friedman, Stanford University, mlfriedm@stanford.edu

John Sullivan, Technical University of Berlin, sullivan@math.tu-berlin.de [mathematics]

TEACHING

Helen Longino, Stanford University, hlongino@stanford.edu

R. Lanier Anderson, Stanford University, lanier@stanford.edu