Filippos Ilarion Sytilidis

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Mathematical Institute

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Research Interests

I am broadly interested in algebraic and geometric topology, higher category theory, and the singularity theory of smooth mappings. Specifically, I enjoy thinking about bordism categories, (higher) Morse–Cerf theory, and topological quantum field theory.

Education

University of Oxford

PhD in Mathematics (expected graduation: 2025)
Thesis title: *On presentations of bordism bicategories*
Advisors: Christopher Douglas and Bruce Bartlett

Harvard College

BA in Mathematics and Physics, *magna cum laude* (2020)
Undergraduate thesis: *On Kontsevich's characteristic classes*, Highest Honors
Advisor: Peter Kronheimer

Extended Research Visits

- Stellenbosch University, South Africa (September - October 2023)
  Visiting Bruce Bartlett

Awards, grants and scholarships

- College Special Grant, St John's College - Oxford (2023)
  Awarded for a research visit in Stellenbosch University, South Africa
- Ioan and Rosemary James Scholarship, St John's College - Oxford (2020)
- David Mumford Undergraduate Mathematics Prize, Harvard (2020)
  Given annually to the most promising senior concentrator in mathematics, provided such concentrator is outstanding.
- Herchel Smith Postgraduate Fellowship (declined to begin DPhil), Harvard - Cambridge (2020)
- Certification of Distinction and Excellence in Teaching, The Derek Bok Center for Teaching and Learning at Harvard University (2019)
- Detur Book Prize, Harvard (2018)
  Recognizes sophomores who attained very high academic standing.
- John Harvard Scholar (2018)
  Recognizes sophomores in the top 5% *of their class.*

[1] Updated October 30, 2024

- Greek National Mathematical Olympiad
  Gold medal (2013), Silver medals (2014, 2016)
- Junior Balkan Mathematical Olympiad (2013)
  Honorable mention
- Greek National Physics Olympiad (2014)
  Third place

Preprints and Publications

In preparation

1. **Elementary Cerf paths and homotopies**. Draft available upon request.
2. **Surgery presentations of bordism** $(2,1)$**-categories**. Draft available upon request.
3. **Skeletal presentations of symmetric monoidal bicategories**
4. **Towards a skeletal presentation of the 3-dimensional bordism bicategory**

Invited Seminar Talks

1. *Presentations of bordism categories.* Junior Topology and Group Theory Seminar, University of Oxford, November 2024.
2. *A roadmap to graph homology through finite type invariants.* Junior Topology and Group Theory Seminar, University of Oxford, April 2021.

Contributed Talks

1. *Presentations of bordism categories via surgery.* Thematic Program in Field Theory and Topology graduate student micro-talk, University of Notre Dame, June 2024.

Topology Advanced Class, Oxford

1. *Kontsevich's configuration space integrals and formality of the little n-disks operad*, March 2024
2. *A (pre)history of rational homotopy theory*, January 2024
3. *Bordisms and cospans*, May 2023
4. *Non-semisimple TQFTs and mapping class group representations*, December 2022
5. $2+1$ *TQFTs extending the renormalized Lyubashenko invariant*, November 2022
6. *Uniqueness of rational CFT with given algebra of open states*, June 2022
7. *K-theory from supersymmetric Euclidean field theories*, February 2022
8. *The differential cohomology hexagon*, October 2021
9. *An introduction to δ-rings*, October 2021
10. *Spanier–Whitehead duality for orbispectra*, May 2021
11. *Solid modules*, February 2021
12. *The Snaith splitting theorem*, October 2020

Kan Seminar, MIT

1. $\pi_*(MU)$ *and Quillen's Theorem*, November 2019
2. *Brown's representability theorem*, October 2019
3. *Steenrod's realization problem and the unoriented cobordism ring*, September 2019

Teaching Experience

NITheCS Mini-schools

Morse–Cerf theory and pseudoisotopy (September-October 2023):
Designed and taught a 6-week mini course for the National Institute for Theoretical and Computational Sciences (NITheCS) in South Africa during my research visit at Stellenbosch University. The course material and video recordings are available at math.sun.ac.za/bbartlett/cerf/.

Mathematical Institute, University of Oxford

- Class Tutor (2021 - 2024):
  Algebraic topology, Topology and groups, Advanced quantum mechanics, Homological algebra
- Teaching Assistant (2020 - 2022):
  Category theory, Topology and groups

Harvard

- Course Assistant (2017 - 2020):
  Math 1b (Calculus II), Math 131 (Topological spaces - First semester undergraduate topology course), Math 231br (Advanced Algebraic Topology - Second semester graduate algebraic topology course)

Mentoring

Undergraduate summer projects

- Tudor-Ioan Caba (then third year undergraduate at Oxford), learning project on 2-*Morse theory* (2022)
- Susan Rutter (then third year undergraduate at Imperial), learning project on *complex cobordism* (2021)

Organization

Workshops

- Organizer of the *European Talbot Workshop*, (2025)
- Organizer of the *European Talbot Workshop: Operads in deformation theory and homotopical algebra, mentored by Geoffroy Horel and Bruno Vallette*, Schleiden, Germany (2024)

Seminars

- Organizer of the *Oxford Topology Advanced Class: Rational homotopy theory and the formality of the little n-disks operad* (Spring 2024)
- Organizer of a graduate reading seminar on *Khovanov homology*, Oxford (Fall 2023)

Selected Workshop and Conference Participation

- *Thematic Program in Field Theory and Topology*, University of Notre Dame, US (June 2024)
- *Higher Structures in Functorial Field Theory*, University of Regensburg, Germany (August 2023)
- *LMS Research School: Bicategories, Categorification and Quantum Theory*, University of Leeds, UK (July 2022)
- *Spring School on Field Theories and Algebraic Topology*, Utrecht, Netherlands (May 2022)

Outreach

- Volunteer, Oxford Maths Festival (August 2023)
  Staffed a crafts session on mathematical origami.
- Tutor in Number Theory, UNIQ Summer School (June 2023)
  University of Oxford's access program for UK state school students
- Guest lecturer, *Introduction to Knot Theory*, PROMYS Europe (2022)
- Lecturer, Mandoulides Schools Mathematics Week (September 2015, 2017, 2020, 2021)
  Mathematics outreach program for high-school students in Greece. Delivered lectures on Euclidean geometry and knot theory.
- Student leader, Harvard Summit for Young Leaders in China (August 2019)
  Annual conference for Chinese high school students organized by the Harvard Association for US-China Relations (HAUSCR). Delivered three week-long workshops on knot theory geared towards high school students of different levels.