# Tristan Ozuch(-Meersseman)


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## Main research interests

Geometric analysis, Einstein manifolds, Ricci Flows, 4-dimensional geometry and topology, applications to Physics.

## Employment

- | **Assistant Professor**, *Rockwell International Career Development Professorship*, 2025–2028.
2023 | Massachusetts Institute of Technology, Cambridge, MA

2023 | **C.L.E. Moore Instructor**
2020 | Massachusetts Institute of Technology, Cambridge, MA

## Education

2020 | **PhD in Mathematics at** ENS, Paris, France
2017 | Advisor : Olivier Biquard,
Subject : *Completion of the moduli space of Einstein 4-manifolds.*

2017 | **Graduated** from École Normale Supérieure (ENS), Paris, France

## Grants and awards

2025–2028 **Rockwell International Career Development Professorship**, MIT.
2024-2027 **NSF Grant: Geometric Analysis**, NSF DMS-2405328 – $200.000.
2024 **MIT Research Support Committee**, NEC corporation Fund – $90.000.
2021 **Young researcher fellowship at the Cluster of excellence**, Münster University.
2014-2019 **Travel grant FSMP and ENS**. 4 semester-long visits to American universities.
2017-2020 **PhD grant for graduate studies from ENS Ulm**.
2013-2017 **Grant for Undergraduate studies ENS Ulm**. 40 granted per year nationally.

## Teaching

- | **Assistant Professor**, MIT, Cambridge, MA, USA
Spring 2026 | Course-head: **Differential equations** (18.03). 300 students from diverse departments.
Spring 2025 | Course-head: **Seminar in Analysis** (18.104). 16 undergraduate and theses on optimal transport.
Fall 2024 | Course-head: **Geometry of Manifolds I** (18.965), 30 undergraduate and graduate students.
2023 | Fall 2023 | Course-head: **Linear Algebra** (18.06), 260 students from diverse departments.

2023 | **C.L.E. Moore Instructor**, MIT, Cambridge, MA, USA
Spring 2023 | Course-head: **Differential Equations with theory** (18.032).
Spring 2022 | *Undergraduate class aimed at mathematics majors, 25 students*
Spring 2021 | *Redefined the syllabus and wrote my own lecture notes*
*In charge of a TA for recitations and a grader*

Fall 2022 | Course-head: **Seminar in Analysis** (18.104).
Fall 2021 | *Undergraduate class on scientific writing and public presentations, 20 students*
*Chose the topic of* **'Optimal Transport, Theory and Applications'**
*Supervised 8 theses in CS, 4 in pure maths , 3 in econ, 1 in scientific writing*
2020 | Fall 2020 | Teaching assistant: **Multivariable Calculus** (18.02).
*Undergraduate class for all science majors*
*Led recitations for 60 students (300 total in the class)*

2020 | **Teaching assistant**, ENS, Paris, France

2017 | 2020 | Course-head: **Mathematics for Humanities** (in French).
2019 | *Designed a curriculum from scratch on topics in pure and applied mathematics*
2018 | *Introductory lectures on scientific reasoning, geometry, number theory, machine learning, game theory*

2020 | Coorganizer and jury of the **undergraduate theses in mathematics** at ENS.
2019 | *Reached out to professors in the math department to create 20 thesis topics*
2018 | *Put together a jury and evaluation grid, acted as like between thesis supervisors and students*

## Publications and preprints

2026 *Non self-similar solutions to the Ricci flow coming out of cones* (with A. Deruelle and F. Schulze), in preparation (final draft available upon request; expected submission Jan 2026).

2025 *Regularity of Einstein 5-manifolds via 4-dimensional gap theorems* (with Y. Huang), arXiv:2512.21317.

2025 *Linear stability and instability of Kähler Ricci solitons* (with K. Naff), arXiv:2511.15885.

2025 *Ricci flow on ALF manifolds* (with D. Kim), arXiv:2510.21997 [math.DG].

2025 *Linear stability of the blowdown Ricci shrinker in 4D* (with K. Naff), arXiv:2509.05470 [math.DG].

2024 *Orbifold singularity formation along ancient and immortal Ricci flows* (with A. Deruelle), arXiv:2410.16075 [math.DG].

2024 *Ancient and expanding spin ALE Ricci flows* (with I. M. Lopez), **J. Funct. Anal. 289** (2025), Article 111062.

2023 *Instability of conformally Kähler, Einstein metrics* (with O. Biquard), to appear in **J. Diff. Geom.**

2022 *The spinorial energy for asymptotically Euclidean Ricci flow* (with J. Baldauf), **Adv. Nonlinear Stud. 23** (2023), Article 20220045.

2022 *Families of degenerating Poincaré–Einstein metrics on* $\mathbf{R}^4$ (with C. A. Alvarado and D. A. Santiago), **Ann. Global Anal. Geom. 65** (2024), Article 5.

2022 *Spinors and mass on weighted manifolds* (with J. Baldauf), **Commun. Math. Phys. 394** (2022), 1153–1172.

2021 *Integrability of Einstein deformations and desingularizations*, **Commun. Pure Appl. Math. 77** (2024), 177–220.

2021 *Dynamical (in)stability of Ricci-flat ALE metrics along Ricci flow* (with A. Deruelle), **Calc. Var. Partial Differ. Equ. 62** (2023), Article 84.

2021 *Depth separation beyond radial functions* (with L. Venturi, S. Jelassi and J. Bruna), **J. Mach. Learn. Res. 23** (2022), 1–56.

2020 *Higher order obstructions to the desingularization of Einstein metrics*, **Camb. J. Math. 9** (2021), no. 4, 901–976.

2020 *Completion of the Moduli Space of Einstein 4-manifolds*, **École Normale Supérieure (Paris)**, 2020.

2020 *A ojasiewicz inequality for ALE metrics* (with A. Deruelle), arXiv:2007.09937 [math.DG]; to appear in **Ann. Sc. Norm. Super. Pisa Cl. Sci.**

2019 *Noncollapsed degeneration of Einstein 4-manifolds II*, **Geom. Topol. 26** (2022), 1529–1634.

2019 *Noncollapsed degeneration of Einstein 4-manifolds I*, **Geom. Topol. 26** (2022), 1483–1528.

2019 *Perelman's functionals on cones*, **J. Geom. Anal. 30** (2020), 1–53.

2019 *How large isotopy is needed to connect homotopic diffeomorphisms (of* $\mathbf{T}^2$*)* (with D. Burago and J. Lu), **J. Topol. Anal. 12** (2020), no. 4, 1213–1222.

## Referee service

Journal of Differential Geometry, GAFA, Crelle's journal, Annales de l'École Normale Supérieure, Journal of Geometric analysis, Revista Mathematica Iberoamericana, Mathematische Zeitschrift, Mathematische Annalen, American Journal of math, Calc. Var. PDE, Pacific J. Math., SIGMA, Proceedings AMS, Transactions

AMS, Mathematical Reviews, zbMATH Open.

## List of students mentored

### Graduate students

| | |
|---|---|
| - | Joseph Bonavia, MIT (co-advised with T. Cohen, A. Goriely, D. Parks) |
| Jan. 2025 | . |
| - | Yiqi Huang, MIT (co-advised with T. Colding) |
| Sept. 2024 | *Regularity of Einstein 5-manifolds* (one upcoming paper in common). |
| - | Cosmin Manea, MIT (co-advised with T. Colding) |
| Sept. 2024 | . |
| - | Benjy Firester, MIT (co-advised with T. Collins and T. Colding) |
| Sept. 2023 | . |
| - | Dain Kim, MIT (co-advised with B. Minicozzi) |
| Sept. 2023 | *Ricci flow on ALF metrics* (one published paper in common). |
| Sept. 2023 | Julius Baldauf, MIT (co-advised with B. Minicozzi) |
| Sept. 2020 | *Ricci flows and spin geometry* (two published paper in common, one on his own). |

### Undergraduate students

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|---|---|
| Fall 2025 | Junhwi Bae, MIT (UROP) |
| Summer 2025 | Katie Hall, William Ewald, Junhwi Bae, MIT (UROP) |
| Spring 2025 | Katie Hall, William Ewald, Isaac Lopez, Junhwi Bae, MIT (UROP) |
| Fall 2024 | Katie Hall, William Ewald, Isaac Lopez, Junhwi Bae, MIT (UROP) |
| Summer 2024 | Katie Hall, William Ewald, MIT (UROP) |
| Spring 2024 | Isaac Lopez, MIT (UROP) |
| Fall 2023 | Isaac Lopez, MIT (UROP) |
| Summer 2023 | Daniel Santiago & Isaac Lopez, MIT (SPUR+) |
| Summer 2023 | Enrique Rivera, MIT (UROP) |
| Summer 2021 | Carlos Alvarado & Daniel Santiago, MIT (UROP) |
| Spring 2021 | Carlos Alvarado & Daniel Santiago, MIT (UROP). |
| May 2022 | Zachary Hunsucker, MIT (UROP) |
| December 2021 | *Schrödinger bridges along Ricci flow and quantum optimal transport.* |
| June 2019 | Raphaël Barboni, Haohao Liu & Martin Malvy, ENS (bachelor thesis) |
| February 2019 | *Level set methods for mean curvature flow.* |

## Committee

### Graduate theses committees

Julius Baldauf (2024), Tang-Kai Lee (2025), Xinrui Zhao (2025).

## Research visits

August 2021 – July 2021 **Young Research Fellow at University of Münster**
*Invited by* : Hans-Joachim Hein
Studied toric Einstein metrics.

December 2019 – September 2019 **Graduate Visiting Student at Courant institute**
*Advisor* : Bruce Kleiner
Desingularization of Einstein manifolds and Ricci flows.

July 2017 – February 2017 **Research Internship at Northwestern University**
*Advisor* : Aaron Naber
Study of the degeneration of Einstein 4-manifolds.

February 2017 **Research internship at ENS**

September 2016 — *Advisor* : Olivier BIQUARD
Study of the desingularization of Einstein orbifolds and obstructions

July 2016 — **Research Internship at UC Berkeley/MSRI**
February 2016 — *Advisor* : Richard BAMLER

July 2015 — **Research Internship at Penn. State University**
February 2015 — *Advisor* : Dmitri BURAGO

## SEMINARS AND CONFERENCES

### AS AN INVITED SPEAKER :

Fall 2026 — **PDE and Differential Geometry Seminar** , University of Connecticut
March 2026 — **CMSA Differential Geometry and Physics Seminar**, Harvard University
January 2026 — **Einstein 4-Manifolds and Gravitational Instantons**, Simons center
December 2025 — **Geometry seminar**, IST Lisbon.
June 2025 — **Master Class series**, Université de Nantes
May 2025 — **Geometric Analysis Seminar**, University of Chicago.
April 2025 — **Workshop on Canonical Metrics in Differential Geometry**, University of Wisconsin Madison.
April 2025 — **Geometry/Topology Seminar**, Stony Brook University.
January 2025 — **Théorie spectrale et géométrie**, Institut Fourier, Grenoble
January 2025 — **Séminaire d'Analyse et Géométrie**, Jussieu, Paris
January 2025 — **Journées parisiennes d'analyse géométrique**, Université Gustave Eiffel
November 2024 — **Curvature and Geometric Analysis in Rome**, Sapienza Univ. di Roma.
October 2024 — **Geometry seminar**, Michigan State University
May 2024 — **Caltech Geometry & Topology Seminar**, Caltech.
May 2024 — **Workshop on Analysis of Geometric Singularities**, CRM in Montréal.
April 2024 — **Math department Seminar**, Fordham University.
April 2024 — **Geometry/Topology Seminar**, Stony Brook University.
March 2024 — **Joint Princeton-Rutgers Geometric PDEs Seminar**.
March 2024 — **Geometry and Topology Seminar**, University of Wisconsin Madison.
February 2024 — **Geometry Seminar**, Stanford University.
February 2024 — **Lehigh Geometry Seminar**, Lehigh University.
February 2024 — **Analysis, Geometry and Topology of PSC Metrics**, Oberwolfach.
February 2024 — **Differential Geometry Seminar**, UC Berkeley.
December 2023 — **Séminaire d'analyse**, Toulouse, France.
November 2023 — **Recent advances in geometric analysis**, CIRM, Marseilles.
December 2023 — **Geometric PDE**, Canadian Math society, Winter meeting, Montréal.
October 2023 — **Analysis seminar**, Columbia university.
September 2023 — **BU Geometry and Physics Seminar**, Boston.
July 2023 — **Analysis, Geometry and Topology of PSC Metrics**, Oberwolfach.
August 2023 — **Analytic Methods in Complex Geometry**, University of Münster.
August 2023 — **Workshop On curvature and global shape**, University of Münster.
July 2023 — **Differentialgeometrie im Grossen**, Oberwolfach.
July 2023 — **Conf. on Einstein spaces and special geometry**, Inst. Mittag-Leffler.

April 2023 **Geometric analysis Seminar** , Rutgers University

April 2023 **PDE and Differential Geometry Seminar** , University of Connecticut

March 2023 **Conference on Geometric Analysis**, Regensburg

March 2023 **Ricci flow and related topics** , Warwick

January 2023 **Colloquium of mathematics**, University of Notre Dame

January 2023 **Colloquium of mathematics**, UC Davis

January 2023 **Pure math seminar**, MIT

December 2022 **Colloquium of mathematics**, Lehigh University

November 2022 **Differential Geometry seminar**, UC Berkeley.

November 2022 **Geometry/Topology seminar**, Stony Brook University.

June 2022 **Canadian Mathematical Society Meeting**, Newfoundland.

May 2022 **CMSA workshop**, Harvard University.

April 2022 **Metric measure spaces and convergence**, University of Mexico.

April 2022 **Geom. & Top. seminar**, Univ. of Science and Technology of China.

April 2022 **KIT Geometric Analysis Seminar**, KIT.

February 2022 **Cornell Analysis and Geometric analysis seminar**, Cornell University.

February 2022 **BOWL Seminar**, Brussels, Oxford, Warwick, London.

October 2021 **Geometric analysis seminar**, UCL.

October 2021 **Séminaire d'analyse**, Université de Toulouse.

October 2021 **Geometry Topology Dynamical Systems Seminar**, UT Dallas.

October 2021 **Geometric analysis seminar**, MIT.

September 2021 **Geometric analysis seminar**, Yale University.

August 2021 **Workshop on Curvature and Global Shape**, University of Münster.

July 2021 **International Conference**, Princeton University - Shanghai Jiaotong.

July 2021 **Curvature constraints and spaces of metrics**, Institut Fourier.

May 2021 **Simons Collaboration on Special Holonomy.** Simons center.

March 2021 **Geometric Analysis Seminar**, University of Chicago.

March 2021 **Differential Geometry & Geometric Analysis Seminar**, Princeton Univ.

November 2020 **Seminar: Cheeger-Colding theory, Ricci flow, Einstein metrics**, UCSD.

November 2020 **Stanford's Geometry seminar**, Stanford University.

November 2020 **BOWL Seminar**, Brussels, Oxford, Warwick, London.

June 2020 **Oberseminar of Differential Geometry**, Münster.

February 2020 **Séminaire Darboux**, Montpellier.

December 2019 **Differential Geometry Seminar**, UC Berkeley.

November 2019 **Geometric Analysis and Topology Seminar**, Courant institute, NYU.

October 2019 **Geometry/Topology Seminar**, Stony Brook University.

May 2019 **Convergence and Low Regularity in General Relativity**, Simons Center.

March 2019 **Geometry seminar**, Bruxelles.

February 2019 **Geometry seminar**, Nantes.

March 2018 **Masters-PhD meeting**, Jussieu.

February 2018 **Geometry seminar of IMJ**, Paris Diderot.

January 2018 **Graduate students seminar**, ENS.

April 2016 **Graduate student seminar**, MSRI, Berkeley.

As a participant :

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| September 2022 | **Special Holonomy: Progress and Open Problems 2022**<br>Simons Center, Stony Brook University |
| September 2022 | **Sixth Annual Meeting: collaboration on special holonomy**<br>Simons Foundation, NYC |
| June 2022 | **Simons collaboration meeting**<br>University of Freiburg |
| May 2021 | **Atelier sur la Géométrie différentielle et l'analyse globale**<br>UQAM |
| October 2019 | **Recent advances in nonlinear problems Symposium**<br>Graduate Center, CUNY |
| May 2019 | **Master class in differential geometry : the structure of limit spaces**<br>Institut Henri Poincaré, Paris |
| December 2018 | **Geometric analysis at IHP**<br>Institut Henri Poincaré, Paris |
| 27 July 2018<br>23 July 2018 | **McGill University Geometric Analysis Workshop 2018**<br>McGill University, Montréal |
| 1 June, 2018<br>28 May, 2018 | **Geometric Analysis**<br>ICMS, Edimburgh |
| 16 February 2018 | **Géométrie : échanges et perspectives**<br>Institut Henri Poincaré, Paris |
| 9 December 2017<br>6 December 2017 | **Riemannian Geometry Past, Present and Future: an homage to Marcel Berger**, IHES, Bures-sur-Yvette |
| 13 October 2017<br>9 October 2017 | **Conference - Geometric Analysis at Roscoff**,<br>Centre Henri Lebesgue, Roscoff |
| 21 July 2017<br>10 July 2017 | **Summer school in Geometric Analysis**,<br>The Fields institute, Toronto<br>"Ricci flow and intrinsic flat convergence" research team. |
| July 2016<br>February 2016 | **Differential geometry semester at MSRI**,<br>MSRI, Berkeley |

## Other Skills

**Languages** French : Native speaker.
English : Fluent.
Italian : Good command.

**Activities** Swimming, running, whittling.