

# Sergio Zamora

Max Planck Institute for Mathematics  
zamora@mpim-bonn.mpg.de

## CURRENT RESEARCH INTERESTS

---

Metric Geometry, Differential Geometry, Geometric Group Theory, Stochastic Processes, Representation Theory, Geometric Topology, Arithmetic Combinatorics

## EDUCATION

---

### PhD in mathematics

2016-2022

Mathematics Department. Penn State University

Dissertation: [Geodesic spaces with large discrete groups of isometries](#)

Advisor: Anton Petrunin

### Bachelor in mathematics

2012-2016

Science School. National Autonomous University of Mexico

Thesis: [Alexandrov spaces with curvature bounded below](#) (in spanish)

Advisor: Adriana Ortiz Rodríguez

## MANUSCRIPTS

---

### Publications

- **Tori can't collapse to an interval**  
[Electronic Research Archive](#)  
AIMS Press, 2021, 29(4): 2637-2644, DOI: 10.3934/era.2021005
- **Moon in a puddle and the four vertex theorem**  
with Anton Petrunin (artwork by Ana Cristina Chávez Cáliz)  
[American Mathematical Monthly](#)  
129:5, 475-479, DOI: 10.1080/00029890.2022.2041355

### Preprints

- **On fundamental groups of RCD spaces**  
with Jaime Santos  
[Preprint](#) (arXiv:2210.07275)
- **Anderson finiteness for RCD spaces**  
[Preprint](#)
- **Fundamental groups and group presentations with bounded relator lengths**  
[Preprint](#) (arXiv:1807.08827)
- **Limits of almost homogeneous spaces and their fundamental groups**  
[Preprint](#) (arXiv:2007.01985)
- **First Betti number and collapse**  
[Preprint](#) (arXiv:2209.12628)
- **Fundamental groups of aspherical manifolds that collapse**  
[Preprint](#) (arXiv:2101.06267)

### Textbook

- **What is differential geometry: curves and surfaces**  
with Anton Petrunin (artwork by Ana Cristina Chávez Cáliz)  
[Video course](#) (work in progress)  
[Textbook](#)

## TALKS AND POSTERS

---

### **Lower semi-continuity of $\pi_1$ and nilpotent structures in persistence** ([notes](#))

Talk. Topology Geometry Zoom Seminar. University of Oregon. 2023

### **Lower semi-continuity of $\pi_1$ and nilpotent structures in persistence**

[Talk](#) . AATRN Vietoris-Rips Seminar. 2023

### **First Betti number and collapse**

Talk. Joint Mathematical Meetings. 2023

### **Topology of convergence with lower Ricci bounds** ([notes](#))

Talk. Geometry Seminar. Karlsruhe Institute of Technology. 2022

### **Restrictions on collapse with lower Ricci curvature bounds**

Talk. Oberseminar Differentialgeometrie. Max Planck Institute. 2022

### **Squishable manifolds** ([slides](#))

Talk. Topology Seminar. Durham University. 2022

### **On collapse of tori under lower sectional curvature bounds** ([slides](#))

Talk. Barrett Lectures, University of Tennessee. 2022

### **Limites de espacios homogeneos discretos** ([slides](#))

Talk. Jornada de Topologia, Geometria y Dinamica. 2022

### **On collapse of tori under lower sectional curvature bounds** ([slides](#))

[Talk](#). Alexandrov Seminar in Geometry. Euler Institute. 2022

### **On limits of almost homogeneous spaces** ([slides](#))

Talk. University of Copenhagen. 2022

### **Structure of collapse of aspherical spaces**

Talk. Geometry and Topology Seminar. University of Toronto. 2021

### **The global shape of Galois covers** ([slides](#))

[Talk](#). Differential Geometry Seminar. UCSB. 2021

### **The global shape of universal covers**

Talk. Topology and Group Theory Seminar. Vanderbilt University. 2021

### **Structure of collapse and fundamental groups** ([slides](#))

[Talk](#). CUNY Geometric Analysis Seminar. 2021

### **Universal Covers of manifolds with Ricci curvature bounded below** ([slides](#))

[Talk](#). UNCG ANT-CoG. 2021

### **Lower semi-continuity of the fundamental group** ([slides](#))

Talk. Friday Lunch Seminar. Penn State University. 2021

## **Lower semi-continuity of the fundamental group and convergence with discrete symmetry**

[Talk](#). Virtual Workshop on Ricci and Scalar Curvature in honor of Misha Gromov. 2020

## **Fundamental groups and limits of almost homogeneous spaces** ([slides](#))

Talk. Metric Measure Spaces and Convergence Seminar. 2020

## **Amenable groups and ultrafilters. Different takes on probability** ([notes](#))

Talk. Student Directed Colloquium. Penn State University. 2019

## **Amenability**

Talk. MSRI Summer School. Geometric Group Theory. 2019

## **Geometry of universal covers through Cayley graphs**

[Poster](#). Sub-Riemannian Geometry and Beyond II. Jyvaskyla. 2019

## **On diameters of universal covers** ([slides](#))

Talk. Geometry Seminar. Penn State University. 2018

## **Non-smooth curvature** ([slides](#))

Talk. Student Directed Colloquium. Penn State University. 2018

## **Curvature and the paper sphere**

Talk. Mathematical Coven. UNAM. 2015

## **TEACHING EXPERIENCE**

---

### **Instructor**

Fall 2017-Spring 2022 (8 in-person sections, 3 online sections)

Multivariate Calculus

Creation of lecture notes, delivery of lectures, office hours, grading and design of homework, quizzes, grading and helping design exams

Mathematics Department. Penn State University

### **Instructor**

Fall 2020

Real Analysis Qualifying Exam Preparation Course

Creation of lecture notes, delivery of lectures

5 two-hour sessions aimed at first year graduate students

PhD Program. Penn State University

### **Teaching assistant**

Fall 2018

An Invitation to Comparison Geometry

Professor: Anton Petrunin

Recitation and grading

MASS Program. Penn State University

### **Teaching assistant**

Fall 2015, Spring 2016

Riemannian Geometry, Complex Analysis

Professor: Federico Sánchez Bringas

Recitation, grading and helping design homework, exams

**Social service**

2012, 2014

Mathematical Olympiad of Federal District (OMDF)

Creation of lecture notes, delivery of lectures and problem solving sessions,  
grading and helping design exams

High School Math Olympiad

**Grader**

Euclidean Geometry, Graph Theory, Spring 2019

Differential Geometry of Curves and Surfaces, Fall 2019

Mathematics Department. Penn State University

**SERVICE**

---

**Referee**

Arnold Mathematical Journal. 2022. Springer

Discrete and Computational Geometry. 2020. Springer

**Student Topology Seminar**

Spring 2021, Fall 2021

Co-organizer. Penn State University

**Peer Mentoring Program**

2019, 2020

PhD program. Penn State University

**SCHOLARSHIP AND FELLOWSHIP**

---

**Willamam Distinguished Fellowship**

Penn State University. 2016

**CONACyT Thesis Writing Scholarship**

UNAM. 2015