

# Maria Foteini Kallimani

PhD candidate in Theoretical Physics  
Humboldt Universität zu Berlin  
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## Research Interests

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Theoretical physics, specifically the mathematical foundations of quantum field theory. Currently investigating the algebraic structures underlying color-kinematics duality and the double copy of scattering amplitudes through the use of homotopy algebras.

## Publications

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- R. Bonezzi, C. Chiafrino, O. Hohm, **M. F. Kallimani**. *Color-kinematics duality from an algebra of superforms*, [arXiv:2601.02478](https://arxiv.org/abs/2601.02478).
- R. Bonezzi, C. Chiafrino, O. Hohm, **M. F. Kallimani**. *Yang-Mills kinematic algebra via homotopy transfer from a worldline operator algebra*, *Phys.Rev.D* 112 (2025) 10, 105006, [arXiv:2508.17933](https://arxiv.org/abs/2508.17933).
- R. Bonezzi, **M. F. Kallimani**. *Worldline geometries for scattering amplitudes*. *JHEP* 06 (2025) 167. [arXiv:2502.18030](https://arxiv.org/abs/2502.18030).

## Education

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### Ph.D. in Theoretical Physics, Humboldt University of Berlin

*Expected Oct 2026*

Supervisor: *Prof. Dr. Olaf Hohm*

Dissertation: *Homotopy Algebras and the Kinematic Algebra of Yang–Mills Theory*

Key contributions:

- Developed a dictionary between path integrals on worldlines of various geometries and QFT scattering amplitudes.
- Explored the relation between the bosonic spinning worldline and the homotopy algebraic description of the kinematic algebra of Yang–Mills theory.
- Investigated the deeper structure of the Yang–Mills kinematic algebra, given by a deformed version of a  $BV_\infty$  algebra, aiming to obtain it as a derived construction from a strict algebra. (*Paper to appear*)

### M.Sc. in High Energy Physics, ETH Zurich and Ecole Polytechnique Paris

*2021–2023*

Supervisor: *Prof. Dario Benedetti*

Dissertation: *Large N Conformal Field Theories*

Studied the  $O(N)$  model and a long-range generalization of it through the use of the 2-particle-irreducible action and the Bethe-Salpeter kernel. Computed correlation functions and anomalous dimensions of operators in the  $1/N$  expansion using conformal integration techniques.

### B.Sc. in Physics, National and Kapodistrian University of Athens

*2016–2020*

Supervisor: *Prof. Konstantinos Sfetsos*

Dissertation: *Cosmological Applications of Quantum Field Theory*

Studied quantum field theory in curved spacetimes. Explored particle creation due to non-flat geometry in the context of the Unruh effect and cosmological spacetimes.

## Selected Talks, Posters & Conferences

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- **Invited Talk**, Worldliners Seminar, 2025.
- **Poster**, ICTP-SAIFR, SIEMBRA-HolaGrav school, 2025, awarded *Best Poster Prize*.
- **Poster**, Eurostrings, Nordita, 2025.
- **Participant**, School on "Symmetries and Anomalies: A modern take", IHES, 2024.
- **Participant**, LACES, GGI, 2024.
- **Participant**, Athens Theoretical Physics Workshop, NKUA, 2019-2023-2025.

## Teaching Experience

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- **Teaching Assistant**, Statistical Physics (HU Berlin, 2025).
- **Teaching Assistant**, Advanced Quantum Field Theory (HU Berlin, 2025).
- **Teaching Assistant**, Theoretical Physics II: Electrodynamics (HU Berlin, 2024).

## Awards

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- **Onassis Foundation Scholarship** (2020-2022), awarded to top Greek students for academic excellence.

## Outreach, Service and Leadership

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### Organization

- **Member**, *Equal Opportunities Board*, RTG 2575 (2023–present)
  - Coordinated diversity based internship program and supervised hiring decisions for PhD students.
  - Organized seminar series "*Multiplicity in and of Physics*".
- **Organizer**, *KMPB Winter Schools on Theoretical Physics* (2024–2025)  
Curated scientific programs, managed speaker coordination, and oversaw event logistics for 60+ participants in two winter schools.

### Public Engagement

- **Speaker**, *Soapbox Science Berlin* (2024).  
Public talk on symmetries and Noether's theorem.
- **Presenter**, *Lange Nacht der Wissenschaften* (2024,2026).  
Created exhibit on explaining hyperbolic geometry using surfaces created through crochet.
- **Content creator**, *Non-Standard Models*  
Produced and starred in outreach videos on AdS/CFT (*Gravity as a Hologram*) and hyperbolic geometry (*Hyperbolic Crochet*) for public non-expert audiences.
- **Volunteer**, Athens Science Festival (2019).

### Professional Development

Scientific Writing Workshop in HU Berlin; QBronze Quantum Computing Seminar; HTML/CSS Web Design Workshop "Decode your Life".

## Technical & Language Skills

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**Programming:** Python (intermediate), Mathematica (intermediate), LaTeX, C (basic), HTML/CSS (intermediate), machine learning and data analysis (basic).

**Languages:** Greek (native), English (C2), French (B2), German (B1), Italian (A1).