Claudia Rella

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**EDUCATION**

**Doctor of Philosophy in Mathematical Physics**  2020, Sep – present

*Department of Theoretical Physics, University of Geneva, Switzerland*

Thesis: Supervised by Prof. Marcos Marino.

Affiliations: ERC Synergy Grant ReNewQuantum – National Centre of Competence in Research SwissMAP.

**Master of Science in Mathematical and Theoretical Physics** – Distinction 2018, Oct – 2019, Jun

*Mathematical Institute and Department of Physics, University of Oxford, UK*

Thesis: *Motivic Amplitudes.* Supervised by Prof. Francis Brown.

Affiliations: St John’s College.

Coursework in Physics: General Relativity – Relativistic Quantum Field Theory – Gauge Field Theory – Bosonic String Theory – The Standard Model and Beyond – Topological Quantum Field Theory – Topological Quantum Matter – Topological Quantum Computation – Radiative Processes and High-Energy Astrophysics.

Coursework in Mathematics: Groups Representations – Algebraic Geometry – Algebraic Topology.

**Bachelor of Science in Physics** – Summa cum Laude 2015, Oct – 2018, Jun

*Department of Physics, University of Rome La Sapienza, Italy*

Thesis: *Photonic Bloch Waves*. Supervised by Prof. Fabio Sciarrino.

Coursework in Physics: Classical, Analytical and Relativistic Mechanics – Inorganic Chemistry – Thermodynamics – Non-Relativistic Electromagnetism – Non-Relativistic Quantum Mechanics – Classical and Quantum Statistical Mechanics – Nuclear and Subnuclear Physics – Atomic and Molecular Physics – Optics and Photonics.

Laboratory Coursework: Mechanics – Thermodynamics – Electronics – Signals and Systems – Optics.

Coursework in Informatics: C Programming Language – Numerical Analysis – Algorithms.

Coursework in Mathematics: Linear Algebra – Real Analysis – Complex and Functional Analysis – Probability Calculus. Number Theory (\*) – Groups, Rings and Fields (\*) – Numerical Semigroups (\*) – Galois Theory (\*) – Modules and Algebras (\*) – Representation Theory (\*) – Lie Groups and Lie Algebras (\*) – Affine and Projective Geometry (\*) – Differential and Riemannian Geometry (\*) – General, Algebraic and Differential Topology (\*) – PDEs (\*).

(\*) : Extra-curricular coursework at Department of Mathematics.

**RESEARCH EXPERIENCE AND INTERNSHIPS**

**Particle Physics Research Internship in Modelling and Data Science** 2020, Jul – Sep

*NA62 @ CERN, Geneva, Switzerland*

Specifics: In progress.

**Master Class in Mathematical Physics** 2019, Oct – 2020, Jun

*University of Geneva and NCCR SwissMAP, Geneva, Switzerland*

Coursework:Random Matrix Theory – Brownian Motion – Stochastic Calculus – Random Growth – Loewner Evolution.

Research: Collaborated with Prof. Francis Brown (University of Oxford) on *Motivic Feynman Integrals*, specifically investigating the motivic Galois coaction and factorisation theorems for scalar Feynman graphs with non-generic kinematics. Collaborated with Prof. Francesco Riva (University of Geneva) on *Effective Field Theory*, specifically investigating the restrictions placed by positivity bounds and beyond on Horndeski theories of modified gravity.

**Business Consulting Internship in Big Data and AI** 2019, Jul – Aug

*Pangea Formazione, Rome, Italy*

Specifics: Contributed to Deep Learning predictive model for preventative maintenance of large infrastructures equipped with alarm nets. Project implemented using Bayesian Neural Networks and programming language R and customized to fit the specific needs of the commissioning telecom company. Pangea Formazione is a Big Data Analytics and AI company providing customised software for management consulting and training.

**Particle Physics Research Internship in Simulation and Data Analysis** 2017, Sep – Nov

*PADME @ INFN – LNF, Frascati, Italy*

Specifics: Contributed to Monte Carlo optical simulation of the Small-Angle Calorimeter of PADME’s detector using simulation software Geant4 and programming language C++. Characterised performance of a single PbF2 crystal attached to a Hamamatsu R13478UV photomultiplier tube using data analysis software ROOT. PADME (Positron Annihilation into Dark Matter Experiment) is a positron-on-target collision experiment searching for dark photon production at high intensity at the DAFNE Beam Test Facility.

**PUBLICATIONS**

**An Introduction to Motivic Feynman Integrals** 2020, Aug

*Submitted to SIGMA,* [*arXiv:2009.00426*](https://arxiv.org/abs/2009.00426)

**Characterization and Performance of PADME's Cherenkov-Based Small-Angle Calorimeter** 2019, Mar

*With A. Frankenthal et al., Nucl. Instrum. Methods Phys. Res. A 919 (2019) 89-97,* [*DOI:10.1016/j.nima.2018.12.035*](https://doi.org/10.1016/j.nima.2018.12.035)

**TALKS**

**Introduction to Motivic Amplitudes**  2019, Nov

*Research Seminar on Lie Groups and Moduli Spaces, University of Geneva, Switzerland*

**Motivic Scattering Amplitudes**  2019, Aug

*Conference on Representation Theory and Integrable Systems, ETH, Zürich,* Switzerland

**Monte Carlo Simulation of PADME’s Small-Angle Calorimeter**  2017, Dec

*PADME Weekly Meeting, INFN – LNF, Frascati, Italy*

**TEACHING EXPERIENCE**

**Lecturer on Topological Surfaces** 2019, Oct

*Master Class in Mathematical Physics – Department of Mathematics, University of Geneva, Switzerland*

Topics: Introduction to Topological Spaces – Hausdorff Separation Axiom – Connectedness and Compactness – Abstract Topological Manifolds and Surfaces – Normal Forms for Surfaces – Real Projective Plane in detail.

**Lecturer on Riemannian Geometry** 2018, Mar – May

*Excellence Program in Physics – Department of Mathematics, University of Rome La Sapienza, Italy*

Topics: Introduction to Riemannian Geometry – Riemannian Manifolds with Non-Positive Curvature – Jacobi Fields and Conjugate Points – Cartan-Hadamard Theorem – Killing Fields.

**ACADEMIC ACHIEVEMENTS AND SCHOLARSHIPS**

**Excellence Fellowship** 2019

*NCCR SwissMAP, Switzerland*

**Degree Prize for Distinction** 2019

*St. John’s College, University of Oxford, UK*

**Torno Subito Scholarship** 2018

*Department of Education, Research and University, Lazio, Italy*

**Best Student Award for the Course in Nuclear and Subnuclear Physics** 2018

*University of Rome La Sapienza and INFN, Italy*

**Summer Student Scholarship** 2017

*INFN, Italy*

**Excellence Program** 2016 – 2018

*Department of Physics, University of Rome La Sapienza, Italy*

**Deserving Student** **Scholarship** 2015 – 2018

*University of Rome La Sapienza, Italy*

**SKILLS**

Italian Language Native

English Language Level C2 (CEFRL) - Cambridge ESOL Level 3 Certificate

Programming Languages C, C++, HTML, Perl, R, Python

Version-control Systems Git

Data Analysis Software MATLAB, ROOT, gnuplot

Simulation Software Geant4

**MEMBERSHIPS**

Mentee of LeadTheFuture Mentorship Program 2019 – present

Invited Fellow of Italian Physics Society (SIF) 2019 – present