Claudia Rella

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EDUCATION

Doctor of Philosophy in Mathematical Physics starting 2020, Sep

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, St John's College, University of Oxford, UK

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

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

Specific contributions: 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 a project on *Motivic Feynman Integrals*, 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 a project on *Effective Field Theory*, 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

Specific contributions: 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

Specific contributions: 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 PbF_2

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](#).

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.](#)

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 of lectures: Introduction to Topological Spaces – Hausdorff Separation Axiom – Connectedness and Compactness – Abstract Topological Manifolds and Surfaces – Normal Forms for Surfaces – Real Projective Plane $\mathbb{R}\mathbf{P^2}$ in detail.

Lecturer on Riemannian Geometry   2018, Mar – May
Excellence Program in Physics – Department of Mathematics, University of Rome La Sapienza, Italy

Topics of lectures: 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

MEMBERSHIPS

Mentee of LeadTheFuture Mentorship Program   Sep 2019 – present
Invited Fellow of Italian Physics Society (SIF)   Jan 2019 – present

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