Matteo Broccoli

Curriculum Vitae

ORCiD
INSPIRE
ResearchGate

Education

2018-2022 **Ph.D. Student**, *Max Planck Institute for Gravitational Physics,* Potsdam, and *Humboldt University of Berlin,* Berlin, Germany.
Final grade: **Summa cum Laude**.
Thesis title: *"Aspects of Conformal Field Theory"*.
Supervisors: Prof. Dr. Stefan Theisen and Dr. Olaf Hohm.

2016-2018 **MSc in Theoretical Physics**, *Alma Mater Studiorum - University of Bologna*, Bologna, Italy.
Final grade: **110/110 cum Laude**.
Thesis title: *"On the trace anomaly of a Weyl fermion in a gauge background"*.
Supervisor: Prof. Dr. Fiorenzo Bastianelli. Co-Supervisor: Prof. Dr. Stefan Theisen.

2013-2016 **BSc in Physics**, *Alma Mater Studiorum - University of Bologna*, Bologna, Italy.
Final grade: **110/110 cum Laude**.
Thesis title: *"MOND and TeVeS: Alternative theories to the dark matter hypothesis"*.
Supervisor: Prof. Dr. Roberto Casadio.

Professional Experience

2022-today **Postdoc Researcher**, *Centro Euro-Mediterraneo sui Cambiamenti Climatici*, Bologna, Italy.
Design of an observation operator based on machine learning technique for the assimilation of skin/subskin Sea Surface Temperature satellite retrievals in the CMCC analysis systems.

03-08.2018 **Guest Scientist**, *Max Planck Institute for Gravitational Physics*, Potsdam, Germany.
Preparation of the master's thesis.

Recent Projects

2025 **WATER**, *Wide-swath AITimetry for Eddy Reconstruction*, ESA Open Call for Proposals for EO Innovation, WP Leader.

2025 **GLORAN**, *Global Ocean Reanalysis*, CMEMS 24254-COP-GLORAN-4000 LOT 1, Technical Expert.

Schools and Conferences

28-31.10.2024 **Artificial Intelligence for Weather and Climate Autumn School**, *Fondazione Bruno Kessler*, Trento, Italy.

9-13.09.2024 **Mediterranean Machine Learning Summer School**, *AI Education Foundation, Google DeepMind*, Milano, Italy.

7-10.05.2024 **ESA-ECMWF Workshop on ML4ESOP**, *ESA-ESRIN*, Frascati, Italy.

14-19.04.2024 **EGU General Assembly 2024**, Vienna, Austria.

16-20.10.2023 **International Symposium on Data Assimilation**, *UniBo*, Bologna, Italy.

05-16.06.2023 **Future Earth Research School on Data Science and Machine Learning for Climate Research**, *CMCC*, Bertinoro, Italy.

01-04.2023 **ECMWF MOOC Machine Learning in Weather & Climate**, *online*, Reading, England.

14-17.11.2022 **ECMWF-ESA Workshop on ML4ESOP**, *online*, Reading, England.

16-19.05.2022 **Atlantic General Relativity 2022**, *online*, Newfoundland, Canada.

21-24.09.2021 **Bright ideas for a dark universe**, *DESY*, Hamburg, Germany.

1-5.02.2021 **CERN Winter School on Supergravity, Strings and Gauge Theory 2021**, *online*, Geneva, Switzerland.

21-25.09.2020 **Great Lessons from Exact techniques and Beyond**, *online*, Padova, Italy.

9-16.02.2020 **YRISW 2020: A modern primer for superconformal field theories**, *DESY*, Hamburg, Germany.

28.03-5.04.2019 **Spring School on Superstring Theory and Related Topics**, *ICTP*, Trieste, Italy.

10-16.02.2019 **YRISW 2019: A modern primer for 2D CFT**, *ESI*, Vienna, Austria.

8-14.08.2018 **International Conference of Physics Students 2018**, Helsinki, Finland.

3-7.04.2018 **String Steilkurs - Part 1: Introduction to String Theory**, *DESY*, Hamburg, Germany.

Selected Presentations

Poster *Assimilation of Diurnal Satellite Retrieval of Sea Surface Temperature for Ocean Reanalysis with Convolutional Neural Network*: **ESA-ECMWF Workshop on ML4ESOP (2024)**, Frascati; **Mediterranean Machine Learning Summer School (2024)**, Milano.

Talk *Towards an Observation Operator for Satellite Retrieval of Sea Surface Temperature with Convolutional Neural Network*: **EGU General Assembly (2024)**, Vienna.

Poster *Towards an Observation Operator for Satellite Retrieval of Sea Surface Temperature with Convolutional Neural Network*: **International Symposium on Data Assimilation (2023)**, Bologna.

Invited Seminar *Irrelevant operators and their holographic anomalies*: **Worldline Meetings (2022)**; **University of Southampton (2022)**.

Invited Seminar *The Third Way to Interacting p-form Theories*: **University of Milan (2021)**; **University of Bologna (2021)**.

Talk *The Third Way to Interacting p-form Theories*: **Bright ideas for a dark universe (2021)**, Hamburg; **Atlantic GR 2022**, Newfoundland.

Talk *On the trace anomaly of a Weyl fermion in a gauge background*: **ICPS 2018**, Helsinki.

Publications

M. Broccoli and A. Cipollone, *"Assimilation of Diurnal Satellite Retrieval of Sea Surface Temperature with Convolutional Neural Network"*, preprint.

2111.08286 M. Broccoli, *"Irrelevant operators and their holographic anomalies,"* **JHEP** 05 (2022), 001.

2103.13243 M. Broccoli, N. S. Deger and S. Theisen, *"Third Way to Interacting p-Form Theories,"* **Phys. Rev. Lett.** 127 (2021) no.9, 091603.

2012.11255 E. M. Brehm and M. Broccoli, *"Correlation functions and quantum measures of descendant states,"* **JHEP** 04 (2021), 227.

1911.02271 F. Bastianelli and M. Broccoli, *"Axial gravity and anomalies of fermions,"* **Eur. Phys. J. C** 80 (2020) no.3, 276.

1908.03750 F. Bastianelli and M. Broccoli, *"Weyl fermions in a non-abelian gauge background and trace anomalies,"* **JHEP** 10 (2019), 241.

1808.03489 F. Bastianelli and M. Broccoli, *"On the trace anomaly of a Weyl fermion in a gauge background,"* **Eur. Phys. J. C** 79 (2019) no.4, 292.

1807.08313 M. Broccoli and A. Viganò, *"Electromagnetic self force in curved spacetime: New insights from the Janis-Newman algorithm,"* **Phys. Rev. D** 98 (2018) no.8, 084007.

Transferable Skills Courses

26-29.04.2021 **The Scientific Writing Workshop**, *Write About Science*.

27-28.02.2020 **Scientific Presentation**, *The Speaking Adventure*.

Personal Skills

Languages

Mother tongue **Italian**, advanced **English**, proficient **German**, beginner **French**.

Computing Skills

Advanced user **Python, TeX, Wolfram Mathematica, C++**.

Proficient user **UNIX shell scripting, Fortran, LabVIEW, ROOT**.

Other Skills

Photographer **Nature and wildlife**, amateur.
Featured in published magazines.

Musician **Bass guitar and Cello**, amateur player.
Experiences with international musicians.

Voluntary Work

2023 **Assisting nesting-birds survey and film shooting**, Northumberland, UK.

2022 **Installation of bird nesting boxes**, *Max Planck Campus*, Potsdam.

2021 **Short film shooting**, about conservation activities in the Potsdam area.

2020-2022 **Wildlife photographer**, for a local newspaper in Potsdam.

Scientific Outreach

2022 **Open Day**, *Max Planck Institute for Gravitational Physics*, Potsdam.