Maria Paola Vaccaro

Born on July 11th, 1997
in Larino (CB), Italy
Currently in Heidelberg, Germany

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Scientific interests

- Computational astrophysics
- Stellar evolution
- Gravitational waves sources
- Black holes dynamics
- Stellar clusters

Numerical tools

Python   ● ● ● ●
C/C++   ● ● ● ○
Matlab   ● ● ● ○

Operating systems

Linux/Unix   ● ● ● ○
Windows   ● ● ● ○

Languages

Italian (mother tongue)
English (fluent, level C1)
Spanish (basic, level A2)
German (basic, level A1)

Education

Sep. 2023 – 2026 PhD in Astronomy and Cosmic Physics
At Institute for Theoretical Astrophysics (ITA), ZAH, Heidelberg University in Heidelberg, Germany.
Supervisor: Prof. Michela Mapelli - Thesis title: "Binary Black Hole population in the Local Universe"

Oct. 2020 – Sep. 2022 Master degree in Astrophysics
At Università degli Studi di Padova in Padua (PD), Italy˙ Final grade: 110/110 *cum laude*, GPA: 29.4/30
Supervisor: Prof. Michela Mapelli - Thesis title: "Hierarchical Black Holes Mergers in Active Galactic Nuclei"

Sep. 2019 – Jul. 2020 Master course in Matter Physics
At Università di Pisa in Pisa (PI), Italy - GPA: 28.8/30

Sep. 2016 – Sep. 2019 Bachelor degree in Physics
At Università di Pisa in Pisa (PI), Italy.
Final grade: 110/110 *cum laude*, GPA: 28.6/30
Supervisor: Prof. Pier Giorgio Prada Moroni - Thesis title: "Cooling evolution of white dwarfs and cosmochronology"

Sep. 2011 – Jul. 2016 High school diploma
At Liceo Scientifico Alfano da Termoli in Termoli (CB), Italy.
Final grade: 100/100 *cum laude*

Aug. 2014 – Jul. 2015 High school exchange year
At Mead High School in Mead, Colorado, USA.
GPA: 4.0/4 - ACT score: 33/36

Funding

Member of the Young Research Convent of the Heidelberg Cluster of Excellence STRUCTURES since October 1st, 2023. Program funded by the German Excellence Strategy fund.

Pre-doctoral fellowship February 1st – August 31st, 2023
DEMOBLACK ERC Team at Università degli Studi di Padova, Padua (PD), Italy. Supervisor: Prof. Michela Mapelli. Research project: "Hierarchical evolution of stellar-sized binary black holes in active galactic nuclei".

Internship in GW group October 1st – December 31st 2022
IFAE-UAB, Barcelona, Spain. Supervisors: Dr. Lluïsa-Maria Mir i Martínez and Prof. Mario Martínez Pérez

Current activity

I am a computational astrophysicist, working in the field of gravitational-wave astronomy and black hole dynamics. I am the main developer of a semi-analytical code for the active galactic nucleus (AGN) disk scenario for hierarchical black hole mergers.

Conferences and workshop

Contributed Talk — University of Tokyo, Tokyo, Japan
RESCEU-NBIA workshop on GW sources — December 7th − 15th, 2023

Talk title: "The impact of Gas Hardening on Hierarchical Black Hole Mergers in Active Galactic Nuclei Disks". Contribution to the **discussion panel** "Many-Body Systems".

Flash Talk — University of Milano Bicocca, Milan, Italy
Workshop "GwPopNext" — July 10th − 14th, 2023

Talk title: "Semi-analytical Model for Hierarchical Binary Black Hole Mergers".

Invited poster presentation — Lorentz Center, Leiden, Netherlands
Workshop "The Renaissance of Stellar Black-Hole Detections" — June 26th − 30th, 2023

Invited Speaker — Venetian institute of science, literature and art, Venice, Italy
Physics of Data Workshop — April 19th − 21st, 2023

Talk title: "How do black holes grow? Active galactic nuclei as a breeding ground for intermediate-mass black holes"

Scientific publications

As first author

Impact of gas hardening on the population properties of hierarchical black hole mergers in AGN disks

M. Paola Vaccaro, Michela Mapelli, Carole Périgois, Dario Barone, M. Celeste Artale, Marco Dall'Amico, Giuliano Iorio, Stefano Torniamenti, 2023, *Accepted for publication on A&A*, arXiv:2311.18548

Others

Hierarchical binary black hole mergers in globular clusters: mass function and evolution with redshift

Stefano Torniamenti, Michela Mapelli, Carole Périgois, Manuel Arca Sedda, M. Celeste Artale, Marco Dall'Amico, M. Paola Vaccaro, 2024, *Submitted to A&A*, arXiv:2401.14837

GW190521: a binary black hole merger inside an active galactic nucleus?

Sophia Morton, Stefano Rinaldi, Alejandro Torres-Orjuela, Andrea Derdzinski, M. Paola Vaccaro, Walter Del Pozzo, 2023, Phys. Rev. D, 108, 123039

The hitchhiker's guide to the galaxy catalog approach for gravitational wave cosmology

Jonathan R. Gair, Archisman Ghosh, Rachel Gray, ..., Maria Paola Vaccaro et al., 2022, AJ, 166, 22

Schools and workshops

- 4th G2Net Training School "A network for Gravitational Waves, Geophysics and Machine Learning" hosted by Aristotle University of Thessaloniki (remote attendance) — March 28th-30th, 2023
- Python Course (level advanced) hosted by ICFO in Barcelona, Spain — November 24th-30th, 2022
- GW Open Data Workshop hosted by GWOSC (online event) — May 23rd-25th, 2022

- IPAM Workshop III: Source inference and parameter estimation in Gravitational Wave Astronomy
  (remote attendance)   November 15th-19th, 2021

Outreach

- Staff member of the cultural association Scholé based in Roccella Jonica (RC), Italy   since 2020
- Member of the organizing committee for the Scholé "School of Physics" for high schoolers   since 2022
- Speaker and staff member at the 2023 Scholé Summer School titled "PHYSIS" ("Nature"). Talks:
  - "Understanding Nature with Quantum Mechanics" with Prof. Giancarlo Cella (Pisa, Italy)   July 25th, 2023
  - "The concept of space from Newton to Einstein" with Prof. Paolo Bussotti (Udine, Italy)   July 29th, 2023
- Author of a pamphlet about stellar evolution, distributed to 13th-grade high schoolers
  in the school Liceo Volta (Reggio Calabria, Italy) by Scholé   2024

Awards and other activities

- Don Peppe Presutto award from Circolo CFR Serracapriola for academic achievements   2016, 2020, 2023
- Aupair program in Cork, Ireland for language enhancement   2018
- Lions Club Tifernus award and 1000€ scholarship for educational achievements   2016
- Internship in the local newspaper Termolionline in Termoli (CB), Italy   2014