Giovanni Stimamiglio

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RESERCH INTERESTS

I am interested to pursue a PhD in astrophysics with a preference for theory or simulation projects. So far I have worked on stellar/binary evolution, neutron stars and magnetic fields. I would enjoy a project that continues in these directions touching on any state of the evolution of stars up to and including their fate as supernova and compact object remnants. More broadly I would also be open to work on accretion disks in AGNs or X-ray binaries, magnetic fields, and gravitational waves progenitors, as well as galaxy formation and evolution.

EDUCATION

Max Planck Institute for Astrophysics, Garching near Munich *Oct 2025 – Present*
PhD in Astrophysics

- 3D MHD Simulations of ONeMg White Dwarfs
- **Advisors:** Dr. Rüdiger Pakmor, Dr. Stephen Justham, Prof. Dr. Selma E. de Mink

Ludwig-Maximilians-Universität, München *Oct 2023 – Jul 2025*
Master's degree in Astrophysics

- **Relevant Coursework:** Introduction to Advanced Astrophysics (Achieved Highest Grade), Stars: Theory and applications (Achieved Highest Grade), The Physics of Cosmic Plasmas (Achieved Highest Grade), Black Holes: Theory and Observations (Achieved Highest Grade), Observational Methods for Astrophysics (Achieved Highest Grade)
- **Seminar presentations:** Seminar on Stellar Astrophysics (SESTAS) at MPA (Achieved Highest Grade)
- Final grade: 1.14 (Sehr gut)*

* German Grading scale: 1 = highest grade; 2 = good; 3 = satisfactory; 4 = sufficient; 5 = not sufficient. — https://www.lmu.de/en/workspace-for-students/international-student-guide/academic-culture/#:~:text=Your%20coursework%20will%20be%20graded,(non%2Dgraded%20lectures)

Università degli Studi di Padova *Sept 2020 – Sept 2023*
Bachelor's Degree in Physics

- **Relevant Coursework:** Newtonian Mechanics, Electromagnetism, Quantum Mechanics, Fundaments of Mathematical Methods (28/30), Fundamentals of Nuclear and Subnuclear Physics (30/30), Introduction to Relativistic Gravity (30/30), Computational Methods in Physics (30/30)
- Final grade: 104/110

* Italian Grading scale: for exams a 30-point scale, where the minimum passing grade is 18/30 and the maximum is 30/30 cum laude. For graduation the minimum passing grade is 66/110 and the maximum 110/110 cum laude. — https://www.unipd.it/en/exams-study-plan

Liceo Classico Statale "Tito Livio", Padova *Sept 2015 – Jun 2020*
High School Diploma

- Final grade: 100/100

RESEARCH EXPERIENCE

Master Thesis - Theoretical predictions on the surface magnetic fields of binary-stripped massive stars *Jul 2024 - Jul 2025*
Max Planck Institute for Astrophysics, Garching near Munich

- Advisors: Prof. Dr. Selma de Mink (MPA). Jing-Ze Ma (daily advisor), External co-advisor: Prof. Dr. Ylva Goetberg (ISTA, VIENNA)
- Keywords: Massive stars — Binary systems — Magnetic fields — MESA simulations — Python — Spectroscopy
- Description:

  This is largely a theoretical project for which I learned how to simulate binary stars with the stellar evolutionary code MESA and analyze the output with Python. I studied the theory of binary star

evolution and in particular of magnetic field amplification and evolution in massive stars (primordial, through a dynamo and from convective motions). I have used this to make predictions for the strength of the field that can be observed once the star is stripped. Later in the project we also intend to compare with spectroscopic observations.

Semester Break Project *Feb 2024 - Mar 2024*
Max Planck Institute for Astrophysics, Garching near Munich

- Supervisors: Jing-Ze Ma (PhD student at MPA, primary advisor) and Prof Dr. Selma de Mink
- Keywords: Binary systems — Metallicity — MESA simulations — Python — Stellar evolution
- The scope of the project was to familiarize with the stellar 1D simulation code MESA and learn more about binary systems' mechanics and mass transfer in close binary. After learning to simulate single stars using MESA, I simulated the evolution of the primary star in a close binary system from the main sequence through the first mass transfer event, up until the stripped He star phase. I investigated through several simulations the effects of the primary's metallicity on the mass transfer event, comparing several parameters (such as mass, luminosity, radius, abundances and power profiles, etc.) of the resulting stripped He star

Bachelor's Thesis - Propagation of radiation in strongly magnetized media *Apr 2023 - Sept 2023*
Università degli Studi di Padova

- Advisor: Prof. Dr. Roberto Turolla, Co-Advisor: Dr. Roberto Taverna
- Keywords: Neutron stars — QED — EM radiation — Plasma — C++ — Numerical methods — Tikz
- Description:

  This was a mainly theoretical project for which I performed an extensive literature search to compile an up-to-date review of the mode switching effect of photons in the ultra-magnetized atmospheric layers of magnetars. I thus studied QED effects in a strongly magnetized vacuum and the propagation of photons in an astrophysical plasma, as well as the main formation hypothesis for magnetars. I then developed a C++ code to reproduce numerical results that may be useful as a baseline for observations and constraining of magnetars' magnetic fields.

- Link (available in Italian only): https://hdl.handle.net/20.500.12608/52521

TALKS

Magnetic fields workshop - Theoretical predictions on the surface magnetic fields of binary-stripped massive stars *November 26th, 2024*
Max Planck Institute for Astrophysics, Garching near Munich

I presented my master thesis topic and some preliminary results at a one-day workshop about magnetic fields in binary systems and massive stars held at MPA with participants from several institutions and universities across the world. Then I actively participated in the following discussion phase.

SKILLS

Languages:

- English: Proficient (CEFR level C1), IELTS Academic: grade 8.0 in Dec 2022
- Italian: Native Speaker

Coding: C++ (proficient, used for various research projects in particular my BSc thesis), Python (very proficient, used for analysis of my results in my MSc thesis)
Software: AREPO, MESA, MATLAB (plotting), Matplotlib, NumPy, Jupyter Notebook, Excel (for data analysis), LaTex, Tikz

MISCELLANEOUS

Tutoring:

- (2020-2023) Physics and Mathematics for High School students (> 300 hours)
- (2018-2020) Help in Mathematics to younger students as part of a school-organized "buddy program"

Volunteer work:

- (June 2019) Volunteer work at Muscular Dystrophy Ireland (Dublin) as part of European Scolarship project
- (July 2018) Volunteer guide for English heritage at Kenwood House, London

Other interests and hobbies:

- Music, guitar playing, drama (classes from 2014 to 2020, Company for young actors from 2020 to 2023)
- Hiking, swimming - Lifeguard Certification (2018 - Federazione Italiana Nuoto)
- Reading, classic literature (especially latin and ancient greek ones), history and philosophy