Benjamin Philip Collins

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Research Interests

Galaxy formation and evolution through cosmic time; dust emission and ISM properties in high-redshift galaxies; large-scale structure, cosmic web, and observational cosmology with Euclid and LSST; multiwavelength surveys with JWST, HST, and ground-based facilities such as ALMA and the VLT.

Education

Alma Mater Studiorum - Università di Bologna Sep. 2023 – Present
MSc in Astrophysics and Cosmology *Bologna, Italy*

- Average grade: 29.29/30 (Italian system)
- Thesis: *Using JWST to Investigate Dust Energy Balance in Galaxies at Cosmic Noon.*
- Expected completion: Oct. 2025

Loughborough University Feb. 2022 – June 2022
Erasmus Exchange Semester *Loughborough, United Kingdom*

- Awarded First Class Honours — Average grade: 88.27% (UK system)

Technische Universität Wien Oct. 2019 – July 2023
BSc in Technical Physics *Vienna, Austria*

- Graduated with Honours — Final grade: 1.9 (Austrian system, 1=highest)
- Thesis: *Optimisation of an Advanced Catcher-QCM Setup for Sputtering Yield Measurements of He^+ and Ar^+ Ions on Enstatite.*

Research Experience

Master's Thesis Research Feb. 2025 – Present
Alma Mater Studiorum - Università di Bologna *Bologna, Italy*

- Investigating dust emission and ISM properties in massive galaxies at Cosmic Noon ($z \sim 2$) using JWST/MIRI photometry in the COSMOS field.
- Performing photometric analysis and source extraction with `Astropy` and `Photutils`.
- Combining PRIMER, COSMOS-Web, COSMOS-3D, and BlueJay data to investigate ISM properties and test the assumption of dust energy balance in PROSPECTOR.
- Preliminary results indicate a systematic overprediction of MIR fluxes by PROSPECTOR, highlighting potential tensions in current dust emission models.

Multiwavelength Laboratory Sep. 2024 – Feb. 2025
Alma Mater Studiorum - Università di Bologna *Bologna, Italy*

- Calibrated and imaged ALMA observations of ^{12}CO(2–1) molecular gas emission in the lenticular galaxy NGC 612 using CASA; created continuum and cube images; estimated molecular gas mass in spiral arms.
- Analysed high-resolution stellar spectra from UVES and UVES-FLAMES to estimate Li abundance in turn-off stars of the globular cluster NGC 6752. Created and presented a mock telescope proposal using the ESO Exposure Time Calculator for VLT and La Silla facilities.
- Processed Chandra observations of NGC 5135; used DS9 to define source regions; extracted spectra; fitted physical models with Xspec to characterise central X-ray sources.
- Final grade: 30 e lode (highest possible).

Bachelor's Thesis Research July 2021 – Nov. 2023
Technische Universität Wien *Vienna, Austria*

- Performed laboratory simulations of space weathering effects on Lunar surface analogues via a Quartz Crystal Microbalance setup.
- Co-developed a sophisticated graphical user interface in Python to evaluate experimental data and improve frequency resolution.
- Co-authored 4 publications, including 1 peer-reviewed paper in *The Planetary Science Journal*.
- Final grade: 1.0 (Austrian system, 1=highest)

Relevant Coursework

High Performance Computing for Astrophysics and Cosmology Feb. 2024 – July 2024
Alma Mater Studiorum - Università di Bologna *Bologna, Italy*

- Studied MPI-based parallel computing frameworks and their application to astrophysical N-body simulations.
- Final project: strong scaling test of Gadget-2 on an HPC cluster using up to 32 cores across multiple nodes.
- Final grade: 30/30

Practical Statistics for Physics and Astrophysics Feb. 2024 – July 2024
Alma Mater Studiorum - Università di Bologna *Bologna, Italy*

- Covered Bayesian and frequentist inference, Monte Carlo methods, parameter estimation, hypothesis testing, model selection, and introductory machine learning techniques.
- Gained hands-on experience with Python packages such as `scipy`, `lmfit`, `emcee`, and `nautilus` for astrophysical data analysis and model fitting.
- Final grade: 28/30

Work Experience

University Teaching Assistant March 2021 – Jan. 2023
Technische Universität Wien *Vienna, Austria*

- Led problem classes in Mathematics I and II for environmental and civil engineering students (40+ participants).
- Explained key mathematical concepts and problem-solving strategies covering analysis and linear algebra.
- Designed exercise sheets, supervised exams, and graded student submissions.

Math and Physics Tutor Nov. 2022 – June 2023
Lernquadrat 3. Bezirk *Vienna, Austria*

- Taught high school level Mathematics and Physics in small groups ($\leq$6 students).

Civilian Service Worker Dec. 2018 – Aug. 2019
Pensionsversicherungsanstalt (Rehabilitation Centre) *Alland, Austria*

- Provided patient support and performed administrative tasks as part of Austria's mandatory civil service.

Internship as Marketing Assistant Sep. 2018 – Oct. 2018
Expanding Branding *Johannesburg, South Africa*

- Worked in a multicultural team environment, engaging in event planning, logistics, and administrative tasks.

Conferences and Summer Schools

IMPRS-HD Summer School: "New Opportunities to Test Cosmology" Sep. 2024
Max Planck Institute for Astronomy (MPIA) *Heidelberg, Germany*

- Participated in lectures and workshops on fundamental questions in cosmology: dark matter, inflation, GR, structure formation, and new physics.
- Programme website: www2.mpia-hd.mpg.de

Technical Skills

Programming: Python, C/C++, Fortran, Bash

Libraries: NumPy, pandas, Matplotlib, Astropy, Photutils, Prospector, emcee, gnuplot

Parallel Computing: MPI, mpi4py

Tools: CASA, XSPEC, SAOImageDS9, ESO-ETC, Git, LaTeX, Jupyter, Linux (Terminal), VSCode

Languages

German:	Native	
English:	C2	IELTS Academic, Overall Band Score 8.5 (2022)
Italian:	B2	Certificate available upon request
French:	B1	Certificate available upon request
Spanish:	A1	Beginner; currently learning

Publications (Co-authored)

Brötzner, J., Biber, H., Szabo, P. S., Jäggi, N., Cupak, C., **Cserveny, B.**, et al. (2022). *An optimised Quartz Crystal Microbalance setup to investigate the sputtering behaviour of bulk targets.* In EGU General Assembly Conference Abstracts, EGU22-5236.

Brötzner, J., Biber, H., Jäggi, N., Szabo, P. S., Cupak, C., **Cserveny, B.**, et al. (2022). *Laboratory measurements to study the sputtering of Hermean surface analogues under He ion impact.* European Planetary Science Congress, EPSC2022-849.

Biber, H., Brötzner, J., Jäggi, N., Szabo, P. S., Pichler, J., Cupak, C., Voith, C., **Cserveny, B.**, et al. (2022). *Sputtering behavior of rough, polycrystalline mercury analogs. The Planetary Science Journal*, 3(12), 271.

Biber, H., Szabo, P., Jäggi, N., Brötzner, J. Cupak, C., **Cserveny, B.**, et al. (2022). *Studying the ejection of particles for realistic Mercury analog samples upon He impact.* In EGU General Assembly Conference Abstracts, EGU22-4995.

All publications and degrees issued under previous surname: Benjamin Cserveny. Official name change documentation available upon request.