Benjamin Philip Collins

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RESEARCH INTERESTS

Formation and evolution of the first galaxies, dust and ISM properties in high-redshift galaxies; large-scale structure, cosmic web, and observational cosmology; multi-wavelength studies of galaxies using JWST, HST, ALMA, and the VLT.

EDUCATION

Alma Mater Studiorum - Università di Bologna
Sep. 2023 – Oct. 2025

MSc in Astrophysics and Cosmology — *Bologna, Italy*

- Graduated with Honours — Final grade: 110 e lode (Italian system)
- Thesis: *Using JWST to Investigate Dust Energy Balance in Galaxies at Cosmic Noon.*

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 (Red Cardinal ERC Project)
Feb. 2025 – Present

Alma Mater Studiorum - Università di Bologna — *Bologna, Italy*

- Conducting research within the Red Cardinal team (ERC Starting Grant, PI: Sirio Belli) on the dust and interstellar medium properties of massive galaxies at $z \sim 2$.
- Extended the Blue Jay photometric catalogue by incorporating JWST/MIRI photometry from the PRIMER, COSMOS-Web, and COSMOS-3D surveys in the COSMOS field.
- Developed a photometric analysis workflow in Python to perform source matching, background modelling, and flux extraction across multiple MIRI datasets.
- Used the new data to test energy-balance models and found that current dust models systematically overpredict mid-infrared fluxes, highlighting tensions in current dust 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 line 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 and NuSTAR observations of NGC 5135; used DS9 to define source regions; extracted spectra; investigated variability; 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 (≤ 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, scipy, 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.