# Mallory Thorp

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## Education

*University of Victoria* 2019 - 2022
PhD Candidate Physics and Astronomy (Supervisor: Dr. Sara Ellison)
Title: "A multifaceted investigation of the resolved properties of galaxy mergers"

*University of Victoria* 2017 - 2019
MSc Physics and Astronomy (Supervisor: Dr. Sara Ellison)
Title: "Resolved properties of galaxy mergers from the MaNGA survey"
*Overall GPA: 8.00/9.00*

*University of Washington – Seattle* 2013 - 2017
B.S. Astronomy and Physics (Double Major), Minor in Classical Studies
*Overall GPA: 3.87/4.00, GPA in ASTR courses 300 level and above: 3.99/4.00*

## Research

***Interests:*** *Galaxy evolution, galaxy mergers, active galactic nuclei, resolving star formation*

**Postdoc** - *Argelander Institut für Astronomie, Universität Bonn, Dr. Frank Bigiel* 2023 - Present
Quantify impact of drastic events (major mergers, active galactic nuclei) on sub-kpc scale interstellar medium through multiwavelength extragalactic surveys and newly proposed observations. Supervise student projects on similar topics at a BSc, MSc, and PhD level.

**Research Assistant** - *University of Victoria, Dr. Sara Ellison* 2017 - 2022
Investigate star-formation and molecular gas properties of interacting galaxies using a combination of SDSS MaNGA integral field spectroscopy and ALMA CO observations. Construct innovate methods to visualize relationship between spatially resolved properties.

**Mitacs Globalink Research Intern** - *University of Cambridge, Dr. Roberto Maiolino & Dr. Asa Bluck* Fall 2019
Evaluate non-parametric morphology measurements of MaNGA integral field spectroscopy data. Utilize cosmological simulations to quantify impact of uncertainty and PSF on measurements and design procedures to correct for these effects.

**Undergraduate Research Assistant** - *University of Washington, Dr. Emily Levesque* 2016 - 2017
Analyze parameters of star forming regions in nearby galaxies through spectroscopic data. Characterize a gamma ray burst galaxy host complex using Gemini Multi-Object Spectrograph (South) data.

**Compile and Analyze Data** - *University of Washington, Dr. Woodruff Sullivan* 2015 - 2016
Study the declination of the sun with meridian line in Rome's Santa Maria Degli Angeli Basilica to gain understanding of ancient observational methods, collect data from images of solar transit over the line and compute declination from the meridian line's scale.

## Collaborations

*ALMaQUEST (ALMA MaNGA Quenching and Star Formation) Survey:* Combining ALMA observations of resolved molecular gas with resolved star formation rates from MaNGA to investigate the evolution from starburst to quenched galaxies for a wide range of galactic properties. http://arc.phys.uvic.ca/~almaquest/ (Joined 2019)
Role: Data Reduction & Management, Website maintenance

*VERTICO (VIRGO Environment Traced in CO) Survey:* Ongoing ALMA Large Program to investigate environmental effects on galaxy evolution with multi-wavelength observations of 51 VIRGO Cluster Galaxies. https://sites.google.com/view/verticosurvey (Joined 2020)
Role: Survey Coordinator (Database management)

*PHANGS (Physics at High Angular resolution in Nearby GalaxieS) Survey:* Investigate "cloud"-scale physics of star formation and the ISM for 90+ local galaxies with observations from ALMA, MUSE, HST, JWST, and more. https://sites.google.com/view/phangs/home (Joined 2023)

*SFB 1601- Habitats of Massive Stars Across Cosmic Time:* Collaborative research centre connecting research institutes in Bonn and Cologne https://sites.google.com/view/phangs/home (Joined 2023)

## Awards

- The R.M. Petrie Memorial Fellowship ($1463, $ 3577) — 2019, 2020
- L.E. Frances Druce Award in Science ($4055) — 2019
- Mitacs Globalink Research Award ($6000) — 2019
- James A. & Laurette Agnew Memorial Award ($2188) — 2018
- University of Victoria Graduate Fellowship ($8000) — 2017
- University of Victoria Graduate Entrance Award ($5000) — 2017
- University of Washington Dean's List — 2014 - 2017
- UW Baer Award for astronomy scholarship and research — 2016

## Contributed Talks

- European Astronomical Society Annual Meeting (SS19) - Kraków, Poland — Jul 2023
  *Talk: The observed impact of galaxy interactions on spatially resolved metallicity and star formation relations*
- Kavli Institute of Cosmology virtual conference: Epoch of Galaxy Quenching - Cambridge, UK — Sep 2022
  *Talk: What Powers Merger Induced Star Formation?*
- KIAA Forum on Gas in Galaxies for Early Career Scientists - Virtual — Nov 2021
  *Talk: Resolving Star Formation and Molecular Gas Properties of Merging Galaxies with ALMaQUEST*
- Lorentz Centre Workshop: The Enigmatic Role of Mergers in Galaxy Evolution - Virtual — Mar 2021
  *Talk: Resolving Star Formation and Molecular Gas Properties of Post-Merger Galaxies with ALMaQUEST*
- Kavli Institute of Cosmology virtual conference: Epoch of Galaxy Quenching - Virtual — Sep 2020
  *Talk: Spatially Resolved Properties of Post-Merger Galaxies with MaNGA and ALMA*
- Australia-ESO Joint Conference: Linking galaxies from the Epoch of initial star-formation to today - Sydney, Australia — Feb 2019
  *Talk: Spatially Resolved Star Formation and Metallicity Profiles in Post-Merger Galaxies from MaNGA*

### *Contributed Posters*

- 52nd annual meeting of the Canadian Astronomical Society - Virtual — May 2021
  *Poster: Towards robust determination of non-parametric morphologies in marginal astronomical data: resolving uncertainties with cosmological hydrodynamical simulations*
- European Astronomical Society Annual Meeting - Virtual — June 2020
  *Poster: Spatially Resolved Star Formation in Merging Galaxies from MaNGA*
- 49th annual meeting of the Canadian Astronomical Society - Victoria, Canada — May 2018
  *Poster: Spatial Distribution of Star Formation Rate and Other Properties of MaNGA Post-Merger Galaxies*
- Mary Gates Undergraduate Research Symposium - Seattle WA, USA — May 2017
  *Talk: A Spatially Resolved Study of the GRB 020903 Host Complex*
- 229th American Astronomical Society Meeting - Grapevine TX, USA — Jan 2017
  *Poster: A Spatially - Resolved Study of the GRB 020903 Host Complex*

### *Seminars*

- Ringberg Virtual Seminar Series - Virtual — Dec 2020
  *Talk: Spatially Resolved Properties of Post-Merger Galaxies with MaNGA and ALMA*
  *Recording: https://www.youtube.com/watch?v=kXo6dJBb9dc&ab_channel=VirtualRingbergSeminarSeries%2C2020*
- Oxford Galaxy Evolution Seminar - Oxford, UK — Nov 2019
  *Talk: Spatially Resolved Properties of Galaxy Mergers from MaNGA*
- University of Cambridge: Institute of Astronomy Seminar - Cambridge, UK — Oct 2019
  *Talk: Spatially Resolved Properties of Galaxy Mergers from MaNGA*
- UVic Astronomy Summer Seminar Series - Victoria, Canada — June 2018
  *Talk: Resolved Profiles of Star Formation and Metallicity in Post-Merger Galaxies from MaNGA*

### *Colloquium*

- CRC 1601: Habitats of Massive Stars Across Cosmic Time - University of Cologne — Dec 2024
  *Talk: Are all starbursts equal? The role of galaxy mergers in shaping unique star-forming conditions*

## Publications

***First Author Contributions***

1. **Thorp, M.D.;** Ellison, S.L.; Galicia, A.;"Are all starbursts equal? Star-formation-rate profiles in merger versus secular starbursts", 2024, A&A, 690, L4.
2. **Thorp, M.D.;** Ellison, S.L.; Pan, H.; Lin, L.; Patton, D. R.; Bluck, A.F.L.; Walters, D.; Scudder, J. M.;"The ALMaQUEST Survey X: What powers merger induced star formation?", 2022, MNRAS, 516, 1462.
3. **Thorp, M.D.;** Bluck, A.F.L.; Ellison, S.L.; Maiolino, R.; Conselice, C.J.; Hani, M.H.; Bottrell, C.; "Towards robust determination of non-parametric morphologies in marginal astronomical data: resolving uncertainties with cosmological hydrodynamical simulations", 2021, MNRAS, 507, 886.
4. **Thorp, M.D.;** Ellison, S.L.; Simard, L.; Sánchez, S.F.; Antonio, B.; "Spatially resolved star formation and metallicity profiles in post-merger galaxies from MaNGA", 2019, MNRAS, 482, L55-59.
5. **Thorp, M.D.** & Levesque, E.; "A spatially resolved study of the GRB 020903 host galaxy", 2018, ApJ, 856, 36.

***27 Co-author publications - details page 4***

## Skills

**Coding Languages:** Python/Jupyter Notebook, SQL, C Shell, IRAF/PYRAF, LaTeX
**Astronomy Specific:** CASA (ALMA data reduction), ALMA Observing Tool, SAOImage DS9, Gemini IRAF (GMOS data reduction), GILDAS (IRAM Interferometry School)

*Other*

- Public Speaking for STEM Topics (general audience & elementary school)
- Planetarium & WorldWide Telescope Presentations
- Educational and Lecturing Techniques (UVic Graduate Student Teaching Pro-D Certificate)
- Database Structuring and Management

## Teaching & Supervising Experience

- Teaching Assistant (University of Victoria) 2017 - 2022
  Astro 102: Exploring the Cosmos, Astro 101: Exploring the Night Sky,
  Astro 150: Concepts in Modern Astronomy, Astro 250: Introduction to Astrophysics
- Astronomy 3xx series class grader (University of Washington) 2016 - 2017
  Astro 321: The Solar System, Astro 322: Content of our Galaxy,
  Astro 323: Extragalactic Astronomy and Cosmology

**Teaching Qualifications**

*LTSI Graduate Student Teaching Pro-D Certificate* 2022
Attended a series of professional development workshops about learning and teaching in higher education, with focuses on inclusivity, interactive learning, and virtual classrooms

*Fall TA Conference Certificate* 2017
Attended six workshops focused on foundational skills for teaching assistants, including lecturing and assessment techniques along with conflict resolution and communication

**Supervision & Mentorship**

- Co-supervised MSc students (University of Bonn)
  Lina Gerlach (2023-2024): "Understanding the molecular gas properties of galaxy merges with little to no star formation"
  Helene Kast (2024-2025): "Evaluating AGN identification with X-ray and resolved optical spectroscopy"
  Minou Greve (2024-2025): "Dense gas relations in NGC 2903"
- Supervised MSc 6-week internship (University of Bonn)
  4 interns (2023 - Present)
- Supervised 2-week school internship (University of Bonn)
  2 interns (2023 - Present)
- Summer Student Supervisor (University of Victoria) May 2022 - Oct 2022
  1st-year undergraduate internship funded by Valerie Kuehne Undergraduate Research Award, resulting in A&A publication.

## Volunteer Experience

- SFB 1601 Collaborative Research Centre: EDI committee member — 2023 - Present
- UVic Astronomy Research Centre Program Management Team: Graduate representative — 2021 - 2022
- Physics and Astronomy Graduate Student Associations: President — 2020 - 2022

*Duties: Organize social and academic events to enrich the university experience of graduate students, and to represent graduate students on a departmental level. As president: form committees to carry out these events, budget expenses, and apply for additional event funding.*

- Organizer and chair, University of Victoria Astronomy Summer Seminar Series — 2018 - 2022
- CUPE 4163 Departmental Steward — 2018 - 2020
- Victoria Nerd Nite Volunteer — 2018 - 2020
- UVic PAGSA Graduate Student Mentor — 2018
- AstronoMay at the Pacific Science Center — 2017
- Theodore Jacobsen Observatory volunteer: Assist at observatory open house and present astronomy based public lectures — 2013 - 2017
- UW Astronomy Club outreach and tutoring (2017 Club President) — 2013 - 2017
- UW planetarium presentations — 2014 - 2017
- Undergraduate representative for UW astronomy undergraduate curriculum committee — 2016 - 2017

## Outreach & Public Presentations

- Astronomy on Tap (Bonn) Presenter - Cosmic cannibals and the chaotic journey of galaxy mergers — Mar 2024
- Public Lecture - Cowichan Valley Starfinders Astronomy Club — Aug 2022
- Public Lecture - Astronomy Day at the Royal BC Museum — May 2022
- Public Lecture - UVic Observatory Open House — Aug 2020
- Victoria Nerd Nite Presenter: Clash of the Galaxies — Apr 2020
- 3 Minute Thesis: UVic Finalist — Jan 2020
  Recording (bottom of page): http://www.astro.uvic.ca/~mallorythorp/
- Public Lecture - University of Cambridge: Institute of Astronomy — Oct 2019
  Recording: https://sms.cam.ac.uk/media/3124250
- Sydney Elementary School Guest Speaker: Intro to Astronomy — Jan 2019 / 2021

## Other Publications

1. Eibensteiner, C., Sun, J., Bigiel, F., et al.; "PHANGS-MeerKAT and MHONGOOSE HI observations of nearby spiral galaxies: Physical drivers of the molecular gas fraction, Rmol", 2024, A&A, 691, A163.
2. Bottrell, C., Hani, M.~H., Teimoorinia, H., et al. "RealSim: Statistical observational realism for synthetic images from galaxy simulations," 2024, Astrophysics Source Code Library. ascl:2407.008
3. Pan, H.A.; Lin L.; Ellison S.L.; **Thorp M.D.;** Sánchez S.F.; Bluck A.F.L.; Belfiore F.; et al.; "The ALMaQUEST Survey. XIII. Understanding Radial Trends in Star Formation Quenching via the Relative Roles of Gas Availability and Star Formation Efficiency", 2024, ApJ, 964, 120.
4. Hogarth L.M.; Saintonge A.; Davis T.A.; Ellison S.L.; Lin L.; López-Cobá C.; Pan H.A.; **Thorp, M.D.;** "The ALMaQUEST Survey XIV: do radial molecular gas flows affect the star-forming ability of barred galaxies?", 2024, MNRAS, 528, 6768
5. Lin, L.; Pan, H.A.; Ellison, S.L.; Harada, N.; Jiménez-Donaire, M. J.; French, K.D.; Baker, W. M.; Hsieh, B.C.; Koyama, Y.; López-Cobá, C.; Michiyama, T.; Rowlands, K.; Sánchez, S. F.; **Thorp, M. D.;** "The ALMaQUEST Survey. XII. Dense Molecular Gas as Traced by HCN and HCO+ in Green Valley Galaxies", 2024, ApJ, 963, 115.
6. Ellison, S.L.; Pan, H.A.; Bluck, A.F.L.; Krumholz, M.R.; Lin, L.; Hunt, L.; Corbelli, E.; **Thorp, M.D.;** Barrera-Ballesteros, J.; Sánchez, S.F.; Scudder, J.M.; Quai, S. "The ALMaQUEST Survey XI: a strong but non-linear relationship between star formation and dynamical equilibrium pressure", 2024, MNRAS, 527, 10201.

7. Brown, T.; Roberts I.D.; **Thorp, M.D.;** Ellison S.L.; Zabel N.; Wilson C.D.; Bahé Y.M.; et al.; "VERTICO. VII. Environmental Quenching Caused by the Suppression of Molecular Gas Content and Star Formation Efficiency in Virgo Cluster Galaxies", 2023, ApJ, 956, 37.
8. Roberts, I.D.; Brown, T.; Zabel, N.; Wilson, C.D.; Chung, A.; Parker, L. C.; Bisaria, D.; Boselli, A.; Catinella, B.; Chown, R.; Cortese, L.; Davis, T.A.; Ellison, S.; Jiménez-Donaire, M.J.; Lee, B.; Smith, R.; Spekkens, K.; Stevens, A. R. H.; **Thorp, M.D.**; Villanueva, V.; Watts, A.B.; Welker, C.; Yoon, H.; "VERTICO. VI. Cold-gas asymmetries in Virgo cluster galaxies", 2023, A&A, 675, A78.
9. Watts A.B.; Cortese L.; Catinella B.; Brown T.; Wilson C.D.; Zabel N.; Roberts I.D.; Davis, T.A. ;Thorp, M.D.; et al.; "VERTICO V: The environmentally driven evolution of the inner cold gas discs of Virgo cluster galaxies", 2023, PASA, 40, e017
10. Jiménez-Donaire, M. J. ; Brown, T. ; Wilson, C. D. ; Roberts, I. D. ; Zabel, N. ; Ellison, S. L. ; **Thorp, M.D.** ; Villanueva, V. ; Chown, R. ; Bisaria, D. ; Bolatto, A. D. ; Boselli, A. ; Catinella, B. ; Chung, A. ; Cortese, L. ; Davis, T. A. ; Lagos, C. D. P. ; Lee, B. ; Parker, L. C. ; Spekkens, K. ; Stevens, A. R. H. ; Sun, J.; "VERTICO III: The Kennicutt-Schmidt relation in Virgo cluster galaxies", 2023, A&A, 671, A3.
11. Villanueva, V.; Bolatto, A. D.; Vogel, S.; Brown, T.; Wilson, C. D.; Zabel, N.; Ellison, S.; Stevens, A. R. H.; Jimenez Donaire, M. J.; Spekkens, K.; **Thorp, M.D**.; Davis, T. A.; Parker, L. C ; Roberts, I. D.; Bisaria, D.; Boselli, A.; Catinella, B.; Chung, A.; Cortese, L.; Lee, B.; Watts, A.; "VERTICO IV: Environmental Effects on the Gas Distribution and Star Formation Efficiency of Virgo Cluster Spirals", 2023, ApJ accepted.
12. Baker, W. M. ; Maiolino, R. ; Belfiore, F. ; Bluck, A. F. L. ; Curti, M. ; Wylezalek, D. ; Bertemes, C. ; Bothwell, M. S. ; Lin, L. ; **Thorp, M.D.** ; Pan, H.; "The molecular gas main sequence and Schmidt-Kennicutt relation are fundamental, the star-forming main sequence is a (useful) byproduct", 2023, MNRAS, 518, 4767.
13. Baker, W. M.; Maiolino, R.; Belfiore, F.; Curti, M.; Bluck, A. F. L.; Lin, L.; Ellison, S. L.; **Thorp, M.D.** ; Pan, H.; "The metallicity's fundamental dependence on both local and global galactic quantities", 2023, MNRAS, 519, 1149.
14. Su, Y.C.; Lin, L.; Pan, H.; Cobá, C.L.; Hsieh, B.C.; Sánchez, S. F.; **Thorp, M.D.;** Bureau, M.; Ellison, S.L.; Li, C.; "The ALMaQUEST survey. VIII. What causes the velocity discrepancy between CO and Hα rotation curves in galaxies?", 2022, ApJ, 934, 19.
15. Zabel, N.; Brown, T.; Wilson, C. D.; Davis, T. A.; Cortese, L.; Parker, L. C.; Boselli, A.; Catinella, B.; Chown, R.; Chung, A.; Deb, T.; Ellison, S. L.; Jiménez-Donaire, M. J.; Lee, B.; Roberts, I. D.; Spekkens, K.; Stevens, A. R. H.; **Thorp, M. D.;** Tonnesen, S.; Villanueva, V.; "VERTICO II: effects of HI-identified environmental mechanisms on molecular gas", 2022, ApJ, 933, 17.
16. Baker, W. M.; Maiolino, R.; Bluck, A.F.L.; Lin, L.; Ellison, S. L.; Belfiore, F.; Pan, H.; **Thorp, M.D.;** "The ALMaQUEST survey IX: the nature of the resolved star forming main sequence", 2022, MNRAS, 510, 3622.
17. Bluck, A.F.L.; Maiolino, R.; Brownson, S.; Conselice, C.J.; Ellison, S.L.; Piotrowska, J.M.; **Thorp, M.D.;** "The quenching of galaxies, bulges, and disks since cosmic noon. A machine learning approach for identifying causality in astronomical data", 2022, A&A, 659, A160.
18. Lin, L.; Ellison, S.L.; Pan, H.-A.; **Thorp, M.D.;** Yu, P.C.; Belfiore, F.; Hsieh, B.-C.; et al.; "The ALMaQUEST Survey. VII. Star Formation Scaling Relations of Green Valley Galaxies", 2022, ApJ, 926, 175.
19. Brown, T.; Wilson, C.D.; Zabel, N.; Davis, T.A.; Boselli, A.; Chung, A.; Ellison, S.L.; Lagos, C.D.P.; Stevens, A.R.H.; Cortese,L.; Bahé, Y.M.; Bisaria, D.; Bolatto, A. D.; Cashmore, C. R.; Catinella, B.; Chown, R.; Diemer, B,; Elahi, P. J.; Hani, M. H.; Jiménez-Donaire, M. J.; Lee, B.; Leidig, K.; Mok, A.; Olsen, K. P.; Parker, L. C.; Roberts, I. D.; Smith, R.; Spekkens, K.; **Thorp, M.D.;** Tonnesen, S.; Vienneau, E.; Villanueva, V.; Vogel, S. N.; Wadsley, J.; Welker, C.; Yoon, H.; "VERTICO: The Virgo Environment Traced in CO Survey", 2021, ApJS, 257, 21.
20. Ellison, S.L.; Lin, L.; **Thorp, M.D.;** Pan, H.-A.; Sánchez, S.F.; Bluck, A.F.L.; Belfiore, F.; "The ALMaQUEST survey - VI. The molecular gas main sequence of 'retired' regions in galaxies", 2021, MNRAS, 502, L6.
21. Ellison, S.L.; Lin, L.; **Thorp, M.D.;** Pan, H.-A.; Scudder, J.M.;; Sánchez, S.F.; Bluck, A.F.L.; et al.; "The ALMaQUEST Survey - V. The non-universality of kpc-scale star formation relations and the factors that drive them", 2021, MNRAS, 501, 4777.

22. Bluck, A.F.L.;; Maiolino, R.; Piotrowska, J.M.; Trussler, J.; Ellison, S.L.; Sánchez, S.F.; **Thorp, M.D.;** et al.; "How do central and satellite galaxies quench? - Insights from spatially resolved spectroscopy in the MaNGA survey", 2020, MNRAS, 499, 230.
23. Lin, L.; Ellison, S.L.; Pan, H.-A.; **Thorp, M.D.;** Su, Y.-C.; Sánchez, S.F.; Belfiore, F.; et al.; "ALMaQUEST. IV. The ALMA-MaNGA QUEnching and STar Formation (ALMaQUEST) Survey", 2020, ApJ, 903, 145.
24. Ellison, S.L.; **Thorp, M.D.;** Lin, L.; Pan, H.-A.; Bluck, A.F.L.; Scudder, J.M.; Teimoorinia, H.;;et al.; "The ALMaQUEST survey - III. Scatter in the resolved star-forming main sequence is primarily due to variations in star formation efficiency", 2020, MNRAS, 493, L39.
25. Ellison, S.L.; **Thorp, M.D.;** Pan, H.-A.; Lin, L.; Scudder, J.M.; Bluck, A.F.L.; Sánchez, S.F.; et al.; "The ALMaQUEST Survey - II. What drives central starbursts at z ~ 0?", 2020, MNRAS, 492, 6027.
26. Bluck, A.F.L.; Maiolino, R.; Sánchez, S.F.; Ellison, S.L.; **Thorp, M.D.;** Piotrowska, J.M.; Teimoorinia, H.; et al.; "Are galactic star formation and quenching governed by local, global, or environmental phenomena?", 2020, MNRAS, 492, 96.
27. Bottrell, C.; Hani, M. H.; Teimoorinia, H.; Ellison, S. L.; Moreno, J.; Torrey, P.; Hayward, C. C.; **Thorp, M.D.**; Simard, L.; Hernquist, L.; "Deep learning predictions of galaxy merger stage and the importance of observational realism", 2019, MNRAS, 490, 5390.
28. Lin, L.; Pan, H.-A.; Ellison, S. L.; Belfiore, F.; Shi, Y.; Sánchez, S. F.; Hsieh, B.-C.; Rowlands, K.; Ramya, S.; **Thorp, M. D.;** Li, C.; Maiolino, R.; "The ALMaQUEST Survey: The Molecular Gas Main Sequence and the Origin of the Star-forming Main Sequence", 2019, ApJL, 884, L33.
29. Woodruff, S.; **Thorp, M.D.;** Tovar, G.; Look, J.; "Modern observations using the 1702 Meridian Line of the Basilica of Santa Maria degli Angeli e dei Martiri (Rome)". The British Sundial Society: Bulletin, vol. 29(3), pp. 2 - 12. September 2017.