

# Ryan Chown

Postdoctoral Scholar

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## INTERESTS AND EXPERTISE

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The interstellar medium (gas, dust, PAHs) and star formation in nearby galaxies and the Milky Way. Infrared (imaging and integral-field spectroscopy) and sub-mm/radio observations particularly with *JWST*, ALMA and the VLA.

## EDUCATION

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**McMaster University** Hamilton, ON  
Ph.D. Astronomy 08/2021  
**Thesis:** *Multi-wavelength studies of the interstellar medium and star formation in nearby galaxies*  
**Advisors:** Prof. Christine D. Wilson and Prof. Laura Parker  
Finalist, J. S. Plaskett Medal for Most Outstanding PhD Thesis, Canada

**McGill University** Montreal, QC  
M.Sc. Physics 05/2015 - 05/2017  
**Thesis:** *Mapping the Millimeter-wave Sky with Combined South Pole Telescope and Planck Data*  
**Advisor:** Prof. Gil Holder

**McGill University** Montreal, QC  
B.Sc. Physics, with a Minor in Computer Science 09/2012 - 04/2015

## ACADEMIC POSITIONS

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**The Ohio State University** Columbus, OH  
Postdoctoral Scholar 10/2023-  
**The University of Western Ontario** London, ON  
Postdoctoral Scholar 10/2021-09/2023

## AWARDS

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Visiting Scholar, Tsinghua University, Beijing, China	2019
Mitacs Globalink Research Award	2018
McMaster Graduate Fellowship	2018
McGill University Graduate Excellence Award in Physics	2015 and 2016
Carl Reinhardt Fellowship	2015
McGill and Novelis Global Technologies Summer Research Award	2014
McGill Summer Research Award	2013 and 2015

## COLLABORATIONS

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The Physics at High Angular Resolution in Nearby Galaxies (PHANGS) Collaboration <a href="http://www.phangs.org">http://www.phangs.org</a>	10/2023-
The Local Group L-Band Survey Collaboration <a href="https://www.lglbs.org">https://www.lglbs.org</a>	10/2023-
PDRs4All: Radiative Feedback from Massive Stars as Traced by Multiband Imaging and Spectroscopic Mosaics – A JWST Early Release Science (ERS) Program <a href="https://pdrs4all.org">https://pdrs4all.org</a>	10/2021-
The Virgo Environment Traced in CO survey (VERTICO; an ALMA Large Program) <a href="https://sites.google.com/view/verticosurvey/home">https://sites.google.com/view/verticosurvey/home</a>	2019-2022
The JCMT Dust & Gas in Nearby Galaxies Legacy Survey (JINGLE) <a href="https://www.eaobservatory.org/jcmt/science/large-programs/jingle/">https://www.eaobservatory.org/jcmt/science/large-programs/jingle/</a>	2017-2021
The South Pole Telescope Collaboration <a href="https://pole.uchicago.edu/public/Home.html">https://pole.uchicago.edu/public/Home.html</a>	2013-2017

## RESEARCH SUPERVISION EXPERIENCE

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NOTES: \* indicates that I was the primary (informal) supervisor

† = student held a MITACS Globalink Research Award

5. *†Rajarshi Choudhury, <i>Indian Inst. of Sci. Ed. and Research Bhopal (undergraduate)</i>	2023
4. †Arnab Chowhan, <i>Centre for Excellence in Basic Sciences, Mumbai (undergraduate)</i>	2023
3. *†Raphaela Kestler, <i>Durham University (undergraduate)</i>	2022
2. *†Holly Raynor, <i>Durham University (undergraduate)</i>	2022
1. *Khaleda Ramzi, <i>Western University Work-Study Program (undergraduate)</i>	2022

## TEACHING EXPERIENCE

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PHYS 1AA3 Teaching Assistant <i>Introduction to Modern Physics</i>	McMaster 2020
PHYS 1A03 Teaching Assistant <i>Introductory Physics</i>	McMaster 2018, 2019, 2020
PHYS 1E03 Teaching Assistant <i>Waves, Electricity, and Magnetic Fields</i>	McMaster 2018
ASTRO 1F03 Teaching Assistant <i>Astronomy and Astrophysics</i>	McMaster 2017, 2021
ASTRO 2C03 Teaching Assistant <i>Big Questions</i>	McMaster 2017, 2021
PHYS 183 Teaching Assistant <i>The Milky Way and Beyond</i>	McGill 2016 and 2017

PHYS 230 Teaching Assistant  
*Dynamics of Simple Systems*

McGill  
 2015 and 2016

## PROFESSIONAL DEVELOPMENT

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Western Certificate for University Teaching and Learning	January 2024
- An intensive five-component program designed “to enhance the quality of teaching by graduate students and postdoctoral scholars, and to prepare them for a future faculty or professional career”	
- <a href="https://teaching.uwo.ca/programs/certificates/cutl.html">https://teaching.uwo.ca/programs/certificates/cutl.html</a>	
“What makes a great postdoc mentor” – Workshop at UWO (attendee)	January 2022
“Anti-racism for White Academic Labour Folks” – Workshop at UWO (attendee)	March 2022

## PUBLIC TALKS

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4. Public Astro Night, Queen’s University	Kingston, ON
Public talk on star formation and galaxies with JWST	8 June 2024
3. “Are We Alone?” – a talk about searching for life in the Universe with JWST	
Amica Retirement Home in London, Ontario	June 2023
Parkwood Institute for veterans in London, Ontario	January 2023
2. JWebbinar 23: PDRs4All Community Telecon	
Virtual	December 2022
1. “Patterns in the Cosmic Microwave Background”	
Astronomy on Tap, Montreal	May 2017

## OUTREACH

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STEAM Factory, Ohio State University	Columbus, OH
Gave a talk on “stellar birth”	2024
McMaster Undergraduate Physics Society	Hamilton, ON
Organized and gave a seminar on Python for undergraduates in physics at McMaster	2021
Astro McGill	McGill University
Volunteered at public Astro Nights	2016-2017
Physics Matters	McGill University
I created the website for this program to advertise public physics talks being given	2016-2017
Eureka! Science Festival	Montreal, QC
Instructed young kids with a laser maze activity	2015

## INVITED SEMINARS

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7. Astronomy Journal Club, Waterloo Center for Astrophysics, 2 October 2024.
6. Astronomy Seminar, Queen’s University Department of Physics & Astronomy, 13 June 2024.
5. Astronomy Journal Club, McMaster University, 5 November 2023.

4. CANadian Virtual Astronomy Seminar (CANVAS), 30 March 2023.
3. Ringberg Seminar Series, MPIA, Germany, 25 May 2021.
2. Extragalactic Database for Galaxy Evolution Meeting, University of Maryland, USA, 5 May 2021.
1. Shanghai Astronomical Observatory, Shanghai, China, August 2018.

## CONTRIBUTED TALKS

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<i>The Physics and Impact of Astrophysical Dust: Star Formation to Cosmology</i> , Aspen, CO	03/2024
<i>PHANGS Collaboration Meeting</i> , Garching, Germany	02/2024
<i>Illuminating the Dusty Universe: A Tribute to the Work of Bruce Draine</i> , Florence, Italy	10/2023
<i>Symposium on the Life Cycle of Cosmic PAHs</i> , Aarhus University, Denmark	09/2022
<i>KIAA Forum on Gas in Galaxies for Early Career Scientists</i> , Peking University, Beijing	11/2021
<i>238th AAS Meeting – Dissertation Talk</i>	7/2021
<i>Exploring Gas in and Around Galaxies meeting</i> , Tsinghua University, Beijing	7/2018
<i>KIAA Forum on Gas in Galaxies</i> , Peking University, Beijing	6/2018
<i>SDSS Chinese MaNGA Meeting</i> , University of Chinese Academy of Sciences, Beijing	6/2018
<i>South Pole Telescope Collaboration Conference</i> , University of Chicago, IL	7/2017
<i>The Centre for Research in Astrophysics of Quebec (CRAQ) Annual Meeting</i> , Montreal, QC	5/2017
<i>South Pole Telescope Collaboration Conference</i> , University of Chicago, IL	8/2016
<i>South Pole Telescope Collaboration Conference</i> , University of Chicago, IL	7/2015

## CONFERENCE POSTERS

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<i>First Science Results from JWST</i> , STScI, Baltimore	9/2023
<i>Canadian Astronomical Society Annual Conference</i> , York University, Toronto, ON	5/2020
<i>Views on the ISM in galaxies in the ALMA era</i> , University of Bologna, Italy	9/2019
<i>Canadian Astronomical Society Annual Conference</i> , McGill University, Montreal, QC	6/2019

## APPROVED OBSERVING PROPOSALS

### As P.I.:

4. ALMA Cycle 11 (2024.1.01179.S) – “A Complete View of Low Metallicity Star Forming Complexes in the Local Group Dwarf NGC 6822.”
3. JCMT 21A – “Measuring global CO(2-1) to supplement interferometric observations from the EDGE survey.”
2. JCMT 18B – “Observing red star-forming galaxies from xCOLD GASS with SCUBA-2.”
1. JCMT 18A – “Extending the JINGLE RxA Samples to Include ‘Red Misfit’ Galaxies.”

### As Co-I.:

8. HST Cycle 32: “Decoding stellar feedback in action with an HST+MUSE+JWST full-disk survey of starburst galaxy prototype NGC 253.” PI D. Thilker.
7. HST Cycle 32: “Bringing HST to the VLA: The Interaction of Stars and Gas in the Local Group.” PI J. Dalcanton.

6. JWST Cycle 3: “A Systematic Study of the 3.3 - 3.5  $\mu\text{m}$  PAH Features at  $z = 0$  with Archival NIRSpec Observations.” PI K. Sandstrom.
5. ALMA Cycle 9 – “The chemical richness of the Orion Bar and its role as a lab of  $\text{CH}_3\text{CN}$  chemistry in disk-evolved systems.” P.I. F. Alarcón.
4. ALMA Cycle 7 (Large Program) – “The Virgo Environment Traced in CO survey (VERTICO).” P.I. T. Brown.
3. ALMA Cycle 7 – “Mapping CO emission in galaxies from the JINGLE survey.” P.I. C.D. Wilson.
2. JCMT 20A (Large Program) – “JINGLE at the edge: the ISM of starbursts and green valley galaxies.” P.I. L.-H. Lin.
1. JCMT 19B – “Observing CO(2-1) in Red Star-forming Galaxies.” P.I. L.-H. Lin.

## PUBLICATIONS

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*Overall summary: 55 peer-reviewed papers; 822 citations; h-index=23*

### A. Papers in preparation

1. **Chown, R., et al.**, *PDRs4All XI. Empirical prescriptions for the interpretation of JWST imaging observations of star-forming regions.* To be submitted to A&A.

### B. First or second author papers

*Summary: 9 papers, 200 citations as of October, 2024.*

9. **Chown, R., et al.**, *Relationships between PAHs, Small Dust Grains,  $\text{H}_2$ , and  $\text{H I}$  in Local Group Dwarf Galaxies NGC 6822 and WLM Using JWST, ALMA, and the VLA.* Submitted to ApJ.
8. **Chown, R., et al.**, *Polycyclic Aromatic Hydrocarbon and CO(2-1) Emission at 50-150 pc Scales in 66 Nearby Galaxies.* Submitted to ApJ. arXiv e-prints (2024): arXiv:2410.05397
7. **Chown, R., et al.**, *PDRs4All. IV. An embarrassment of riches: Aromatic infrared bands in the Orion Bar.* A&A 685 (2024): A75
6. **Chown, R., et al.**, *The cold gas and dust properties of red star-forming galaxies.* MNRAS 516 (2022): 84-99
5. **Chown, R., et al.**, *A new estimator of resolved molecular gas in nearby galaxies.* MNRAS 500 (2021): 1261-1278
4. **Chown, R., et al.**, *Linking bar- and interaction-driven molecular gas concentration with centrally enhanced star formation in EDGE-CALIFA galaxies.* MNRAS 484 (2019): 5192-5211
3. **Chown, R., et al.**, *Maps of the Southern Millimeter-wave Sky from Combined 2500  $\text{deg}^2$  SPT-SZ and Planck Temperature Data.* ApJS 239 (2018): 10
2. Omori, Y., **Chown, R., et al.**, *A 2500  $\text{deg}^2$  CMB Lensing Map from Combined South Pole Telescope and Planck Data.* ApJ 849 (2017): 124
1. Crawford, T., **Chown, R., et al.**, *Maps of the Magellanic Clouds from Combined South Pole Telescope and PLANCK Data.* ApJS 227 (2016): 23

### C. Other papers with significant contributions during or after PhD

*Summary: 30 papers, 204 citations as of October, 2024.*

30. Pingel, N., *et al.*, *The Local Group L-band Survey: The First Measurements of Localized Cold Neutral Medium Properties in the Low-metallicity Dwarf Galaxy NGC 6822*. *ApJ* 974 (2024): 93
29. Chastenet, J., *et al.*, *The Resolved Behavior of Dust Mass, Polycyclic Aromatic Hydrocarbon Fraction, and Radiation Field in ~800 Nearby Galaxies*. *arXiv e-prints* (2024): arXiv:2410.03835
28. Sarbadhicary, S., *et al.*, *A First-look at Spatially-resolved Infrared Supernova Remnants in M33 with JWST*. *arXiv e-prints* (2024): arXiv:2410.11821
27. Goicoechea, J., *et al.*, *PDRs4All: X. ALMA and JWST detection of neutral carbon in the externally irradiated disk d203-506: Undepleted gas-phase carbon*. *A&A* 689 (2024): L4
26. Sutter, J., *et al.*, *The Fraction of Dust Mass in the Form of Polycyclic Aromatic Hydrocarbons on 10–50 pc Scales in Nearby Galaxies*. *ApJ* 971 (2024): 178
25. Williams, T., *et al.*, *PHANGS-JWST: Data-processing Pipeline and First Full Public Data Release*. *ApJS* 273 (2024): 13
24. Mayker Chen, N., *et al.*, *H $\alpha$  Emission and H II Regions at the Locations of Recent Supernovae in Nearby Galaxies*. *AJ* 168 (2024): 5
23. Fuente, A., *et al.*, *PDRs4All. IX. Sulfur elemental abundance in the Orion Bar*. *A&A* 687 (2024): A87
22. Van De Putte, D., *et al.*, *PDRs4All. VIII. Mid-infrared emission line inventory of the Orion Bar*. *A&A* 687 (2024): A86
21. Elyajouri, M., *et al.*, *PDRs4All. V. Modelling the dust evolution across the illuminated edge of the Orion Bar*. *A&A* 685 (2024): A76
20. Schroetter, I., *et al.*, *PDRs4All. VII. The 3.3  $\mu$ m aromatic infrared band as a tracer of physical properties of the interstellar medium in galaxies*. *A&A* 685 (2024): A78
19. Pasquini, S., *et al.*, *PDRs4All. VI. Probing the photochemical evolution of PAHs in the Orion Bar using machine learning techniques*. *A&A* 685 (2024): A77
18. Zannese, M., *et al.*, *OH as a probe of the warm-water cycle in planet-forming disks*. *Nature Astronomy* 8 (2024): 577-586
17. Peeters, E., *et al.*, *PDRs4All: III. JWST’s NIR spectroscopic view of the Orion Bar*. *A&A* 685 (2024): A74
16. Habart, E., *et al.*, *PDRs4All. II. JWST’s NIR and MIR imaging view of the Orion Nebula*. *A&A* 685 (2024): A73
15. Berné, O., *et al.*, *A far-ultraviolet–driven photoevaporation flow observed in a protoplanetary disk*. *Science* 383 (2024): 988-992
14. Teng, Y., *et al.*, *Star Formation Efficiency in Nearby Galaxies Revealed with a New CO-to-H<sub>2</sub> Conversion Factor Prescription*. *ApJ* 961 (2024): 42
13. Pathak, D., *et al.*, *A Two-Component Probability Distribution Function Describes the Mid-IR Emission from the Disks of Star-forming Galaxies*. *AJ* 167 (2024): 39
12. Changala, P., *et al.*, *Astronomical CH<sub>3</sub><sup>+</sup> rovibrational assignments. A combined theoretical and experimental study validating observational findings in the d203-506 UV-irradiated protoplanetary disk*. *A&A* 680 (2023): A19

11. Berné, O., *et al.*, *Formation of the methyl cation by photochemistry in a protoplanetary disk*. *Nature* 621 (2023): 56-59
10. Roberts, I., *et al.*, *VERTICO. VI. Cold-gas asymmetries in Virgo cluster galaxies*. *A&A* 675 (2023): A78
9. Jiménez-Donaire, M., *et al.*, *VERTICO. III. The Kennicutt-Schmidt relation in Virgo cluster galaxies*. *A&A* 671 (2023): A3
8. Leroy, A., *et al.*, *PHANGS-JWST First Results: Mid-infrared Emission Traces Both Gas Column Density and Heating at 100 pc Scales*. *ApJ* 944 (2023): L9
7. Leroy, A., *et al.*, *PHANGS-JWST First Results: A Global and Moderately Resolved View of Mid-infrared and CO Line Emission from Galaxies at the Start of the JWST Era*. *ApJ* 944 (2023): L10
6. Chown, R., *et al.*, *Correction to: The cold gas and dust properties of red star-forming galaxies*. *MNRAS* 518 (2023): 4536-4536
5. Zabel, N., *et al.*, *Erratum: “VERTICO II: How H I-identified Environmental Mechanisms Affect the Molecular Gas in Cluster Galaxies”* (2022, *ApJ*, 933, 10). *ApJ* 942 (2023): 56
4. Gao, Y., *et al.*, *The Correlation between WISE 12  $\mu$ m Emission and Molecular Gas Tracers on Subkiloparsec Scales in Nearby Star-forming Galaxies*. *ApJ* 940 (2022): 133
3. Zabel, N., *et al.*, *VERTICO II: How H I-identified Environmental Mechanisms Affect the Molecular Gas in Cluster Galaxies*. *ApJ* 933 (2022): 10
2. Berné, O., *et al.*, *PDRs4All: A JWST Early Release Science Program on Radiative Feedback from Massive Stars*. *PASP* 134 (2022): 054301
1. Brown, T., *et al.*, *VERTICO: The Virgo Environment Traced in CO Survey*. *ApJS* 257 (2021): 21

### C. Other papers with significant contributions prior to PhD

Summary: 17 papers, 488 citations as of October, 2024.

17. Sánchez, J., *et al.*, *Mapping gas around massive galaxies: cross-correlation of DES Y3 galaxies and Compton-y maps from SPT and Planck*. *MNRAS* 522 (2023): 3163-3182
16. Omori, Y., *et al.*, *Joint analysis of Dark Energy Survey Year 3 data and CMB lensing from SPT and Planck. I. Construction of CMB lensing maps and modeling choices*. *Phys. Rev. D* 107 (2023): 023529
15. Abbott, T., *et al.*, *Joint analysis of Dark Energy Survey Year 3 data and CMB lensing from SPT and Planck. III. Combined cosmological constraints*. *Phys. Rev. D* 107 (2023): 023531
14. Chang, C., *et al.*, *Joint analysis of Dark Energy Survey Year 3 data and CMB lensing from SPT and Planck. II. Cross-correlation measurements and cosmological constraints*. *Phys. Rev. D* 107 (2023): 023530
13. Anbajagane, D., *et al.*, *Shocks in the stacked Sunyaev-Zel’dovich profiles of clusters II: Measurements from SPT-SZ + Planck Compton-y map*. *MNRAS* 514 (2022): 1645-1663
12. Salvati, L., *et al.*, *Combining Planck and SPT Cluster Catalogs: Cosmological Analysis and Impact on the Planck Scaling Relation Calibration*. *ApJ* 934 (2022): 129
11. Bleem, L., *et al.*, *CMB/kSZ and Compton-y Maps from 2500 deg<sup>2</sup> of SPT-SZ and Planck Survey Data*. *ApJS* 258 (2022): 36

10. Omori, Y., *et al.*, *Dark Energy Survey Year 1 Results: Cross-correlation between Dark Energy Survey Y1 galaxy weak lensing and South Pole Telescope+Planck CMB weak lensing*. Phys. Rev. D 100 (2019): 043517
9. Omori, Y., *et al.*, *Dark Energy Survey Year 1 Results: Tomographic cross-correlations between Dark Energy Survey galaxies and CMB lensing from South Pole Telescope +Planck*. Phys. Rev. D 100 (2019): 043501
8. Prat, J., *et al.*, *Cosmological lensing ratios with DES Y1, SPT, and Planck*. MNRAS 487 (2019): 1363-1379
7. Mocanu, L., *et al.*, *Consistency of cosmic microwave background temperature measurements in three frequency bands in the 2500-square-degree SPT-SZ survey*. J. Cosmology Astropart. Phys. 2019 (2019): 038
6. Abbott, T., *et al.*, *Dark Energy Survey year 1 results: Joint analysis of galaxy clustering, galaxy lensing, and CMB lensing two-point functions*. Phys. Rev. D 100 (2019): 023541
5. Simard, G., *et al.*, *Constraints on Cosmological Parameters from the Angular Power Spectrum of a Combined 2500 deg<sup>2</sup> SPT-SZ and Planck Gravitational Lensing Map*. ApJ 860 (2018): 137
4. Hou, Z., *et al.*, *A Comparison of Maps and Power Spectra Determined from South Pole Telescope and Planck Data*. ApJ 853 (2018): 3
3. Aylor, K., *et al.*, *A Comparison of Cosmological Parameters Determined from CMB Temperature Power Spectra from the South Pole Telescope and the Planck Satellite*. ApJ 850 (2017): 101
2. Baxter, E., *et al.*, *Joint measurement of lensing-galaxy correlations using SPT and DES SV data*. MNRAS 461 (2016): 4099-4114
1. Soergel, B., *et al.*, *Detection of the kinematic Sunyaev-Zel'dovich effect with DES Year 1 and SPT*. MNRAS 461 (2016): 3172-3193

#### **D. Abstracts in proceedings**

1. **R. Chown**, et al. "PDRs4All IV. An embarrassment of riches: the Aromatic Infrared Bands in the Orion Bar." AstroPAH Newsletter, 104 (December 2023).
2. **R. Chown**, et al. "The Relationship Between Mid-infrared and CO Emission at kpc Scales in Nearby Galaxies." Bulletin of the American Astronomical Society, Vol. 53, No. 6 (2021).
3. T. Brown, et al. (incl. **R. Chown**) "VERTICO: Virgo Environment Traced In CO." Scientific Meeting of the Spanish Astronomical Society, 13-15 July 2020.