Ryan Chown

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Interests and expertise

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

Education

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

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

Awards

Visiting Scholar, Tsinghua University, Beijing, China	2019
Mitacs Globalink Research Award	2018
McMaster Graduate Fellowship	2018
McGill University Graduate Excllence 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

The Physics at High Angular Resolution in Nearby GalaxieS (PHANGS) Collaboration 10/2023-
http://www.phangs.org

The Local Group L-Band Survey Collaboration 10/2023-
https://www.lglbs.org

PDRs4All: Radiative Feedback from Massive Stars as Traced by Multiband Imaging and Spectroscopic Mosaics – A JWST Early Release Science (ERS) Program 10/2021-
https://pdrs4all.org

The Virgo Environment Traced in CO survey (VERTICO; an ALMA Large Program) 2019-2022
https://sites.google.com/view/verticosurvey/home

The JCMT Dust & Gas in Nearby Galaxies Legacy Survey (JINGLE) 2017-2021
https://www.eaobservatory.org/jcmt/science/large-programs/jingle/

The South Pole Telescope Collaboration 2013-2017
https://pole.uchicago.edu/public/Home.html

Research Supervision Experience

Notes: * indicates that I was the primary (informal) supervisor
† = student held a MITACS Globalink Research Award

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

Teaching Experience

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

PHYS 230 Teaching Assistant — McGill
Dynamics of Simple Systems — 2015 and 2016

Professional Development

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"
- `https://teaching.uwo.ca/programs/certificates/cutl.html`

"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

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

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

9. Astro Tea talk, Indiana University, Bloomington, 27 January 2025.
8. PHANGS Colloquium, 27 November 2024.
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

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

Conference Posters

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

Approved Observing Proposals

As P.I.:

4. ALMA Cycle 11 (2024.1.01179.S, B-ranked) – "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.:

12. ALMA Cycle 11: "Linking Molecular Cloud Structure to Massive Star Formation: 5000 molecular clouds, filaments, and bubbles across M33." PI: E. Koch.

11. ALMA Cycle 11: "Completing the Virgo High-resolution CO 2-1 Survey: Dissecting Galaxy Quenching with Molecular Cloud Scale Micro-physics". PI: J. Sun.
10. ALMA Cycle 11: "The Last Refuge of CO and PAH Emission in the Most Metal Poor Galaxies." PI E. Tarantino.
9. 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.
8. HST Cycle 32: "Bringing HST to the VLA: The Interaction of Stars and Gas in the Local Group." PI J. Dalcanton.
7. ALMA Cycle 10: "Virgo High-resolution CO(2-1) Survey: Dissecting Galaxy Quenching with Molecular Cloud Scale 'Micro-physics'". PI: J. Sun.
6. JWST Cycle 3: "A Systematic Study of the 3.3 - 3.5 μm 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 CH_3CN 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

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

A. Papers in preparation

1 **Chown, R.**, *et al.*, *Relationships between PAHs, Small Dust Grains, H_2, and* HI *in Local Group Dwarf Galaxies NGC 6822 and WLM Using JWST, ALMA, and the VLA*. Submitted to ApJ.

A. First or second author papers

*Summary: **9** papers, **200** citations as of March, 2025.*

9. **Chown, R.**, *et al.*, *PDRs4All XI. Empirical prescriptions for the interpretation of JWST imaging observations of star-forming regions*. Submitted to A&A.
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 deg^2 SPT-SZ and Planck Temperature Data*. ApJS 239 (2018): 10

2. Omori, Y., **Chown, R.**, *et al.*, *A 2500 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

B. Other papers with significant contributions during or after PhD

*Summary: **30** papers, **204** citations as of March, 2025.*

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.*, *Hα 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 μm 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_2 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_3^+ 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 μm 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 March, 2025.*

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^2 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+P l a n c k 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^2 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.