

# Dongwoo Chung

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**Current position:** CITA–Dunlap Institute Senior Research Fellow, University of Toronto

## EDUCATION

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**PhD in Physics**, Stanford University 2014–2020

*Thesis:* Line-intensity mapping with the CO Mapping Array Pathfinder and beyond

*Advisor:* Prof Sarah Church

**AB in Physics**, Princeton University (*magna cum laude*) 2010–2014

*Thesis:* Characterization of a microwave SQUID multiplexer *Advisor:* Prof Lyman Page

## RESEARCH

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*Interests:* spectral line-intensity mapping; cosmic star-formation history, galaxy formation, epoch of reionisation; galaxy–halo connection; structure formation; statistical probes of non-Gaussian information; radio/mm-wave instrumentation and observational techniques.

*Experience (selected):*

**CITA–Dunlap Institute Research Fellow**, University of Toronto Nov 2020–present

- COMAP: signal forecasting, analysis and interpretation of early science results
- TIME: part of site team for 2021–22 season; instrument support, analysis of calibration and commissioning observations, simulations of signal observations
- CCAT: continued work on [C II] halo models and survey projections
- Advisory discussions on simulations, analysis with SPT-SLIM, EXCLAIM teams

**Research assistant w/ Prof Sarah Church**, Stanford University Mar 2015–Sep 2020

- Argus: commissioning of W-band focal plane array for Green Bank Telescope
- COMAP: signal forecasting, commissioning data analysis, and miscellaneous hardware/software tasks for dedicated  $z \sim 3$  CO line-intensity mapping instrument
- CCAT: signal and sensitivity forecasting for [C II] line-intensity survey

**Student researcher in Gravity Group**, Princeton University *intermittent, 2011–2014*

(w/ Prof Suzanne Staggs 2011–2012, w/ Prof Lyman Page 2013–2014)

- Demonstration of microwave SQUID multiplexer in basic cryogenic operation
- Measurement of MuSE bolometer frequency-dependent impedance
- Recording and analysis of SQUID bias noise in ACTPol lab tests

## TEACHING AND MENTORING (SELECTED)

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**Summer undergraduates mentored:** (\* *supervised project resulted in publication/preprint*)

- Natalie Faraj (U of Toronto, CITA SURF) May–Aug 2023
- Patrick Horlavage\* (McGill, CITA SURF; co-sup. w/ Prof J R Bond) May–Aug 2022
- Ishika Bangari\* (U of Toronto; SURP 2021 poster hon. mention) Jun–Aug 2021
- Lisa Nasu-Yu (U of Toronto; co-supervised w/ Prof Abigail Crites) Jun–Aug 2021
- Meredie Cohen (Brown, worked at Stanford; co-sup. w/ Prof S Church) Jun–Aug 2018

**Stanford teaching assistantships:**

- Electricity, Magnetism, and Optics Lab (PHYSICS 24) Jan–Mar 2019
- Introduction to Modern Physics (PHYSICS 70) Sep–Dec 2016
- Electricity and Magnetism Lab (PHYSICS 44) Mar–Jun 2015

## AWARDS AND HONOURS

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<b>Vincent and Beatrice Tremaine Postdoctoral Fellowship</b> , CITA, U of Toronto	2022–2023
<b>CITA &amp; Dunlap Postdoctoral Fellowships</b> , University of Toronto	2020–2025
<b>KIPAC Giddings Graduate Student Fellowship</b> , Stanford University	2014–2015
<b>Allen G. Shenstone Prize in Physics</b> , Princeton University	2014
<b>Joseph Henry Fellowship &amp; Treiman Fellowship</b> , Princeton University	2013
<b>Kusaka Memorial Prize in Physics</b> , Princeton University	2012, 2013

## ACADEMIC PRESENTATIONS (SELECTED)

### Invited conference talks and department seminars:

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—Present and Future of Line-Intensity Mapping (MPIA, Garching)	Apr 2023
—SPT-SLIM collaboration meeting (KICP, University of Chicago)	Jul 2022
—New York University, CCPP Astrophysics Seminar	Apr 2022
—Flatiron CCA, Tri-State Cosmology × Data Science	Apr 2022
—Cross-correlations with CHORD Workshop (McGill University, <i>virtual</i> )	Oct 2021
—University of Toronto, CITA seminar	Nov 2020
—Annual CCAT-prime Collaboration Meeting (University of Waterloo, <i>virtual</i> )	Apr 2020
—CfA, Harvard & Smithsonian, Special SMA talk	Dec 2019
—Princeton University, Dept of Astrophysical Sciences, Cosmology seminar	Oct 2019
—CCAT-prime / Chile Workshop (Cerro Calán)	Apr 2019

### Contributed presentations and informal seminars:

—Stanford/SLAC, KIPAC@20 conference	Sep 2023
—UCSB, Dept of Physics, Astro Lunch	Feb 2023
—KITP, Co-evolution of the Cosmic Web and Galaxies across Cosmic Time	Feb 2023
—Caltech, Dept of Astronomy, Astronomy Tea talk ( <i>virtual</i> )	Oct 2022
—Cornell University, Dept of Astronomy, Galaxy lunch	Sep 2022
—University of Toronto, Pan-Canadian EoR Focus Group	Jan 2023
—McGill University, CMB+EoR workshop	Jul 2022
—Stanford University, KIPAC Tea talk	Jun 2022
—AAS 240th Meeting (Pasadena, California)	Jun 2022
—CASCA 2022 Annual General Meeting (University of Waterloo, <i>virtual</i> )	May 2022
—Annual CCAT-prime/FYST Collaboration Meeting (Cornell/Köln, <i>virtual</i> )	Apr 2022
—University of Chicago, KICP Line-intensity Mapping Workshop ( <i>virtual</i> )	Jun 2021
—Johns Hopkins University, Dept of Phys & Astro, Cosmology/HEP seminar	Oct 2019
—Cornell University, Dept of Astronomy, Astrophysics lunch	Oct 2019
—Aix-Marseille Université, ‘L2S2’ (Lines in the LSS) conf. ( <i>two talks</i> )	Jul 2019
—U. of Virginia, Radio/mm Astrophysical Frontiers in the Next Decade ( <i>poster</i> )	Jun 2019
—Aspen Ctr for Phys, Cosmological Signals from Cosmic Dawn to the Present	Feb 2018
—Johns Hopkins University, Second Annual Intensity Mapping Workshop	Jun 2017

## OUTREACH AND SERVICE (SELECTED)

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<b>CITA Pan-Canadian Reionisation Workshop co-organiser</b>	Aug 2023
<b>UofT Astronomy Community Climate Committee</b>	2022–present
<b>UofT DADDAA Graduate Admissions Committee</b>	2021–2022
<b>CITA National Jamboree co-organiser</b>	2021, 2022, 2023
<b>UofT Astronomy and Space Exploration Society ‘Star Talk’ speaker</b>	Aug 2021
<b>Stanford Physics Equity and Inclusion Committee</b>	2017–2019
<b>Kavli Institute for Particle Astrophys. and Cosmology (KIPAC) Outreach</b>	2015–2019
<i>Referee service: ApJ (2020), MNRAS (2022), Phys Rev D (2023)</i>	

## LIST OF PUBLICATIONS, PREPRINTS, AND PROCEEDINGS

(*names set in bold type: mentored student leading or co-leading publication/preprint work*)

**First-author, refereed:** (*in reverse order of preprint announcement*)

1. Chung, D. T., Chluba, J., & Breysse, P. C., ‘Carbon monoxide and ionized carbon line emission global signals: foregrounds and targets for absolute microwave spectrometry’, 2023, submitted to Phys Rev D [arXiv:2311.03297]
2. Chung, D. T., ‘Constraining the halo-ISM connection through multi-transition carbon monoxide line-intensity mapping’, 2023, submitted to JCAP [arXiv:2309.03184]
3. Chung, D. T., **Bangari, I.**, Breysse, P. C., Ihle, H. T. et al. (COMAP Collaboration), ‘The deconvolved distribution estimator: enhancing reionisation-era CO line-intensity mapping analyses with a cross-correlation analogue for one-point statistics’, 2023, MNRAS, 520, 5305 [DOI: 10.1093/mnras/stad359]
4. Chung, D. T., ‘Leveraging cross-correlations and linear covariance-based filtering for line-intensity map reconstructions at linear scales’, 2023, Phys Rev D, 107, 023509 [DOI: 10.1103/PhysRevD.107.023509]
5. Chung, D. T., ‘Exploration of 3D wavelet scattering transform coefficients for line-intensity mapping measurements’, 2022, MNRAS, 517, 2 [DOI: 10.1093/mnras/stac2662]
6. Chung, D. T., ‘Cross-correlations between mm-wave line-intensity mapping and weak lensing surveys: preliminary consideration of long-term prospects’, 2022, MNRAS, 513, 4090 [DOI: 10.1093/mnras/stac1142]
7. Chung, D. T. et al. (COMAP Collaboration), ‘COMAP Early Science: V. Constraints and Forecasts at  $z \sim 3$ ’, 2022, ApJ, 933, 186 [DOI: 10.3847/1538-4357/ac63c7]
8. Chung, D. T. et al. (COMAP Collaboration), ‘A model of spectral line broadening in signal forecasts for line-intensity mapping experiments’, 2021, ApJ, 923, 188 [DOI: 10.3847/1538-4357/ac2a35]
9. Chung, D. T., ‘A partial inventory of observational anisotropies in line-intensity mapping’, 2019, ApJ, 881, 149 [DOI: 10.3847/1538-4357/ab3040]
10. Chung, D. T., Viero, M. P., Church, S. E., & Wechsler, R. H., ‘Forecasting [C II] line-intensity mapping measurements between the end of reionization and the epoch of galaxy assembly’, 2020, ApJ, 892, 51 [DOI: 10.3847/1538-4357/ab798f]
11. Chung, D. T., Viero, M. P., Church, S. E., Wechsler, R. H. et al. (COMAP Collaboration), ‘Cross-correlating Carbon Monoxide Line-intensity Maps with Spectroscopic and Photometric Galaxy Surveys’, 2019, ApJ, 872, 186 [DOI: 10.3847/1538-4357/ab0027]
12. Chung, D. T., Li, T. Y., Viero, M. P., Church, S. E., & Wechsler, R. H., ‘On estimation of contamination from hydrogen cyanide in carbon monoxide line intensity mapping’, 2017, ApJ, 846, 60 [DOI: 10.3847/1538-4357/aa8624]

**Contributing author, refereed:**

1. **Horlville, P.**, Chung, D. T., Bond, J. R., & Liang, L., ‘The informativeness of [C II] line-intensity mapping as a probe of the H I content and metallicity of galaxies at the end of reionization’, 2023, submitted to MNRAS [arXiv:2309.15733]
2. Dunne, D. A., Cleary, K. A., Breysse, P. C., Chung, D. T., Ihle, H. T., et al. (COMAP Collaboration), ‘COMAP Early Science: VIII. A Joint Stacking Analysis with eBOSS Quasars’, 2023, submitted to ApJ [arXiv:2304.09832]
3. Liang, L., Feldmann, R., Murray, N., et al. (including Chung, D. T.), ‘[C II] 158  $\mu\text{m}$  emission as an indicator of galaxy star formation rate’, 2023, submitted to MNRAS [arXiv:2301.04149]

4. Breysse, P. C., Chung, D. T., & Ihle, H. T., ‘Characteristic functions for cosmological cross-correlations’, 2023, MNRAS, 525, 1824 [DOI: 10.1093/mnras/stad2350]
5. Viero, M. P., Sun, G., Chung, D. T. et al., ‘The early Universe was dust-rich and extremely hot’, 2022, MNRAS Letters, 516, L30 [DOI: 10.1093/mnras/lsac075]
6. Cleary, K. A., et al. (COMAP Collaboration, including Chung, D. T.), ‘COMAP Early Science: I. Overview’, 2022, ApJ, 933, 182 [DOI: 10.3847/1538-4357/ac63cc]
7. Lamb, J. W., et al. (COMAP Collaboration, including Chung, D. T.), ‘COMAP Early Science: II. Pathfinder Instrument’, 2022, ApJ, 933, 183 [DOI: 10.3847/1538-4357/ac63c6]
8. Foss, M. K., Ihle, H. T. et al. (COMAP Collaboration, including Chung, D. T.), ‘COMAP Early Science: III. CO Data Processing’, 2022, ApJ, 933, 184 [DOI: 10.3847/1538-4357/ac63ca]
9. Ihle, H. T. et al. (COMAP Collaboration, including Chung, D. T.), ‘COMAP Early Science: IV. Power Spectrum Methodology and Results’, 2022, ApJ, 933, 185 [DOI: 10.3847/1538-4357/ac63c5]
10. Rennie, T. J. et al. (COMAP Collaboration, including Chung, D. T.), ‘COMAP Early Science: VI. A First Look at the COMAP Galactic Plane Survey’, 2022, ApJ, 933, 187 [DOI: 10.3847/1538-4357/ac63c8]
11. Breysse, P. C. et al. (COMAP Collaboration, including Chung, D. T. as second author), ‘COMAP Early Science: VII. Prospects for CO Intensity Mapping at Reionization’, 2022, ApJ, 933, 188 [DOI: 10.3847/1538-4357/ac63c9]
12. CCAT-prime collaboration et al. (including Chung, D. T.), ‘CCAT-prime Collaboration: Science Goals and Forecasts with Prime-Cam on the Fred Young Submillimeter Telescope’, 2023, ApJS, 264, 7 [DOI: 10.3847/1538-4365/ac9838]
13. Seo, Y. M., Majumdar, L., Goldsmith, P. F., et al. (including Chung, D.), ‘An Ammonia Spectral Map of the L1495-B218 Filaments in the Taurus Molecular Cloud: II CCS & HC<sub>7</sub>N Chemistry and Three Modes of Star Formation in the Filaments’. 2019, ApJ, 871, 134 [DOI: 10.3847/1538-4357/aaf887]
14. Ihle, H. T., Chung, D., Stein, G. et al. (COMAP Collaboration), ‘Joint power spectrum and voxel intensity distribution forecast on the CO luminosity function with COMAP’, 2019, ApJ, 871, 75 [DOI: 10.3847/1538-4357/aaf4bc]

**Proceedings and non-refereed articles:**

1. Karkare, K. S. et al. (including Chung, D. T.), ‘Snowmass 2021 Cosmic Frontier White Paper: Cosmology with Millimeter-Wave Line Intensity Mapping’, 2022, arXiv:2203.07258
2. Silva, M. B. et al. (including Chung, D. T.), ‘Synergies between the COMAP CO Line Intensity Mapping mission and a Ly $\alpha$  galaxy survey: How to probe the early universe with voxel based analysis of observational data’, 2021, arXiv:2111.05354; originally submitted to A&A
3. Choi, S. K. et al. (including Chung, D. T.), ‘Sensitivity of the Prime-Cam Instrument on the CCAT-prime Telescope’, 2020, JLTP, 199, 1089 [DOI: 10.1007/s10909-020-02428-z]
4. Herter, T. et al. (including Chung, D.), ‘The CCAT-Prime Submillimeter Observatory’, 2019, Bulletin of the AAS, 51, 213 [arXiv:1909.02587]
5. Vavagiakis, E. M. et al. (including Chung, D.), ‘Prime-Cam: A first-light instrument for the CCAT-prime telescope’, 2018, Proc SPIE, 10708, 107081U [DOI: 10.1117/12.2313868]
6. Stacey, G. J. et al. (including Chung, D. T.), ‘CCAT-Prime: science with an ultra-widefield submillimeter observatory on Cerro Chajnantor’, 2018, Proc SPIE, 10700, 107001M [DOI: 10.1117/12.2314031]
7. Kovetz, E. D. et al. (including Chung, D.), ‘Line-Intensity Mapping: 2017 Status Report’, 2017, arXiv:1709.09066