YUN-TING CHENG

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Jet Propulsion Laboratory / California Institute of Technology
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PROFESSIONAL EXPERIENCE

Jet Propulsion Laboratory/California Institute of Technology
Postdoctoral Researcher (Advisor: Dr. Olivier Doré) October 2021 - present

EDUCATION

California Institute of Technology
Ph.D. in Physics (Advisor: Prof. Jamie Bock) June 2021
Thesis: Cosmology and Astrophysics with Intensity Mapping

M.S. in Physics June 2019

National Taiwan University
B.S. in Physics June 2014

RESEARCH INTERESTS

analysis algorithms for cosmological surveys, observational cosmology, intensity mapping, large-scale structure, extragalactic background light, intra-halo light

RESEARCH EXPERIENCE

Jet Propulsion Laboratory / California Institute of Technology — Pasadena, CA

Postdoctoral Researcher (Advisor: Dr. Olivier Doré) October 2021 - Present

· **Data-driven Cosmology from 3D Light Cones**
(collaborators: Benjamin Wandelt, Olivier Doré, Tzu-Ching Chang)
- Developing a data-driven method to constrain cosmology with spectral imaging data

· **Galactic Extinction Modeling**
(collaborators: Brandon Hensley, Olivier Doré, Tzu-Ching Chang)
- Building Galactic dust extinction model from multi-wavelength datasets

· **Extragalactic Radio Dipole**
(collaborators: Adam Lidz, Tzu-Ching Chang)
- Modeling the radio dipole from extragalactic sources

· **Intra-halo Light Signal in the Extragalactic Background**
(collaborators: Jamie Bock)
- Modeling the non-linear clustering and the intro-halo light in the near-infrared background

Graduate Research Assistant (Advisor: Prof. Jamie Bock) September 2015 - June 2021

· **Intensity Mapping**
- Developing analysis algorithms to solve the line blending problem in line intensity mapping
- Establishing the formalism of optimal mapping strategy for large-scale structure survey
- Modeling galaxy-intensity mapping cross correlation for SPHEREx

· **CIBER** (Cosmic Infrared Background Experiment)
- Building CIBER analysis pipeline and characterizing noise and systematic effects
- Studying intra-halo light with stacking analysis on CIBER images

· **TIME** (Tomographic Ionized Carbon Intensity Mapping Experiment)
- Simulating the signal and foregrounds for TIME analysis pipeline
- Developing foreground mitigation techniques
- Analyzing TIME instrument data
- Helping with instrument deployment at the ARO 12m telescope

Academia Sinica of Astronomy and Astrophysics (ASIAA) — Taipei, Taiwan

Research Assistant (Advisor: Tzu-Ching Chang) May 2014 - July 2015
· Developing foreground mitigation technique for line intensity mapping

Summer Student (Advisor: Sheng-Yuan Liu, Yu-Nung Su, I-Ta Hsieh) July 2013 - August 2013
· Modeling the starless core with radiative transfer

TECHNICAL SKILLS

- Statistical Tools: Bayesian statistics, Markov Chain Monte Carlo, Fisher analysis, Sparse Reconstruction, convex optimization, Machine Learning (with experience in CNN and Machine Learning Explainability)
- Programming Languages: Python (Astropy, emcee, Pandas, scikit-learn, TensorFlow, Keras, seaborn), SQL, IDL, Matlab, C++, Fortran, Latex
- Instrumentation: SOLIDWORKS, machine shop trained

PRESENTATIONS

- (**invited overview talk**) Line Intensity Mapping Workshop — MPA, Garching, Germany, Apr, 2023
- LAM Cafe Club — LAM, Marseille, France, Dec, 2022
- LAM CONCERTO Working Group Meeting — LAM, Marseille, France, Dec, 2022
- IAP Universe Seminar — IAP, Paris, France, Nov, 2022
- Caltech ObsCos Seminar — Caltech, CA, Oct, 2022
- Columbia Cosmology Group Seminar — Columbia, NY, Aug, 2022
- NYU CCPP Seminar — NYU, NY, Aug, 2022
- ICAP seminar — (virtual) IAP, Paris, France, Jun, 2022
- Cosmology from Home — (virtual), Jun, 2022
- ASIAA Seminar — ASIAA, Taiwan, May, 2022
- Cross Correlations with CHORD Workshop — (virtual), Oct, 2021
- SUBLIME Workshop — (virtual), Oct, 2021
- IRSIG Webminar — (virtual), Oct, 2021
- KICP Line Intensity Mapping Workshop — (virtual) Chicago, IL, Jul, 2021
- ASIAA Seminar — (virtual) ASIAA, Taiwan, Mar, 2021
- Caltech ObsCos Seminar — (virtual) Caltech, CA, Feb, 2021
- UChicago KICP Seminar — (virtual) Chicago, IL, Jan, 2021
- 237th AAS Meeting — (virtual), Jan, 2021
- Berkeley BCCP Seminar — (virtual) Berkeley, CA, Dec, 2020
- CCA Flatiron Institute Cosmology Group Meeting — (virtual) CCA, NY, Oct, 2020
- OSU CCAPP Seminar — (virtual) OSU, OH, Oct, 2020
- Johns Hopkins U Cosmology/GW Journal Club — (virtual) JHU, MD, Oct, 2020
- UPenn Astronomy Seminar — (virtual) UPenn, PA, Sep, 2020
- Caltech ObsCos Seminar — (virtual) Caltech, CA, Sep, 2020
- CCAT-prime Science Working Group Meeting — (virtual) Cornell, NY, Sep, 2020
- CCA Flatiron Institute Lunch Talk — (virtual) CCA, NY, Sep, 2020
- Caltech ObsCos Seminar — Caltech, CA, Feb, 2020
- L2S2 : Lines in the Large Scale Structure Conference — Marseille, France, Jul, 2019
- Caltech ObsCos Seminar — Caltech, CA, Jun, 2019
- Caltech ObsCos Seminar — Caltech, CA, May, 2019
- 233rd AAS Meeting — Seattle, WA, Jan, 2019
- Taiwanese Theoretical Astrophysics Workshop — ASIAA, Taiwan, Sep, 2018
- ASIAA Seminar — ASIAA, Taiwan, Sep, 2018
- Caltech ObsCos Seminar — Caltech, CA, Jun, 2018
- Cosmological Signals from Cosmic Dawn to the Present — Aspen, CO, Feb, 2018
- Caltech ObsCos Seminar — Caltech, CA, Dec, 2017
- Caltech ObsCos Seminar — Caltech, CA, Nov, 2016
- Caltech ObsCos Seminar — Caltech, CA, Jun, 2016
- Opportunities and Challenges in Intensity Mapping Workshop — KIPAC, CA, Mar, 2016
- ASROC Annual Meeting (Taiwanese Astronomical Society) — Ilan, Taiwan, May, 2015

AWARDS AND HONORS

Balzan Cosmological Studies Travel Award — Oct 2022
Taiwan-Caltech Ministry of Education Fellowship — Sep 2015 - Aug 2019
Dean's Award of College of Science, National Taiwan University — Jun 2014

SERVICE AND OUTREACH

Caltech Cosmology Journal Club co-organizer	Sep 2022 - present
Referee for the Astrophysical Journal and the Astrophysical Journal Letters	Sep 2021 - present
237th AAS meeting oral session chair	Jan 2021
Leading physics in-class activities at Gabrielino High School, CA	Jan 2020 - Sep 2022
233rd AAS meeting poster judge	Jan 2019

REFERENCES

- **James J. (Jamie) Bock**
  Professor, California Institute of Technology/Jet Propulsion Laboratory
  jjb@astro.caltch.edu
- **Tzu-Ching Chang**
  Research Scientist, Jet Propulsion Laboratory/California Institute of Technology
  tzu-ching.chang@jpl.nasa.gov/tzu@caltech.edu
- **Olivier P. Doré**
  Research Scientist, Jet Propulsion Laboratory/California Institute of Technology
  olivier.p.dore@jpl.nasa.gov/odore@caltech.edu
- **Abigail T. Crites**
  Assistant Professor, Cornell University
  atc72@cornell.edu
- **Benjamin D. Wandelt**
  Professor, Institut dAstrophysique de Paris/Center for Computational Astrophysics, Flatiron Institute
  bwandelt@iap.fr

PUBLICATIONS

See ADS, Google Scholar, and INSPIRE for the complete publication list

First-author papers

- *"Data-driven Cosmology from Three-dimensional Light Cones"*
  Y.-T. Cheng, B. D. Wandelt, T.-C. Chang, and O. Doré; 2023, ApJ 944, 151; arXiv:2210.10052
- *"Near-infrared Extragalactic Background Light Fluctuations on Nonlinear Scales"*
  Y.-T. Cheng, and J. J. Bock; 2022; ApJ 940, 115; arXiv:2207.13712
- *"Cosmic Near-Infrared Background Tomography with SPHEREx Using Galaxy Cross-Correlations"*
  Y.-T. Cheng, and T.-C. Chang; 2022, ApJ 925, 136; arXiv:2109.10914
- *"Probing Intra-Halo Light with Galaxy Stacking in CIBER Images"*
  Y.-T. Cheng, et al. (CIBER Collaboration); 2021, ApJ, 919, 69; arXiv:2103.03882
- *"Phase-Space Spectral Line De-confusion in Intensity Mapping"*
  Y.-T. Cheng, T.-C. Chang, and J. J. Bock; 2020, ApJ, 901, 142; arXiv:2005.05341
- *"Optimally Mapping Large-Scale Structures with Luminous Sources"*
  Y.-T. Cheng, R. de Putter, T.-C. Chang, and O. Doré; 2019, ApJ, 877, 86; arXiv:1809.06384
- *"Spectral Line De-Confusion in an Intensity Mapping Survey"*
  Y.-T. Cheng, T.-C. Chang, J. J. Bock, C. M. Bradford, and A. R. Cooray; 2016, ApJ, 832, 165; arXiv:1604.07833

Co-author papers

- *"Inferred Measurements of the Zodiacal Light Absolute Intensity through Fraunhofer Absorption Line Spectroscopy with CIBER"*
  P. M. Korngut, et al., 2022, ApJ, 926, 133; arXiv:2104.07104
- *"Probing Cosmic Reionization and Molecular Gas Growth with TIME"*
  G. Sun, T.-C. Chang, et al., 2021, ApJ, 915, 33; arXiv:2012.09160
- *"Superresolution Reconstruction of Severely Undersampled Point-spread Functions Using Point-source Stacking and Deconvolution"*
  T. Symons, M. Zemcov, et al., 2021, ApJS, 252, 24; arXiv:2102.01094
- *"Hafnium Films and Magnetic Shielding for TIME, A mm-Wavelength Spectrometer Array"*
  J. Hunacek, et al., 2018, JLTP, 193, 893
- *"A Foreground Masking Strategy for [C II] Intensity Mapping Experiments Using Galaxies Selected by Stellar Mass and Redshift"*
  G. Sun, L. Moncelsi, M. P. Viero, et al., 2018, ApJ, 856, 107; arXiv:1601.10095
- *"Design and fabrication of tes detector modules for the time-pilot [cii] intensity mapping experiment"*
  J. Hunacek, et al., 2016, JLTP, 184, 733

Non-refereed review papers / white papers

- *"Tomography of the Cosmic Dawn and Reionization Eras with Multiple Tracers"*
  T.-C. Chang, et al., 2019, Astro2020 White Paper, arXiv: 1903.11744
- *"Line-Intensity Mapping: 2017 Status Report"*
  E. D. Kovetz, M. P. Viero, et al., 2017, arXiv:1709.09066

Conference proceedings

- *"A status update on TIME: a mm-wavelength spectrometer designed to probe the Epoch of Reionization"*
  A. Crites, et al., 2020, SPIE, 114530G
- *"Detector modules and spectrometers for the TIME-Pilot [CII] intensity mapping experiment"*
  J. Hunacek, et al., 2016, SPIE, 99140L