Yu-Hsuan "Eltha" Teng

yuteng@ucsd.edu • elthateng.github.io • elthateng • elthateng

Education

University of California San Diego Sep 2019–*present*
Ph.D. in Physics (expected Jun 2024) Advisor: Prof. Karin Sandstrom

National Taiwan University Sep 2018–Jun 2019
M.S. in Physics Advisors: Dr. Naomi Hirano and Prof. You-Hua Chu
Thesis: "Physical Conditions and Kinematics of the Filamentary Structure in Orion Molecular Cloud 1"

Academia Sinica, Institute of Astronomy and Astrophysics (ASIAA) Jul 2016–Jun 2019
Research Student Advisor: Dr. Naomi Hirano

National Taiwan University Sep 2013–Jun 2017
B.S. in Electrical Engineering Research advisor: Prof. Jean-Fu Kiang

Research Experience

CO-to-H_2 Conversion Factors in Nearby Galaxy Centers using ALMA Jan 2020–*present*
- Conducted multi-line radiative transfer modeling and a Bayesian likelihood analysis to constrain environmental conditions in three nearby barred galaxy centers
- Derived cloud-scale spatial variation of the CO-to-H_2 conversion factor in the central kpc of galaxies and studied the correlations with molecular gas properties

AGN Outflows from Low-redshift Quasars (Advisor: Prof. Alison Coil) Jun–Dec 2020
- Reduced Keck Cosmic Web Imager (KCWI) data of 11 low-redshift active galactic nuclei (AGNs) and analyzed structure and kinematics in [OII], [OIII], [NeIII], [NeV], and Balmer lines

Physical Conditions and Gas Kinematics in OMC1 Jul 2016–Jul 2019
- Reduced and combined N_2H^+ J=3-2 data from the Submillimeter Array and Telescope (SMA+SMT)
- Conducted hyperfine spectral fitting, filament identification, and LTE/non-LTE analysis to derive the physical conditions in Orion Molecular Cloud 1 (OMC1)
- Analyzed the gas motion inside the filaments and compared with filament/core formation models

Image Reconstruction in Radio Interferometry Oct 2017–May 2018
- Developed codes for simulating the instantaneous visibility data observed with SKA
- Proposed a novel reconstruction model associating compressed sensing with Stockwell transform

Gravitational Wave Theories and Simulations Feb 2016–Jun 2017
- Implemented Runge-Kutta method to solve light trajectories near a Schwarzschild/Kerr geometry
- Simulated the gravitational waves from a binary black hole merger based on far-field theories

Honors & Awards

Government Scholarship to Study Abroad ($32,000), *Ministry of Education, Taiwan* 2021–2023
Chambliss Astronomy Achievement Award, *American Astronomical Society (AAS)* 2021
Chien-Shiung Wu Fellowship (NT$20,000), *The Physical Society of Taiwan* 2020
Physics Excellence Award ($8,500), *Department of Physics, UC San Diego* 2019–2020
Dean's Award, *College of Science, National Taiwan University* 2019
Best Oral Presentation Award (NT$10,000), *Astronomical Society of Taiwan (ASROC)* 2018

Travel Grants

IAU Grant (€1,000), *International Astronomical Union (IAU)* 2022
KAS Grant (€318), *Korean Astronomical Society (KAS)* 2022
Chair's Challenge Award ($500), *Department of Physics, UC San Diego* 2021, 2022

Publications

First-authored publications

- **Yu-Hsuan Teng**, Karin M. Sandstrom, Jiayi Sun, Munan Gong, Alberto D. Bolatto *et al.*, "The Physical Drivers and Observational Tracers of CO-to-H2 Conversion Factor Variations in Nearby Barred Galaxy Centers", 2023, *The Astrophysical Journal (**ApJ**)*, in press.
- **Yu-Hsuan Teng** and Karin Sandstrom, "Investigating the Drivers of CO-to-H_2 Conversion Factor Variations in Nearby Galaxy Centers", 2022, *Proceedings of the IAU*, 373, in press.
- **Yu-Hsuan Teng**, Karin M. Sandstrom, Jiayi Sun, Adam K. Leroy, L. Clifton Johnson, Alberto D. Bolatto *et al.*, "Molecular Gas Properties and CO-to-H_2 Conversion Factors in the Central Kiloparsec of NGC 3351", 2022, *The Astrophysical Journal (**ApJ**)*, 925, 72.
- **Yu-Hsuan Teng** and Naomi Hirano, "Physical Conditions and Kinematics of the Filamentary Structure in Orion Molecular Cloud 1", 2020, *Submillimeter Array Newsletter*, 30.
- **Yu-Hsuan Teng** and Naomi Hirano, "Physical Conditions and Kinematics of the Filamentary Structure in Orion Molecular Cloud 1", 2020, *The Astrophysical Journal (**ApJ**)*, 893, 63.

Co-authored publications

- Mattia C. Sormani, Ashley T. Barnes, Jiayi Sun, ..., **Yu-Hsuan Teng** *et al.*, "Fuelling the nuclear ring of NGC 1097", 2023, *Monthly Notices of the Royal Astronomical Society (**MNRAS**)*, submitted.
- Jiayi Sun, Adam K. Leroy, Eve C. Ostriker, ..., **Yu-Hsuan Teng** *et al.*, "Star Formation Laws and Efficiencies across 80 Nearby Galaxies", 2023, *The Astrophysical Journal Letters (**ApJL**)*, 945, 19.
- Jakob S. den Brok, Frank Bigiel, Jérémy Chastenet, ..., **Yu-Hsuan Teng** *et al.*, "Wide-Field CO Isotopologue Emission and the CO-to-H2 Factor across the Nearby Spiral Galaxy M101", 2023, *Astronomy and Astrophysics (**A&A**)*, in press.
- Lukas Neumann, Molly J. Gallagher, Frank Bigiel, ..., **Yu-Hsuan Teng** *et al.*, "The ALMOND Survey: Molecular cloud properties and gas density tracers across 25 nearby spiral galaxies with ALMA", 2023, *Monthly Notices of the Royal Astronomical Society (**MNRAS**)*, 521, 3.
- Daizhong Liu, Eva Schinnerer, Toshiki Saito, ..., **Yu-Hsuan Teng** *et al.*, "CI and CO in Nearby Spiral Galaxies - I. Line Ratio and Abundance Variations at ∼200 pc Scales", 2023, *Astronomy and Astrophysics (**A&A**)*, 672, 36.
- Daizhong Liu, Eva Schinnerer, Yixian Cao, ..., **Yu-Hsuan Teng** *et al.*, "PHANGS-JWST First Results: Stellar Feedback-Driven Excitation and Dissociation of Molecular Gas in the Starburst Ring of NGC 1365?", 2023, *The Astrophysical Journal Letters (**ApJL**)*, 944, 19.
- Janice C. Lee, Karin M. Sandstrom, Adam K. Leroy, ..., **Yu-Hsuan Teng** *et al.*, "The PHANGS-JWST Treasury Survey: Star Formation, Feedback, and Dust Physics at High Angular resolution in Nearby GalaxieS", 2023, *The Astrophysical Journal Letters (**ApJL**)*, 944, 17.
- Axel García-Rodríguez, Antonio Usero, Adam K. Leroy, ..., **Yu-Hsuan Teng** *et al.*, "Sub-kpc empirical relations and excitation conditions of HCN and HCO^+ J=3-2 in nearby star-forming galaxies", 2023, *Astronomy and Astrophysics (**A&A**)*, in press.
- Cosima Eibensteiner, Ashley T. Barnes, Frank Bigiel, ..., **Yu-Hsuan Teng** *et al.*, "A 2-3 mm high-resolution molecular line survey towards the centre of the nearby spiral galaxy NGC 6946", 2022, *Astronomy and Astrophysics (**A&A**)*, 659, A173.

Academic Talks

Invited talks

- "Studying Molecular Gas and Star Formation: from Orion Molecular Cloud to Nearby Galaxy Centers", ***SMA Seminar***, *Harvard & Smithonian Center for Astrophysics (CfA)*, Mar. 2022.
- "Cloud-scale Molecular Gas Properties and CO-to-H_2 Conversion Factor Variations in Nearby Galaxy Centers", ***Ringberg Seminar***, *Max Planck Institute for Astronomy (MPIA)*, Mar. 2022.
- "Molecular Gas Properties and CO-to-H_2 Conversion Factors in the Central Kiloparsec of NGC 3351", ***PHANGS Collaboration Meeting***, Feb. 2022.
- "Molecular Gas Properties and CO-to-H_2 Conversion Factors in the Central Kiloparsec of NGC 3351", ***Origins Workshop – ISM, Star and Cluster Formation***, Jan. 2022.

Conference presentations

- "Connecting CO-to-H_2 Conversion Factors to Molecular Gas Properties in Nearby Barred Galaxy Centers", ***241th AAS Meeting***, Seattle, USA, contributed talk, Jan. 2023.
- "Investigating the Drivers of CO-to-H_2 Conversion Factor Variations in Nearby Galaxy Centers", ***IAU Symposium 373***, Busan, South Korea, contributed e-talk, Aug. 2022.
- "Investigating the Drivers of CO-to-H_2 Conversion Factor Variations in Nearby Galaxy Centers", ***From Stars to Galaxies II***, Gothenburg, Sweden, contributed poster, Jun. 2022.
- "ALMA Observations and Multi-line Modeling of the Galaxy Center of NGC 3351", ***237th AAS Meeting***, Virtual, contributed talk with i-poster, Jan. 2021.
- "Physical Conditions and Kinematics in the Orion Molecular Cloud-1 Filaments", ***ASROC Annual Meeting***, Taichung, Taiwan, contributed poster, May 2019.
- "Filamentary Structure and Star Formation in OMC1", ***ASROC Annual Meeting***, Kinmen, Taiwan, contributed talk, May 2018.

Seminar talks

- "Molecular Gas and CO-to-H_2 Conversion Factors in the Center of NGC 3351", ***CASS Journal Club***, *UC San Diego*, May 2021.
- "Properties and Kinematics in OMC1 with N_2H^+ Observations", ***ASIAA Lunch Talk***, *ASIAA*, Sep. 2018.
- "Non-LTE Analysis and Filamentary Structure in OMC1 with N_2H^+ Observations", ***ASIAA Star Formation Seminar***, *ASIAA*, Aug. 2018.
- "Filamentary Structure and Star Formation in OMC1", ***ASIAA Student Seminar***, *ASIAA*, May 2018.

Observing Programs

Telescope time awarded

- **Co-I**, "Probing the Excitation and the Mass-Luminosity Conversion Factor of the Dense, Star Forming Gas Across Galaxy Disks", *ALMA*, Cycle 9, 2022.1.01713.S (grade C).
- **Co-I**, "CO Excitation Across the Local Galaxy Population", *ALMA*, Cycle 9, 2022.1.01479.S (grade C).
- **Co-I**, "Hidden Gems on a Ring: Resolving Embedded Young Massive Clusters in a Nearby Ringed Galaxy", *ALMA*, Cycle 9, 2022.1.00159.S (7h 12-m awarded).
- **Co-I**, "A Top-down View of Massive Cluster Formation in a Nearby Nuclear Starburst Ring", *ALMA*, Cycle 8, 2021.1.00059.S (7h 12-m + 2h ACA awarded).
- **PI**, "Studying the Properties and Kinematics in the Nearest Massive Hub-Filament Region", *Arizona Radio Observatory (ARO)*, 2018B, TW-T17 (12h SMT awarded).

Observing experience

Second-shift remote operation, *Submillimeter Array (SMA)*, Taipei, Taiwan — Jul 2017–Jul 2019

On-site operation, *Submillimeter Array (SMA)*, Hilo, HI, USA — Jun 2018

Kenting Observatory Program, *Kenting Observatory*, Pingtung, Taiwan — Jul 2012, Jan 2014

Training

International Summer School, *on "The Interstellar Medium of Galaxies, from the Epoch of Reionization to the Milky Way"* — Jul 2021

AAS 237 Workshop, *"Hands-on Machine Learning for Astronomers: Artificial Intelligence for Big-Data Astronomy", organized by American Astronomical Society* — Jan 2021

SOKENDAI Asia Winter School, *"Star and Planet Formation: Key Questions and Challenges", organized by National Astronomical Observatory of Japan (NAOJ)* — Feb–Mar 2019

NCTS Summer School, *"Accretion and Emission of Accreting Black Hole", organized by National Center for Theoretical Science (NCTS)* — Sep 2018

TIARA Summer School, *"Origins of the Solar System", organized by Theoretical Institute for Advanced Research in Astrophysics (TIARA)* — Jul 2018

TIARA Summer School, *"Astrostatistics & Big Data", organized by TIARA* — Sep 2017

TIARA Summer School, *"Radio Astronomy", organized by TIARA* — Aug 2016

Skills

Languages—English, Mandarin (native)
Programming—Proficient in Python, MATLAB, LaTeX; familiar with C/C++, IDL, Bash/Csh
Scientific tools—Astropy, RADEX, MIRIAD, CLASS, CASA

Teaching Experience

Teaching Assistant, *PHYS 162 (Cosmology), UC San Diego* Spring 2021

Teaching Assistant, *PHYS 163 (Galaxies and Quasars), UC San Diego* Spring 2020, Winter 2021

Teaching Assistant, *PHYS 2A (Mechanics), UC San Diego* Spring 2020

Teaching Assistant, *PHYS 1B (Electromagnetism) Lab, UC San Diego* Winter 2020

Teaching Assistant, *PHYS 1A (Mechanics) Lab, UC San Diego* Fall 2019

Academic Membership & Service

Member, *Physics at High Angular resolution in Nearby GalaxieS (PHANGS)* 2021–*present*

Graduate Student Member, *American Astronomical Society (AAS)* 2020–*present*

Judge, *Chambliss Astronomy Achievement Student Award* 2023

Reviewer, *ALMA Cycle 9 Proposal Call (10 proposals reviewed)* 2022