CHENG-HAN
HSIEH

ORCID: 0000-0003-2803-6358
Personal Website: https://chenghanhsieh.github.io/

UT Austin Department of
Astronomy, Physics, Math, and
Astronomy Building, 2515
Speedway, Austin, TX 78712

Research Interest

My research focuses on a comprehensive statistical characterization of **disk substructures** around the youngest protostars, discerning the relationship between protoplanetary disk properties and the primordial conditions of planetary systems. I investigate the origins of these substructures and the timing of the onset of **planet formation**, integrating radio observations of environments around planet-forming disks to probe the coupling between star and planet formation through **protostellar outflows**, non-axisymmetric accretion flows, and magnetic fields. In parallel, I examine the origins and chemical compositions of **interstellar objects** and use them as tracers of the building blocks of planets.

Summary

- **Funding:** **$500,365 USD** in external awards since 2021
- **Telescope time:** Radio Telescopes: **936.2 hours** awarded, Optical/near-infrared telescopes: **22 nights** awarded
- Major ongoing observational projects:
  - Project initiator of the ALMA 100 protostars Legacy project (788.7 hours)
  - **PI** of Green Bank Telescope interstellar comet 3I/ATLAS project (30.8 hr)
- **Papers: H-index**: **7** | Citation: **172** since 2019
- **Students:** **8** undergrad. students, **2** graduate students | **1** published student-led research note | **3** student-led papers (in perp.)
- **Teaching:** **4** undergrad-level courses at Yale University as Teaching Assistant, designing major astrophysics assignments, running discussion sessions, grading, tutoring.
- **Service and Outreach:** Organize **1** ALMA proposal workshop, **2** free star and planet formation / exoplanet conferences
- **Presentations:** **42** talks, including **24** invited seminar talks
- **Observing experience:** Atacama Large Millimeter/submillimeter Array (ALMA), Submillimeter Array (SMA), Green Bank Telescope (GBT), Palomar 200-inch telescope WIRC+POL polarization and Triple Spectrograph, McDonald Observatory Immersion GRating INfrared Spectrometer (IGRINS), Keck Near Infrared Spectrograp (NIRSPEC)

Academic Appointments

- 2024-Present — University of Texas at Austin — **NHFP Sagan Fellow**
  Host scientist: Stella Offner (Director of CosmicAI Institute)

Education

- Dec 2024 — **Ph.D. in Astronomy**, Yale University
  Advisor: Prof. Héctor Arce

- 2021 **M. S. in Astronomy**, Yale University
- 2021 **M. Phil. in Astronomy**, Yale University
- May 2018 **B. S.** in Physics, National Tsing Hua University

Awards

- 2026 Japanese-Language Proficiency Test N3 (CEFR B1 level) passed
- 2025 UT Austin Postdoc Excellence in Mentoring Service Award
  (The award is granted annually to a single postdoctoral scholar. The UT Austin Department of Astronomy currently hosts approximately 20 postdoctoral researchers.)
- 2025 UT Austin Teaching Certificate
- 2025 The Dirk Brouwer Memorial Prize
  (Established in 1966 by friends of Professor Dirk Brouwer, Chairman of the Department of Astronomy and Director of Yale Observatory from 1941 to 1966. The prize is awarded upon recommendation by the Chair of the Department of Astronomy to a student for a contribution of unusual merit to any branch of astronomy.)
- 2024-ongoing NASA Hubble Fellowship Program (NHFP) Sagan Fellow
- 2023 Yale Poorvu Center Public Communication Certificate
- 2022 From Stars to Galaxies II Conference (Sweden) poster award
- 2020-2022 Government Scholarship for Study Abroad program (Taiwan)
- 2020-2021 Yale Nathan Hale Associates Scholarship
- 2019-2020 Yale Henry A. Smith Fellowship
- 2017 NTHU Physics/Astronomy Poster Competition winner
- 2017 NTHU Academy Award
  (Awarded to top 5% of students based on GPA)

Accepted Observational Proposals

Radio Proposals:

1. 2025 Green Bank Telescope DDT proposal on the interstellar comet 3I/ATLAS (GBT/25A-504)
   - **PI** (30.8 hours awarded, A rank)
2. 2025 Submillimeter Array (SMA) DDT proposal on the interstellar comet 3I/ATLAS
   - **PI** (30 hours awarded)
3. 2024 ALMA Cycle 11 Outflow impact on dense gas project (2024.1.01151.S)
   - **Co-I** (16.7 hours 12-m array awarded)
4. 2024 ALMA Cycle 11 One-Hundred Protostar Project (Fully Observed)
   - **Co-I** (39.8 hours 12-m array awarded)
   - Resubmit of ALMA Cycle 10
5. 2023 ALMA Cycle 10 One-Hundred Protostar Project (Partly observed)
   - **Co-I** (39.8 hours 12-m array awarded)
   - Resubmit of ALMA Cycle 9
6. 2022 ALMA Cycle 9 One-Hundred Protostar Project (2022.1.00342.S)
   - **Co-I** (39.8 hours 12-m array, 212 hours on 7-m array, 536.9 hours on Total Power awarded)
   - ALMA shutdown due to cyber-attack.

- I was the PI of this proposal in ALMA Cycle 8. I transferred the PI position to my PhD advisor in Cycle 9.

7. 2019 ALMA DDT proposal on the first interstellar comet (2019.A.00005.S)
   - **PI** (13.8 hours awarded)
   - ALMA shutdown due to Covid-19
8. 2019 Green Bank Telescope DDT proposal on the first interstellar comet (GBT/19B-311)
   - **PI** (33.5 hours awarded)
   - No comet outburst within the observing window
9. 2018 ALMA Cycle 6 VLA1623A Class 0 disk (2018.1.00388.S)
   - **PI** (16.7 hours on 12-m array, 2 hours on 7-m array awarded)
10. 2016 Submillimeter Array (SMA) filler proposal on Yellow Hypergiant HR8752 (2016B-A020)
    - **PI** (6 hours awarded)

Optical/ Near Infrared Proposals:

11. 2023 Palomar 200-inch telescope 2023A Magnetic field in Perseus Molecular Cloud
    - **Co-PI** (4 nights awarded)
12. 2022 Palomar 200-inch telescope 2022A Magnetic field in Orion A Molecular Cloud
    - **Co-PI** (8 nights awarded)
13. 2021 Palomar 200-inch telescope 2021A Protostellar Mass Function: A pilot study
    - **PI** (3 nights awarded)
14. 2021 Palomar 200-inch telescope 2021A Magnetic field in Orion A Molecular Cloud
    - **Co-PI** (3 nights awarded)
15. 2020 Palomar 200-inch telescope 2020A Magnetic field in Orion A Molecular Cloud
    - **Co-PI** (3 nights awarded)
16. 2019 Keck 2019B Detecting CO ice in prestellar core L1544(2019B_Y028)
    - **Co-PI** (1 night awarded)

Grants and external funding

2025

- ♦ 20,000 Node Hours — 2025 Texas Advanced Computing Center Super Computer (2.2 million CPU hours)
- ♦ 142,910 USD — 2025 NASA Hubble Fellowship Program Cycle 33 / Round 35 Program HF2-51556.001-A
- ♦ 10,000 USD — Funding from Los Alamos National Laboratory for organizing the 2025 Southwest Star and Planet Formation Conference at UT Austin **(Main organizer, LOC, SOC)**
- ♦ 5,000 USD — Funding from Department of Astronomy, UT Austin for organizing the 2025 Southwest Star and Planet Formation Conference at UT Austin

(Main organizer, LOC, SOC)

- 1,000 USD — The Dirk Brouwer Memorial Prize
- 1,000 USD — UT Austin Postdoc Excellence in Mentoring Service Award

2024

- 75,000 Node Hours — 2024 Texas Advanced Computing Center Super Computer (8.4 million CPU hours)
- 155,655 USD — 2024 NASA Hubble Fellowship Program Cycle 32 / Round 34 Program HF2-51556

2023

- 140,000 USD — Funding from Heising-Simons Foundation for organizing the 2023 Emerging Researchers in Exoplanet Science Symposium (ERESVIII @ Yale) **(Main organizer, LOC, SOC)**
- 800 USD — Yale Graduate School Assembly Conference Travel Grant
- 400 USD — 2023 AAS Doxsey Travel Prize

2022

- 32,000 USD — 2020-2022 Taiwan Government Scholarship for Study Abroad program
- 10,000 USD — National Radio Astronomy Observatory Conference/Reference Grant (ALMA Ambassador Program)
- 800 USD — Yale Graduate School Assembly Conference Travel Grant

2021

- 800 USD — Yale Graduate School Assembly Conference Travel Grant

Interviews and Media Coverage

2024

- Media Coverage of my research [protostellar disk study]: ScienceAlert, National Radio Astronomy Press release, Universe Today, SciTechDaily, Space Daily, Tech Explorist, Space.com
- Atacama Large Millimeter/submillimeter Array Observatory Press release: Early Evolution of Planetary Disk Structures Seen for the First Time
- 243rd American Astronomical Society Conference, New Orleans, **press release** AAS Press Office Recorded Video
- AstroArticulated podcast

2023

- Physics.org/Universe Today's coverage of my student's interstellar crater study: Some of the moon's craters are from interstellar impacts. Can we tell which?

2019

- Media Coverage of my research [Interstellar Comet]: Fox News, ScienceAlert, Keck Observatory press release, Universe Today, Astronomy Now, Space.com, Axios, UPI, The Weather Network, News Nation, New Atlas, Earth Sky, Mashable India, CNET, BGR, Houston Chronicle, Tech Explorist, SCI News
- The New York Times interview [Interstellar Comet]: "The Interstellar Comet Has Arrived in Time for the Holidays"
- Yale Daily News interview [Interstellar Comet]: "New image offers close-up view of interstellar comet"
- W Radio Colombia: "Cometa Borisov, el objeto de otro sistema solar que pasará por la tierra"

Talks & Presentations

Invited Talks

2025

- Astronomy department colloquium, Texas A&M University, Texas
- University of Arizona, Origin planets and stars seminar speaker
- Los Alamos Astrophysics Distinguished Seminar Series seminar speaker, Los Alamos National Laboratory
- National Radio Astronomy Observatory TUNA seminar speaker
- HICE Seminar speaker, University of Arizona

2024

- HICE Seminar speaker, University of Arizona
- 243rd American Astronomical Society Conference, New Orleans, **press release**
- Space and Astro plasma physics Seminar speaker, Los Alamos National Lab

2023

- ISM/ Stars Seminar, speaker University of Texas, Austin
- Radio Millimeter Submillimeter (RMS) Science Seminar speaker, Harvard CfA
- NAOJ seminar speaker
- Nagoya University seminar speaker, Japan

2022

- National Tsing Hua University seminar speaker, Taiwan
- Academia Sinica Institute of Astronomy and Astrophysics Taiwan lunch talk
- Max Planck Institute for extraterrestrial physics (MPE) seminar speaker, Germany

- Submillimeter Array Science Seminar speaker, Harvard CfA

2021

- National University Ireland Galway (NUIG) seminar speaker, Ireland
- University of Arizona, Origin planets and stars seminar speaker
- National Radio Astronomy Observatory TUNA seminar speaker
- National Taiwan Normal University seminar speaker, Taiwan
- National Tsing Hua University seminar speaker, Taiwan
- Academia Sinica Institute of Astronomy and Astrophysics lunch talk, Taiwan

2020

- Academia Sinica Institute of Astronomy and Astrophysics lunch talk, Taiwan

2019

- National Radio Astronomy Observatory TUNA seminar talk

Other Talks

2025
- 2025 Nasa Hubble Fellowship Program Symposium, STScI, speaker
- Origins of Solar Systems Gordon Research Seminar, Mount Holyoke College in South Hadley, speaker

2024
- 243rd American Astronomical Society Conference, New Orleans, thesis talk speaker

2023
- North East Star & Planet Formation conference, CfA, Harvard speaker
- NAOJ Star Formation workshop, Tokyo, Japan speaker
- 241st American Astronomical Society Conference, Seattle, speaker

2022

- North East Star Formation Conference Wesleyan university speaker
- From Stars to Galaxies II, Chalmers University of Technology, Sweden (poster award winner talk)
- Seeing the Future: Of the universe, data, learning & digital scholarship speaker

2021

- Star Formation: From Clouds to Discs Conference, Dublin Ireland
- HOPS research group virtual lunch talk
- European Astronomical Society Annual meeting
- East Asian ALMA Science Workshop
- Max-Planck-Institute for Extraterrestrial Physics Paola Caselli's group lunch talk

- American Astronomical Society Annual meeting

2020

- New England Star Formation Conference University of Connecticut
- Midwest Magnetic Fields Conference

2019

- New England Star Formation Meeting UMass Amherst, USA

Student Mentoring

Graduate Students

- 2023-ongoing Aiswarya Arun | University de Chile
  - Co-author mentor, meet biweekly
  - Presenter in ESO Unveiling the Origins Conference
  - Student-led first author paper in prep (in preparation, available upon request).
- 2020-2025 Ren Koontz | Yale University
  - Co-author mentor
  - Student-led first author paper in prep (in preparation, available upon request).

Undergraduate Students

- 2025-ongoing Bethany Grimm | University of Texas at Austin
  - Advisor of project (earning research credit at UT Austin)
  - Project: Investigate the protostellar outflow opening angles for over 300 protostars
- 2025 Gayathri Budamgunta | University of Colorado Boulder
  - Advisor of the 2025 Moncrief Summer Internship Program
  - Taught Linux commands, CASA, CARTA, RADMC3D and radiative transfer modeling
  - Project: "Studying spiral substructures in protoplanetary disks through STARFORGE star formation simulations, using radiative transfer calculations and synthetic observations to compare with telescope data."
- 2023 Ivaris Martinez | University of Puerto Rico | Hoffleit Fellow
  - Advisor of the Yale Hoffleit summer research program
  - Taught Linux commands, programming in python, radio astronomy basics
- 2023 Chris Santiago | Yale University
  - Advisor of project
  - Project: "Using Palomar Triple Spectrograph data to derive extinction of young protostars in Orion"
- 2021-2023 Daniel Chang | Yale University
  - Advisor of project
  - Student-led research published in AAS research note: Chang, D., **Hsieh, C.-H.,** & Laughlin, G., 2023

  - Project: “Constraints to Efficiently Find Interstellar Object Generated Craters on the Moon”
- 2021-2023 Sally Jiang | Yale University | Yale STARS Program Fellow
  - Co-Advisor of the senior thesis project with my PhD advisor
  - Student-led first author paper in prep (in preparation, available upon request).
  - Project: “Mapping the magnetic fields in the Orion A molecular clouds”
  - Continue Abby Mintz’s project
  - Presenter at American Astronomical Society Meeting
  - Observed 18 nights on Palomar observation together
  - Admitted into Columbia Astronomy graduate program.
- 2022 Jessica Sanchez | Yale University | Yale STARS Summer Researcher
  - Advisor of the Yale STARS summer research program
  - Taught Linux commands, programming in python, radio astronomy basics
- 2020-2022 Abby Mintz | Yale University
  - Co-Advisor of the senior thesis project with my PhD advisor
  - Student-led co-author paper in prep (in preparation, available upon request).
  - Project: “Mapping the magnetic fields in the Orion A molecular clouds”
  - Observed 17 nights on Palomar together
  - Admitted into Princeton Astronomy graduate program.

Teaching

2018-2021

- Yale University | Teaching Assistant
  (Run discussion sessions, mid-term and final review sessions, tutor, and grader)
  - Frontiers and Controversy in Astrophysics (ASTRO 160)
    - Develop assignment “Lunar base design study” that builds upon the various modules and skills covered throughout the course, the physics concepts, and the topic paper assignments (a mission proposal to NASA and a press release).
  - Introduction to Observational Astronomy (ASTRO 155)
  - Introduction to Relativity and Black Holes (ASTRO 180)
  - Galaxies and the Universe (ASTRO 120)

2018

- Yale University | Teaching Training
  - Semester-long teaching training, Teaching in American Classroom (ELP 515)

Service and Outreach

Other

- NASA Exoplanet Research Program (XRP) panel invited reviewer (year redacted)

2025

- Initiate the 2025 Star and Planet Formation Conference in the Southwest at UT Austin (Free conference for building star and planet community in the greater Texas)
  - Secured over 10,000 USD from Los Alamos National Laboratory, 5,000 USD from Department of Astronomy, UT Austin
  - Free Conference, provide travel support for some early career researchers
- Refereed paper for the peer review journal (e.g. A&A)
- Develop the IGRINS instrument observer guide (McDonald observatory)

2024

- AstroArticulated podcast

  (AstroArticulated is an educational podcast which investigates the astronomy and physics behind science fiction novels and films. As the creator and producer, my goal is to create an accessible platform that can inspire other students to become interested in astrophysics and to become passionate about learning the secrets of our universe.)

2023

- Main organizer of the 2023 Emerging Researchers in Exoplanet Science Symposium (Free conference to support young researchers) at Yale
  - Secured over 140,000 USD from Heising-Simons Foundation
  - Free for all attendees, covering hotels, meals, and travel.
  - Promotes Diversity, Inclusion, Equality in the field as most attendees (undergraduates or 1st year graduate students) do not have travel funds on their own.

2022

- National Radio Astronomy Observatory (NRAO) ALMA Ambassador
- Organize the Cycle 9 ALMA proposal preparation workshop for USA Northeast coastal region
- Panel reviewer of the NRAO Student Observing Support (SOS) Grant proposals
- Member of the Yale Astronomy and Climate Diversity Committee (ACDC)

2020-2021

- Scientific Referee of the Yale Undergraduate Research Journal (YURA)

2019-2024

- Mentor of AstroSibs, Undergraduate Mentorship Program for more than 4 years

2018

- Presenter for the planetarium show and telescope viewing at the Leitner Family Observatory and Planetarium, Yale University

Publications

First-Author Publications

Refereed: 7 first-author papers, citation count: 223 citations (Google Scholar), h-index: 7

1. **Hsieh C.-H.,** Arce H.G., Maureira M.J., Pineda J.E., Segura-Cox D., Mardones D., Dunham M.M., et al., 2025, A&A, 700, A235. “CAMPOS II. The onset of protostellar disk substructures and planet formation”
2. **Hsieh C.-H**., Arce H.G., Maureira, María José, Pineda, Jaime E. Segura-Cox, Dominique, +3 coauthors “The ALMA Legacy survey of Class 0/I disks in Corona australis, Aquila, chaMaeleon, oPhiuchus north, Ophiuchus, Serpens (CAMPOS). I. Evolution of Protostellar disk radii” 2024, ApJ, 973, 138.

3. **Hsieh C.-H.,** Arce H.G., Li Z.-Y., Dunham M., Offner S., +11 co-authors "The Evolution of Protostellar Outflow Cavities, Kinematics, and Angular Distribution of Momentum and Energy in Orion A: Evidence for Dynamical Cores" 2023, ApJ, 947, 25.
4. **Hsieh C.-H**., Laughlin G., Arce H.G., "Evidence that 'Oumuamua is the ~45 Myr-old product of a Molecular Cloud" 2021, ApJ, 917, 20.
5. **Hsieh C.-H.**, Arce H.G., Mardones D., Kong S., Plunkett A., "Rotating N2D+ filament in LBS23 (Orion B): Do cores inheriting initial angular momentum from the rotating filament?" 2021, ApJ, 908, 92.
6. **Hsieh C.-H.,** Lai S.-P., Cheong P.-I., Ko C.-L., Li Z.-Y., Murillo N.M., "Determining the physical conditions of extremely young Class 0 circumbinary disk around VLA1623A" 2020, ApJ, 894, 23.
7. **Hsieh C.-H.,** Hu Y., Lai S.-P., Yuen K.H., Liu S.-Y., Hsieh I.-T., Ho K.W., et al., "Tracing magnetic field morphology using the velocity gradient technique in the presence of co self-absorption" 2019, ApJ, 873, 16.

Contributing Author

1. Bolin B.T., Belyakov M., Fremling C., Graham M.J., Abdelaziz A.M., Elhosseiny E., Gray C.L., et al. (include **Hsieh C.-H.,**), 2025, MNRAS, 542. "Interstellar comet 3I/ATLAS: discovery and physical description".
2. Levine W.G., Gerbig K., Louden E.M., Lu T., **Hsieh C.-H.,** O'Connor C., Li R., et al., 2024, BAAS, 56, 2024 "Emerging Researchers in Exoplanetary Science (ERES): Lessons Learned in Conference Organization for Early-Career Researchers"
3. Chang, D., **Hsieh, C.-H.,** & Laughlin, G., "Constraints to Efficiently Find Interstellar Object Generated Craters on the Moon" 2023, Research Notes of the American Astronomical Society, 7, 228.

In preparation: (Estimate submission 2026)

1. **Hsieh, C.-H.,** et al. in prep. "Preferential alignment of Class 0/I protostellar disks in multiple systems across nine nearby molecular clouds"
2. Wu, D., Arce H.G., **Hsieh, C.-H.,** in prep. "Asymmetry in protostellar system HOPS 198: evidence for evolution of the outflow opening angle driven by density of the surrounding core"
3. Jiang, Sally., Mintz A., **Hsieh, C.-H., et al.** in prep. "Palomar Polarization Observations of the Magnetic Fields Morphology and Alignment with Striations in the Orion A Molecular Cloud"