KUNG-YI SU

Black Hole Initiative ⋄ Harvard University
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EDUCATION

California Institute of Technology (Caltech), Pasadena *June 2019*
Ph.D. in physics
Advisor: Prof. Philip F. Hopkins

National Taiwan University (NTU), Taipei *June 2010*
B.S. in physics
Advisor: Prof. Pisin Chen

EMPLOYMENT

Black Hole Initiative, Harvard University September 2022 -
BHI Fellow *Harvard University*

Department of Astronomy, Columbia University August 2020 - August 2022
Posdoctoral Fellow *Columbia University*

Center for Computational Astrophysics, Flatiron Institute August 2019 - August 2020
Flatiron Fellow *Simons Foundation*

Department of Physics, Caltech September 2011 - August 2019
Teaching Assistant/ Graduate Research Assistant *Caltech*

Lecospa December 2008 - July 2010
Undergraduate Researcher *NTU*

LEADERSHIP EXPERIENCE

- Co-leader - SMAUG Black Hole Working Group (Summer 2020- Fall 2021)
- SOC member - New England FOLIAGE 2024: FIRE mOdeLIng And Galaxy Evolution workshop (Nov. 2024)
- LOC member - Bridging Scale Workshop (May 2024)
- Co-organizer – Writing workshop (May 2017)

STUDENT MENTORING

- Nadia Qutob – Undergraduate – Georgia Institute of Technology & Harvard REU Program
  — Nadia studied the signatures of different AGN jet models on ion distributions and published a first-author paper on arXiv, which was accepted by ApJ.
- Manami Roy – Graduate – Raman Research Institute & CCA Predoctoral Fellow
  (Currently CCAPP Fellow at OSU)
  — Manami studied the effect of satellites on the host CGM and published a first-author paper in MNRAS in 2023, another first-author paper on arXiv submitted to ApJ, and has a third in preparation.

COLLABORATION

FIRE, SMAUG, LtU

AWARD

- FIRE Award for Distinguished Service and Leadership (2024)
- Burke Graduate Fellowship (2018-2019 spring)
- Groce travel funding (Dec. 2018)
- NTU President Award (2006); Dean Award (2010)
- Lecospa Outstanding Student Research Award (2009)

COMPUTING AWARDS

PI – Frontera Pathway AST22010 2022-2025	34.1M CPU-hours (608350 SUs)	"A Systematic Study of How AGN Feedback Regulates the Black Hole Accretion in Early Protogalaxies"
PI – XSEDE XRAC/ACCESS Maximize TG-PHY220047 2022-2025	51.8M CPU-hours $\sim$ \$624,498	"A Systematic Study of AGN Jet and Black Hole Accretion in Massive Galaxies"
PI – XSEDE Starup/ ACCESS Explore TG-PHY220027 2022-2025	650k CPU-hours	"AGN feedback across multiple scales"

SERVICE

- Referee, MNRAS (2018−), APJL (2022−), APJ (2023−), A&A (2023−)
- Chambliss poster judge, AAS (233,235,240)

OUTREACH

- Forum for undergraduate/master students at ASIAA in Taiwan – "Studying galaxy evolution as an international student in Caltech" – Speaker (Dec. 2018)
- Stargazing and Lecture Series – Telescope volunteer (May 2016; Aug. 2016)
- NTU Physics Camp (for high school students) – Co-organizer (2007;2008)

TEACHING EXPERIENCE

Ph 2	Wave, Quantum and Statistical Mechanics (Non-physics major)
Ph 12	Wave, Quantum and Statistical Mechanics (Physics major)
Ph 106c	Topics in Classical Physics: Electromagnetism and Introduction to Classical Optics
Ph 125	Quantum Mechanics
Ph 136c	Applications of Classical Physics: General Relativity
Ph 199	Frontiers of Fundamental Physics

SKILL

Python, IDL, C, MPI

PUBLICATIONS – ADS **(referred:33 - 1st author:13 - citations:2190 - h-index:21) (2024-12-13)**

First Author

1. **K. Su**, P. Natarajan, H. Cho, R. Narayan, P.F. Hopkins et al., "Bridging Scales: Coupling the galactic nucleus to the larger cosmic environment ", arXiv:2410.13235 (2024)

2. **K. Su**, G.L. Bryan, Z. Haiman, "Self-regulation of High-Redshift Black Hole Accretion via Jets: Challenges for SMBH Formation", arXiv:2409.12250 (2024)
3. **K. Su**, G.L. Bryan, C.C. Hayward et al., R.S. Sommerville, P.F. Hopkins et al., "Unraveling Jet Quenching Criteria Across L* Galaxies and Massive Cluster Ellipticals"MNRAS Vol. 532, Issue 2, p.2724-27 (2024)
4. **K. Su**, G.L. Bryan, Z. Haiman, R.S. Sommerville et al., "Self-regulation of black hole accretion via jets in early protogalaxies", MNRAS Vol. 520, Issue 3, p.4258–4275 (2023)
5. **K. Su**, P.F. Hopkins, G.L. Bryan, R.S. Sommerville, C.C. Hayward et al., "Which AGN Jets Quench Star Formation in Massive Galaxies?", MNRAS Vol. 507, Issue 1, p.175-204 (2021)
6. **K. Su**, P.F. Hopkins, C.C. Hayward et al., "Cosmic rays or turbulence can suppress cooling flows (where thermal heating or momentum injection fail)",MNRAS Vol. 491, Issue 1, p.1190–1212 (2020)
7. **K. Su**, P.F. Hopkins, C.C. Hayward et al., "The failure of stellar feedback, magnetic fields, conduction, and morphological quenching in maintaining red galaxies", MNRAS Vol. 487, Issue 3, p.4393–4408 (2019)
8. **K. Su**, C.C. Hayward, P.F. Hopkins et al., "Stellar feedback strongly alters the amplification and morphology of galactic magnetic fields", MNRAS Vol. 473, Issue 1, p.L111-L115 (2018)
9. **K. Su**, P.F. Hopkins, C.C. Hayward et al., "Discrete effects in stellar feedback: Individual Supernovae, Hypernovae, and IMF Sampling in Dwarf Galaxies", MNRAS Vol. 480, Issue 2, p.1666-1675 (2018)
10. **K. Su**, P.F. Hopkins, C.C. Hayward et al., "Feedback first: the surprisingly weak effects of magnetic fields, viscosity, conduction and metal diffusion on sub-L* galaxy formation", MNRAS Vol. 471, Issue 1, p.144-166 (2017)
11. **K. Su**, P. Chen, "Solving the cusp-core problem with a novel scalar field dark matter", JCAP, 08, 016 (2011)
12. **K. Su**, P. Chen, "Comments on"Remarks on the spherical scalar field halo in galaxies"", arXiv1009.0869S (2010)
13. **K. Su**, P. Chen, "Comment on "Modeling galaxy halos using dark matter with pressure"", PRD, 79, 128301 (2009)

Other Publications († marks mentored student papers)

1. †M. Roy, **K. Su et al.**, "Where is the Super-Virial Gas? The Supply from hot inflows", arXiv:2409.17252 (2024)
2. R. Emami, L. Hernquist, R. Smith, J.F. Steiner, G. Tremblay, D. Finkbeiner, M. Vogelsberger, J. Grindlay, Federico Marinacci, **K. Su et al.**, "Unraveling the role of merger histories in the population of Insitu stars: linking IllustrisTNG cosmological simulation to H3 survey ", arXiv:2407.07169 (2024)
3. H. Cho, B. Prather, K. Su et al., "Multi-Zone Modeling of Black Hole Accretion and Feedback in 3D GRMHD: Bridging Vast Spatial and Temporal Scales", ApJ Vol. 977, Number 2, p.200 (2024)
4. S.B. Ponnada, I.S. Butsky, R. Skalidis, P.F. Hopkins, G.V. Panopoulou, C. Hummels, D. Kereš, E. Quataert, C. Faucher-Giguère, **K. Su**, "Synchrotron Signatures of Cosmic Ray Transport Physics in Galaxies", MNRAS Vol. 530, Issue 1, p.L1-L6 (2024)
5. P.F. Hopkins, J. Squire, E. Quataert, N. Murray, **K. Su** et al. "An Analytic Model For Magnetically-Dominated Accretion Disks", OJAp, Vol. 7, id. 20 (2024)
6. P.F. Hopkins, J. Squire, **K. Su** et al. "FORGE'd in FIRE II: The Formation of Magnetically-Dominated Quasar Accretion Disks from Cosmological Initial Conditions", OJAp, Vol. 7, id. 19 (2024)
7. P.F. Hopkins, M.Y. Grudic, **K. Su** et al. "FORGE'd in FIRE: Resolving the End of Star Formation and Structure of AGN Accretion Disks from Cosmological Initial Conditions", OJAp, Vol. 7, id. 18 (2024)
8. J. Stern, D. Fielding, Z. Hafen, **K. Su** et al., "Accretion onto disk galaxies via hot and rotating CGM inflows", MNRAS Vol. 530, Issue 2, p.1711-1731 (2024)

9. S.B. Ponnada, G.V. Panopoulou, I.S. Butsky, P.F. Hopkins, R. Skalidis, C. Hummels, E. Quataert, D. Kereš, C. Faucher-Giguère, **K. Su**, "Synchrotron Emission on FIRE: Equipartition Estimators of Magnetic Fields in Simulated Galaxies with Spectrally-Resolved Cosmic Rays",MNRAS Vol. 527, Issue 4, pp.11707-11718 (2024)
10. M.C. Smith, D.B. Fielding, G.L. Bryan, C. Kim, E.C. Ostriker, R.S. Somerville, J. Stern, **K. Su** et al., "Arkenstone I: A Novel Method for Robustly Capturing High Specific Energy Outflows In Cosmological Simulations", MNRAS Vol. 527, Issue 1, p.1216–1243 (2024)
11. †M. Roy, **K. Su** et al., "Seeding the CGM: How Satellites Populate the Cold Phase of Milky Way Halos", MNRAS Vol. 527, Issue 1, p.265-280 (2024)
12. †N. Qutob, R. Emami, **K. Su** et al., "Observational Signatures of AGN Feedback in the Morphology and the Ionization States of Milky Way-like Galaxies", ApJ Vol. 977, Number 1, p.72 (2024)
13. H. Cho, B. Prather, R. Narayan, P. Natarajan, **K. Su** et al., "Bridging Scales in Black Hole Accretion and Feedback: Magnetized Bondi Accretion in 3D GRMHD", ApJ Letters Vol. 959 L22 (2023)
14. J. Mercedes-Feliz, D. Anglés-Alcázar, B. Oh, C.C. Hayward, R. Cochrane, A.J. Richings, C. Faucher-Giguère, S. Wellons, B.A. Terrazas, J. Moreno, **K. Su** et al., "Dense stellar clump formation driven by strong quasar winds in the FIRE cosmological hydrodynamic simulations", MNRAS Vol. 530, Issue 3, p 2795-2809 (2024)
15. J. Mercedes-Feliz, D. Anglés-Alcázar, C.C. Hayward, R.K. Cochrane, B.A. Terrazas, S. Wellons, A.J. Richings, C. Faucher-Giguère, J. Moreno, **K. Su**, et al., "Local positive feedback in the overall negative: the impact of quasar winds on star formation in the FIRE cosmological simulations", MNRAS Vol. 524, Issue 3, p.3446-3463 (2023)
16. R.K. Cochrane, D. Anglés-Alcázar, J. Mercedes-Feliz, C.C. Hayward, C. Faucher-Giguère, S. Wellons, B.A. Terrazas, A. Wetzel, P.F. Hopkins, J. Moreno, **K. Su** et al., "The impact of AGN-driven winds on physical and observable galaxy sizes", MNRAS Vol. 523, Issue 2, p.2409–2421 (2023)
17. R. Weinberger, **K. Su** et al ,"Active galactic nucleus jet feedback in hydrostatic halos ", MNRAS Vol. 523, Issue 1, p.1104-1125 (2023)
18. S. Wellons, C. Faucher-Giguère, P.F. Hopkins, E. Quataert, D. Anglés-Alcázar, R. Fieldmann, C.C. Hayward, **K. Su** et al ,"Exploring supermassive black hole physics and galaxy quenching across halo mass in FIRE cosmological zoom simulations ", MNRAS Vol. 520, Issue 4, p.5394–5412 (2023)
19. P.F. Hopkins, A. Wetzel, C. Wheeler R. Sanderson, M. Grudic, O. Sameie, M. Boylan-kochin, M. Orr, X. Ma, C. Faucher-Giguère, D. Kereš, E. Quataert, **K. Su** et al.,"FIRE-3: Updated Stellar Evolution Models, Yields, & Microphysics and Fitting Functions for Applications in Galaxy Simulations", MNRAS Vol. 519, Issue 2, p.3154-3181 (2023)
20. D.B. Fielding, S. Tonnesen, D. DeFelippis, M. Li, **K. Su** et al. "First results from SMAUG: Uncovering the Origin of the Multiphase Circumgalactic Medium with a Comparative Analysis of Idealized and Cosmological Simulations", ApJ, Vol. 903, Issue 1, id.32 (2020)
21. M.E. Orr, C.C. Hayward, A.M. Medling, P.F. Hopkins, N. Murray, J.L. Pineda, C.C. Faucher-Giguère, D. Kereš, and **K. Su**,"Swirls of FIRE: Spatially Resolved Gas Velocity Dispersions and Star Formation Rates in FIRE-2 Disk Environments", MNRAS Vol. 496, Issue 2, p.1620-1637 (2020)
22. P.F. Hopkins, T.K. Chan, S. Garrison-Kimmel, S. Ji, **K. Su** et al.,"But what about...: cosmic rays, magnetic fields, conduction, and viscosity in galaxy formation", MNRAS Vol. 492, Issue 3, p.3465–3498 (2020)
23. T.K. Chan, D. Kereš, P.F. Hopkins, E. Quataert, **K. Su** et al.,"Cosmic ray feedback in the FIRE simulations: constraining cosmic ray propagation with GeV gamma ray emission", MNRAS Vol. 488, Issue 3, p.3716–3744 (2019)
24. P.F. Hopkins, A. Wetzel, D. Kereš, C. Faucher-Giguère, E. Quataert, M. Boylan-Kolchin, N. Murray, C.C. Hayward, S. Garrison-Kimmel, C. Hummels, R. Feldmann, P. Torrey, X. Ma, D. Anglés-Alcázar, **K. Su**, et al. "FIRE-2 simulations: physics versus numerics in galaxy formation", MNRAS Vol. 480, Issue 1, p.800-863 (2018)

RECENT PRESENTATIONS

Conferences

New England FOLIAGE 2024 **(SOC)**	Nov. 2024
Computational Galaxy Formation 2024 **(Invited)**	Oct. 2024
10th Galaxy Evolution Workshop **(Invited)**	Aug. 2024
7th ICM Theory & Computation Workshop **(Invited)**	Jun. 2024
Aspen Workshop – Cosmic Ray Feedback in Galaxies and Galaxy Clusters **(Invited)**	May. 2024
Bridging Scale Workshop **(LOC)**	May. 2024
243rd Meeting of the AAS	Jan. 2024
International Conference on Resolving Galaxy Ecosystems Across All Scales	Dec. 2023
Black Hole on Broadway	Dec. 2023
CR workshop in Lyon **(Invited)**	Nov. 2023
Signatures of AGN Feedback: The Post-SOFIA Era **(Invited)**	Oct. 2022
240th Meeting of the AAS	June 2022
2022 Intermediate-Mass Black Holes	April 2022
2020 Aspen Galaxy Quenching Conference	Feb. 2020
235th Meeting of the AAS	Jan. 2020
2019 Santa Cruz Galaxy Workshop	Aug. 2019
Big Apple Magnetic Fields 2019	Jan. 2019
233rd Meeting of the AAS	Jan. 2019
Galaxy Formation & Evolution in Southern California 2018 (GalFRESCA18)	Aug. 2018
2018 Santa Cruz Galaxy Workshop	Aug. 2018
SnowCluster 2018	Mar. 2018
Third LeCosPA International Symposium **(Invited)**	Dec. 2017
Swinburne-CalTech Science Workshop 3 (SCTW3)	Sep. 2017
Galaxy Formation & Evolution in Southern California 2017 (GalFRESCA17)	Aug. 2017
Modeling and Observing DEnse STellar Systems 2017 (MODEST-16)	Sep. 2016
Theoretical Astrophysics in Southern California 2015 (TASC2015)	Nov. 2015

Seminars

ASIAA	ASIAA Colloquium **(Invited)**	Dec. 2023
UConn	Special Seminar **(Invited)**	Oct. 2023
OSU	CCAPP Seminar	Nov. 2022
CCA	CCA Lunch Talk	Apr. 2021
Columbia	Columbia Pizza Lunch	Oct. 2020
CCA	CCA Lunch Talk	Oct. 2019
ASIAA	Lunch Talk **(Invited)**	Dec. 2018
UT Austin	Theory Seminar	Dec. 2018
U Chicago	Prof. Kravtsov and Gnedin Group meeting	Nov. 2018
UIUC	Astrophysics, Gravitation, and cosmology Seminar	Oct. 2018
Northwestern	CIERA Theory Group Meeting	Oct. 2018
UCSB	Lunch talks	Oct. 2018
UCSD	Journal Club talks CIERA Theory Group Meeting	Oct. 2018
UCSC	FLASH seminar	Oct. 2018
Stanford	Cosmology seminar	Oct. 2018
Princeton	SFIR: Star Formation/ISM Rendezvous	Apr. 2018
Princeton	Galread	Apr. 2018
MIT	Brown Bag Lunch series	Apr. 2018
Harvard	Lars's Group Meeting	Mar. 2018
Harvard	Galaxy & Cosmology seminars	Mar. 2018
Columbia	Columbia Thursday seminar	Mar. 2018
CCA	Internal Talks	Mar. 2018