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)
- Writing workshop – Co-organizer (May 2017)

STUDENT MENTORING

- Mentoring Harvard REU Student, Nadia Qutob, on the signatures of different AGN jet models on ion distributions (June.-Aug. 2023) – draft in preparation
- Mentoring CCA Predoc, Manami Roy, on the effect of satellites on the host CGM (Feb.-Jul. 2022) – first paper accepted by MNRAS Oct. 2023

AWARD

- Burke Graduate Fellowship (2018-2019 spring)
- Groce travel funding (Dec. 2018)
- NTU President Award (2006); Dean Award (2010)
- Lecospa Outstanding Student Research Award (2009)

COLLABORATION

FIRE, SMAUG, LtU

COMPUTING AWARDS

12.5M CPU-hours (223200 SUs)	PI – Frontera Pathway AST22010 2022-2023	"A Systematic Study of How AGN Feedback Regulates the Black Hole Accretion in Early Protogalaxies"
11.1M CPU-hours (198400 SUs)	PI – Frontera Pathway AST22010 2023-2024 (renew)	"A Systematic Study of How AGN Feedback Regulates the Black Hole Accretion in Early Protogalaxies"
11M CPU-hours ∼ $132,434	PI – XSEDE XRAC TG-PHY220047 2022-2023	"A Systematic Study of AGN Jet and Black Hole Accretion in Massive Galaxies"
20.8M CPU-hours ∼ $250,804	PI – ACCESS Maximize TG-PHY220047 2023-2024 (renew)	"A Systematic Study of AGN Jet and Black Hole Accretion in Massive Galaxies"
50k CPU-hours ∼ $880	PI – XSEDE Starup TG-PHY220027 2022-2023	"AGN feedback across multiple scales"
200k CPU-hours	PI – ACCESS Explore TG-PHY220027 2023-2024 (renew)	"AGN feedback across multiple scales"

SERVICE

- Referee, MNRAS (2018–), APJL (2022–), APJ (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 125	Quantum Mechanics
Ph 136c	Applications of Classical Physics: General Relativity
Ph 199	Frontiers of Fundamental Physics

SKILL

Python, IDL, C, MPI

PUBLICATIONS

First Author

1. **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"arXiv:2310.17692
2. **K. Su**, G.L. Bryan, Z. Haiman, R.S. Sommerville et al., "Self-regulation of black hole accretion via jets in early protogalaxies", MNRAS 520, 4258–4275 (2023)
3. **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 507, 175-204 (2021)
4. **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 491, 1190–1212 (2020)
5. **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 487, 4393–4408 (2019)

6. **K. Su**, C.C. Hayward, P.F. Hopkins et al., "Stellar feedback strongly alters the amplification and morphology of galactic magnetic fields", MNRAS 473, L111-L115 (2018)
7. **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 480, 1666-1675 (2018)
8. **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 471, 144-166 (2017)
9. **K. Su**, P. Chen, "Solving the cusp-core problem with a novel scalar field dark matter", JCAP, 08, 016 (2011)
10. **K. Su**, P. Chen, "Comments on"Remarks on the spherical scalar field halo in galaxies"", arXiv1009.0869S (2010)
11. **K. Su**, P. Chen, "Comment on "Modeling galaxy halos using dark matter with pressure"", PRD, 79, 128301 (2009)

Other Publications

1. 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., "Local positive feedback in the overall negative: the impact of quasar winds on star formation in the FIRE cosmological simulations", arXiv:2310.19863 (2023)
2. 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", submitted to ApJ Letters, arXiv:2310.19135 (2023)
3. 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", arXiv:2310.04506 (2023)
4. P.F. Hopkins, J. Squire, E. Quataert, N. Murray, **K. Su** et al. "An Analytic Model For Magnetically-Dominated Accretion Disks", arXiv:2310.04507 (2023)
5. M. Roy, **K. Su** et al., "Seeding the CGM: How Satellites Populate the Cold Phase of Milky Way Halos ", MNRAS 527, 265-280 (2023)
6. 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", arXiv:2309.16752 (2023)
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", arXiv:2309.13115 (2023)
8. S. 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",arXiv:2309.04526 (2023)
9. 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 524, 3446-3463 (2023)
10. 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 523, 2409–2421 (2023)
11. R. Weinberger, **K. Su** et al ,"Active galactic nucleus jet feedback in hydrostatic halos ", MNRAS 523, 1104-1125 (2023)
12. J. Stern, D. Fielding, Z. Hafen, **K. Su** et al., "Accretion onto disk galaxies via hot and rotating CGM inflows", arXiv:2306.00092 (2023)
13. 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 520, 5394–5412 (2023)

14. 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 519, 3154-3181 (2023)
15. 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 stad3168 (2023)
16. 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", The Astrophysical Journal, Volume 903, Issue 1, id.32, 22 pp (2020)
17. 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 496, 1620-1637 (2020)
18. 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 492, 3465–3498 (2020)
19. 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 488, 3716–3744 (2019)
20. 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 480, 800-863 (2018)

RECENT PRESENTATIONS

Conferences

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

UConn	Special Seminar	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