XUEJIAN(JACOB) SHEN

(+1)617-866-3133 ⋄ xshen@caltech.edu ⋄ Personal Site
California Institute of Technology
1200 E. California Blvd, MC350-17, Pasadena, CA 91125 USA

EDUCATION

California Institute of Technology *Sept 2018 - June 2023 (expected)*
Ph.D. Candidate, Physics
Division of Physics, Math and Astronomy, California Institute of Technology, Pasadena, CA, USA
Academic and Research Advisor: Prof. Philip Hopkins
Thesis Title: Cosmic structure and galaxy formation in alternative dark matter

Peking University *Sept 2014 - June 2018*
B.S., Physics
Department of Physics, Peking University, Beijing, China
Advisor: Prof. Fukun Liu
Thesis Title: "Strengthened Kozai-Lidov Oscillation, Tidal Disruption Event Rate and Gravitational Wave in Hierarchical SMBH Triplets"

EMPLOYMENT

Graduate Research Assistant July 2022 - Present
California Institute of Technology, Pasadena, CA, USA

Graduate Teaching Assistant Jan 2018 - June 2022
California Institute of Technology, Pasadena, CA, USA

Undergraduate Summer Research Intern July 2017 - Sept 2017
Kavli Institute for Astrophysics and Space Research, Massachusetts Institute of Technology, Cambridge, MA, USA

RESEARCH INTERESTS

Theoretical Astrophysics, primarily cosmological simulations of galaxy formation and astrophysical constraints for the nature of dark matter. Secondary interest: galaxies at high redshift.

SUMMARY OF PUBLICATIONS

Refereed publications: **13** (see attached publication list)
Metrics: >**400 citations**, >**200 first-author citations**, **h-index: 10**

AWARDS & FELLOWSHIPS

James A. Cullen Memorial Fellowship 2022
Caltech, The Division of Physics, Mathematics and Astronomy

Honored Graduate 2018
Peking University

Robin Li Fellowship 2017
Peking University

Meritorious Award 2017
Mathematical Contest in Modeling (MCM)

SELECTED TALKS

High-z prediction with Illustris-TNG	MIT (Cambridge, MA, 2019)
Alternative dark matter and structure formation	Observational cosmology seminar Caltech (Pasadena, CA, 2021)
Galaxy formation in dissipative dark matter	GalFRESCA workshop (Pasadena, CA, 2022)
Alternative dark matter in galaxy formation	Harvard CfA (Cambridge, MA, 2022)
Alternative dark matter in galaxy formation	MIT, Brown Bag Lunch Talk (Cambridge, MA, 2022)
Alternative dark matter in galaxy formation	Princeton, Dark Cosmos Talk (Princeton, NJ, 2022)
Some new aspects about CDM alternatives	Stanford, KIPAC Tea Talk (Stanford, CA, 2023)

TEACHING & ADVISING

Caltech Graduate Teaching Assistant	Compulational Physics Lab Ph20/21/22 (2019 - 2022)
Caltech SURF program 2021	Co-advisor of Gabriel Aguiar (Undergraduate)
Caltech SURF program 2022	Co-advisor of Eitan Rapaport (Undergraduate)

TECHNICAL STRENGTHS

Natural Languages	Native in Mandarin. Fluent in English.
Programming Languages	Proficient in Python, Mathematica, C/C++ and Linux shell. Experience in MATLAB, SQL.
Markup Languages	Proficient in LaTeX and HTML.

PROFESSION SERVICE & OUTREACH

Oscii Bascii (& Grad student representative) of Theoretical AstroPhysics Including Relativity and Cosmology (TAPIR), Caltech

Journal Referee: Monthly Notices of the Royal Astronomical Society; The Astrophysical Journal
See my Publons profile for details

Leader of the Local Organizing Committee (LOC) for the Galaxy Formation and Evolution in Southern California (GalFRESCA) workshop (2022)

PUBLICATIONS (FIRST-AUTHOR & PEER-REVIEWED)

See my NASA ADS bibliography for full information

1. **Xuejian Shen**, Thejs Brinckmann, David Rapetti, Mark Vogelsberger, Adam Mantz, Jesús Zavala, and Steven W. Allen. X-ray morphology of cluster-mass haloes in self-interacting dark matter. *MNRAS*, 516(1):1302–1319, October 2022

2. **Xuejian Shen**, Mark Vogelsberger, Dylan Nelson, Sandro Tacchella, Lars Hernquist, Volker Springel, Federico Marinacci, and Paul Torrey. High-redshift predictions from IllustrisTNG - III. Infrared luminosity functions, obscured star formation, and dust temperature of high-redshift galaxies. *MNRAS*, 510(4):5560–5578, March 2022

3. **Xuejian Shen**, Philip F. Hopkins, Lina Necib, Fangzhou Jiang, Michael Boylan-Kolchin, and Andrew Wetzel. Dissipative dark matter on FIRE - I. Structural and kinematic properties of dwarf galaxies. *MNRAS*, 506(3):4421–4445, September 2021

4. **Xuejian Shen**, Mark Vogelsberger, Dylan Nelson, Annalisa Pillepich, Sandro Tacchella, Federico Marinacci, Paul Torrey, Lars Hernquist, and Volker Springel. High-redshift JWST predictions from IllustrisTNG: II. Galaxy line and continuum spectral indices and dust attenuation curves. *MNRAS*, 495(4):4747–4768, July 2020

5. **Xuejian Shen**, Philip F. Hopkins, Claude-André Faucher-Giguère, D. M. Alexander, Gordon T. Richards, Nicholas P. Ross, and R. C. Hickox. The bolometric quasar luminosity function at z = 0-7. *MNRAS*, 495(3):3252–3275, January 2020

PUBLICATIONS (FIRST-AUTHOR & UNDER REVIEW)

1. **Xuejian Shen**, Huangyu Xiao, Philip F. Hopkins, and Kathryn M. Zurek. Disruption of Dark Matter Minihaloes in the Milky Way environment: Implications for Axion Miniclusters and Early Matter Domination. *arXiv e-prints*, page arXiv:2207.11276, July 2022

2. **Xuejian Shen**, Philip F. Hopkins, Lina Necib, Fangzhou Jiang, Michael Boylan-Kolchin, and Andrew Wetzel. Dissipative Dark Matter on FIRE: II. Observational signatures and constraints from local dwarf galaxies. *arXiv e-prints*, page arXiv:2206.05327, June 2022

PUBLICATIONS (CO-AUTHORED & PEER-REVIEWED)

1. Rahul Kannan, Aaron Smith, Enrico Garaldi, **Xuejian Shen**, Mark Vogelsberger, Rüdiger Pakmor, Volker Springel, and Lars Hernquist. The THESAN project: predictions for multitracer line intensity mapping in the epoch of reionization. *MNRAS*, 514(3):3857–3878, August 2022

2. Huangyu Xiao, **Xuejian Shen**, Philip F. Hopkins, and Kathryn M. Zurek. SMBH seeds from dissipative dark matter. *J. Cosmol. Astropart. Phys.*, 2021(7):039, July 2021 (Major contribution)

3. Razieh Emami, Lars Hernquist, Charles Alcock, Shy Genel, Sownak Bose, Rainer Weinberger, Mark Vogelsberger, **Xuejian Shen**, Joshua S. Speagle, Federico Marinacci, John C. Forbes, and Paul Torrey. Inferring the Morphology of Stellar Distribution in TNG50: Twisted and Twisted-stretched Shapes. *ApJ*, 918(1):7, September 2021

4. Philip Mocz, Anastasia Fialkov, Mark Vogelsberger, Fernando Becerra, **Xuejian Shen**, Victor H. Robles, Mustafa A. Amin, Jesús Zavala, Michael Boylan-Kolchin, Sownak Bose, Federico Marinacci, Pierre-Henri Chavanis, Lachlan Lancaster, and Lars Hernquist. Galaxy formation with BECDM - II. Cosmic filaments and first galaxies. *MNRAS*, 494(2):2027–2044, May 2020

5. Mark Vogelsberger, Dylan Nelson, Annalisa Pillepich, **Xuejian Shen**, Federico Marinacci, Volker Springel, Rüdiger Pakmor, Sandro Tacchella, Rainer Weinberger, Paul Torrey, and Lars Hernquist. High-redshift JWST predictions from IllustrisTNG: dust modelling and galaxy luminosity functions. *MNRAS*, 492(4):5167–5201, March 2020 (Major contribution)

6. Yunchong Wang, Mark Vogelsberger, Dandan Xu, **Xuejian Shen**, Shude Mao, David Barnes, Hui Li, Federico Marinacci, Paul Torrey, Volker Springel, and Lars Hernquist. Early-type galaxy density profiles from IllustrisTNG - II. Evolutionary trend of the total density profile. *MNRAS*, 490(4):5722–5738, October 2019

7. Mark R. Lovell, Jesús Zavala, Mark Vogelsberger, **Xuejian Shen**, Francis-Yan Cyr-Racine, Christoph Pfrommer, Kris Sigurdson, Michael Boylan-Kolchin, and Annalisa Pillepich. ETHOS - an effective theory of structure formation: predictions for the high-redshift Universe - abundance of galaxies and reionization. *MNRAS*, 477(3):2886–2899, July 2018

PUBLICATIONS (CO-AUTHORED & UNDER REVIEW)

1. Philip F. Hopkins, Alexander B. Gurvich, **Xuejian Shen**, Zachary Hafen, Michael Y. Grudic, Shalini Kurinchi-Vendhan, Christopher C. Hayward, Fangzhou Jiang, Matthew E. Orr, Andrew Wetzel, Dusan Keres, Jonathan Stern, Claude-Andre Faucher-Giguere, James Bullock, Coral Wheeler, Kareem El-Badry, Sarah R. Loebman, Jorge Moreno, Michael Boylan-Kolchin, and Eliot Quataert. What Causes The Formation of Disks and End of Bursty Star Formation? *arXiv e-prints*, page arXiv:2301.08263, January 2023

2. Philip F. Hopkins, Ethan O. Nadler, Michael Y. Grudic, **Xuejian Shen**, Isabel Sands, and Fangzhou Jiang. Novel Conservative Methods for Adaptive Force Softening in Collisionless and Multi-Species N-Body Simulations. *arXiv e-prints*, page arXiv:2212.06851, December 2022

3. Thomas K. Waters, Colton Peterson, Razieh Emami, **Xuejian Shen**, Lars Hernquist, Randall Smith, Mark Vogelsberger, Charles Alcock, Grant Tremblay, Matthew Liska, John C. Forbes, and Jorge Moreno. Gas Morphology of Milky Way-like Galaxies in the TNG50: Signals of Twisting and Stretching. *arXiv e-prints*, page arXiv:2210.01051, October 2022

4. Fangzhou Jiang, Andrew Benson, Philip F. Hopkins, Oren Slone, Mariangela Lisanti, Manoj Kaplinghat, Annika H. G. Peter, Zhichao Carton Zeng, Xiaolong Du, Shengqi Yang, and **Xuejian Shen**. A semi-analytic study of self-interacting dark-matter haloes with baryons. *arXiv e-prints*, page arXiv:2206.12425, June 2022

5. Razieh Emami, Lars Hernquist, Mark Vogelsberger, **Xuejian Shen**, Joshua S. Speagle, Jorge Moreno, Charles Alcock, Shy Genel, John C. Forbes, Federico Marinacci, and Paul Torrey. On the robustness of the velocity anisotropy parameter in probing the stellar kinematics in Milky Way like galaxies: Take away from TNG50 simulation. *arXiv e-prints*, page arXiv:2202.07162, February 2022

CONFERENCE PROCEEDINGS

1. **Xuejian Shen**, Philip Hopkins, Lina Necib, Fangzhou Jiang, Michael Boylan-Kolchin, and Andrew Wetzel. Dissipative Dark Matter on FIRE: Structural and kinematic properties of dwarf galaxies and observational constraints. In *American Astronomical Society Meeting Abstracts*, volume 54 of *American Astronomical Society Meeting Abstracts*, page 347.06, June 2022