

Xiangcheng Ma

Software Engineer, Nuro

Phone: +1 (626) 755-5430 ◦ Email: xiangchma@gmail.com ◦ Website: <http://www.tapir.caltech.edu/~xchma>
Married, no children ◦ Nationality: China (U.S. permanent resident)

EDUCATION

- Ph.D. in Theoretical Astrophysics, California Institute of Technology 06/2018
Thesis: *Understanding Galaxy Formation and Evolution with Realistic Simulations*
Advisor: Prof. Philip F. Hopkins
- B.S. in Astronomy, University of Science and Technology of China 06/2013
with highest honor
Advisor: Prof. Ting-Gui Wang

INDUSTRY EXPERIENCE

- Nuro, Inc. 04/2022–
Software Engineer, *Simulation – Interactive agents*

ACADEMIC APPOINTMENTS

- Kavli Institute of Astronomy and Astrophysics, Peking University 02/2021–04/2022
(Incoming) Tenure-Track Assistant Professor
- Steward Observatory Theory Prize Fellow, University of Arizona 08/2021–04/2022
Independent
- TAC Postdoctoral Fellow, University of California, Berkeley 08/2018–08/2021
Faculty Advisor: Prof. Eliot Quataert
- Graduate Research Assistant, California Institute of Technology 09/2013–06/2018
Advisor: Prof. Philip F. Hopkins

HONORS AND AWARDS

- Steward Observatory Theory Prize Fellowship, University of Arizona 2021
- CIERA Postdoctoral Fellowship, Northwestern University (declined) 2021
- T. D. Lee Visiting Fellow in Astrophysics, the T. D. Lee Institute 2019
- TAC Postdoctoral Fellowship, University of California, Berkeley 2018
- Harlan J. Smith Postdoctoral Fellowship, UT Austin (declined) 2018, 2021
- John Stager Stemple Memorial Prize in Physics, Caltech 2018
- David Groce Graduate Travel Award in Physics, Caltech 2017
- David Groce Graduate Fellowship in Theoretical Physics, Caltech 2014
- Guo Mo-Ruo Scholarship (USTC highest honor) 2013
- National Astronomical Observatory Scholarship, China 2013
- National Scholarship, P. R. China 2012

TEACHING EXPERIENCE

- Ay104: Relativistic Astrophysics (Spring 2016, Caltech, instructor: M. Kasliwal; 1 lecture)
- Ay102: Interstellar Medium (Winter 2016, Caltech, instructor: S. R. Kulkarni)
- Ph101: Order of Magnitude Physics (Spring 2015, Caltech, instructor: E. S. Phinney)
- Ay21: Galaxies and Cosmology (Winter 2015, Caltech, instructor: S. G. Djorgovski; 2 lectures)

PROPOSALS

- PI, XSEDE allocation TG-AST200021, *Building realistic simulations of galaxies at the epoch of reionization* (~1.2 million CPU hours)
- PI, XSEDE startup allocation TG-AST190028, *Making realistic models of the first galaxies* (96,000 CPU hours)
- Co-I, HST Legacy Theory Program, *Probing the epoch of reionization with the fossil record of nearby dwarf galaxies* (PI: A. Wetzel, UC Davis)
- Co-I, Keck telescope proposal, *Dwarf Galaxies or Star Clusters: Spectroscopic Follow up of Compact Sources in the Frontier Fields* (PI: D. Weisz, UC Berkeley)

SERVICES

- Graduate Admission Committee, Department of Astronomy, University of Arizona (fall 2021)
- External Reviewer, Subaru Telescope Open Use proposal for S22A semester
- Referee for *Monthly Notices of the Royal Astronomical Society* and the *Astrophysical Journal*
- Organizer, Theoretical Astrophysics Center (TAC) seminar (UC Berkeley)

PUBLIC TALKS AND OUTREACH

- *Supermassive black holes*, Berkeley Public Library 10/2019
- *Galaxy Formation on Supercomputers*, Berkeley Public Library 06/2019

STUDENTS & POSTDOCS ADVISED

- Postdocs:
 - Omid Sameie, UT Austin (co-advising with Mike Boylan-Kolchin) 03/2020–now
Project: *Formation and occupation of globular clusters in ultra-faint dwarf galaxies*
- Graduate students:
 - Victoria Strait, UC Davis (co-advising with Andrew Wetzel) 07/2020–now
Project: *Testing the bursty star formation in simulations with observed high- z galaxies*
 - Francisco Holguin, U Michigan (co-advising with Chris Hayward) 08/2020–now
Project: *The effect of photoionization from stars on the CGM ionization states*
 - Benjamin Kimock, U Florida (co-advised with Desika Narayanan and Aaron Smith) 2019
Project: *Understanding Lyman- α blobs with the FIRE simulations* (1 paper published)
 - Christian Binggeli, Uppsala, Sweden (co-advised with Erik Zackrisson) 2018
Project: *Balmer decrement distribution in high- z galaxies* (1 paper published)
- Undergraduate students:
 - Karolus Lu (Berkeley, summer 2019), Jiashu Han (Berkeley, spring 2019), Hyerin Cho (Caltech, fall 2017), Matthew Colbrook (Cambridge, summer 2015), Nick Zolman (Caltech, summer 2014)

TALKS (†Invited talks)

- †Theoretical Astrophysics Program Colloquium, Steward Observatory 11/2021
- †Galaxy seminar, University of Michigan (online) 04/2021
- †EURECA seminar on high-redshift Universe, University of Arizona (online) 02/2021
- †Astronomy colloquium, KIAA, Peking University, China (online) 01/2021
- †Astronomy colloquium, Tsinghua University, China (online) 01/2021
- †Astronomy colloquium, University of Science & Technology of China (online) 12/2020

- †Physics & astronomy forum, Zhejiang University, China (online) 12/2020
- †Astronomy seminar, Shanghai Jiao Tong University, China (online) 12/2020
- †KIPAC tea talk, Stanford University (online) 12/2020
- Lunch talk series, Carnegie Observatories (online) 11/2020
- †Lunch talk, Galaxy formation group, CCA, Flatiron Institute (online) 11/2020
- Summer all zoom epoch of reionization astronomy conference (online) 07/2020
- †Astronomy colloquium series, Xiamen University, China (online) 05/2020
- †Astronomy Lunch Seminar, IPMU, Japan (online) 05/2020
- †Astronomy seminar series, Nanjing University, China (online) 05/2020
- †Review talk, KITP workshop on star clusters, UC Santa Barbara (online) 05/2020
- †Conference on galaxy formation and evolution across cosmic time, Taipei, China 12/2019
- APP conference on SED modeling of galaxies, Milan, Italy 11/2019
- †Lorentz center workshop on JWST spectroscopy, Leiden, the Netherlands 10/2019
- Galaxy and cosmology seminar, UT Austin 09/2019
- KIAA Forum on Gas in Galaxies, Peking University, Beijing, China 09/2019
- Santa Cruz Galaxy workshop, UC Santa Cruz 08/2019
- IAU 352 on Galaxy Evolution with JWST and ALMA, Viana do Castelo, Portugal 06/2019
- Department lunch talk, UC Berkeley 04/2019
- Dusting the Universe conference, Tucson, Arizona 03/2019
- †Lorentz center workshop on star clusters, Leiden, the Netherlands 02/2019
- †Astronomy Colloquium, Shanghai Astronomical Observatory (SHAO), China 01/2019
- †Colloquium series, T. D. Lee Institute/SJTU, Shanghai, China 01/2019
- AstroFrontiers conference, Portland, Oregon 06/2018
- Galaxy Journal Club, STScI 11/2017
- †Galaxies and Cosmology seminar, CfA, Harvard University 11/2017
- FLASH seminar, UC Santa Cruz 10/2017
- †Cosmology seminar, Stanford University 10/2017
- †Cosmology seminar, UC Davis 10/2017
- †Theoretical Astrophysics Center seminar, UC Berkeley 10/2017
- Swinburne-Caltech Workshop, Caltech 09/2017
- SoCal Galaxy Formation and Evolution workshop, Caltech 08/2017
- Santa Cruz Galaxy workshop, UC Santa Cruz 08/2017
- ITC luncheon series, CfA, Harvard University 04/2017
- Brown bag lunch talk series, MIT 04/2017
- Astronomy seminar, Columbia University 04/2017
- Galaxy lunch seminar, Yale University 04/2017
- GalRead, Princeton University 04/2017
- Lunch seminar, Center for Computational Astrophysics, New York 04/2017
- SnowCLAW conference on Lyman-alpha, Salt Lake City, Utah 03/2017
- SoCal Galaxy Formation and Evolution workshop, Caltech 09/2016
- Santa Cruz Galaxy Workshop, UC Santa Cruz 08/2016
- †Brown bag lunch talk series, MIT 05/2016
- Hernquist Group seminar, CfA, Harvard University 05/2016
- †Astronomy seminar, UC Riverside 04/2016
- †Astronomy colloquium, USTC, Hefei, China 09/2015

- Santa Cruz Galaxy workshop, UC Santa Cruz 08/2015
- South by High Redshift conference, UT Austin (poster) 04/2015
- Theoretical Astrophysics in SoCal meeting, UC San Diego 11/2014

SKILLS

- Programming languages: C, C++, PYTHON (proficient)
- High performance computing platforms, MPI & OpenMP parallelization

RESEARCH INTERESTS

- Cosmological (magneto)hydrodynamic simulations, Monte Carlo radiative transfer
- Galaxy formation and evolution, high-redshift galaxies, cosmic reionization
- Star clusters and globular clusters across cosmic time
- Supermassive black hole formation, growth, and feedback
- Dust grain physics in the interstellar and circumgalactic medium

REFERENCE

- Philip F. Hopkins
Ira S. Bowen Professor of Theoretical Astrophysics, California Institute of Technology
MC 350-17, 1200 E California Blvd, Pasadena, CA 91125, USA
Email: phopkins@caltech.edu, Phone: +1 626 395-2563
- Eliot Quataert
Charles A. Young Professor of Astronomy, Princeton University
4 Ivy Lane, Princeton University, Princeton, NJ 08544
Email: quataert@princeton.edu
- Steven L. Finkelstein
Professor of Astronomy, The University of Texas at Austin
2515 Speedway Blvd Stop C1400, Austin, TX 78712, USA
Email: stevenf@astro.as.utexas.edu, Phone: +1 512 471-1483
- Claude-André Faucher-Giguère
Associate Professor of Physics and Astronomy, Northwestern University
CIERA, 2145 Sheridan Road, Evanston, IL 60208-3112, USA
Email: cgiguere@northwestern.edu, Phone: +1 847 467-4647
- Mike Boylan-Kolchin
Associate Professor of Astronomy, The University of Texas at Austin
2515 Speedway Blvd Stop C1400, Austin, TX 78712, USA
Email: mbk@astro.as.utexas.edu, Phone: +1 512-471-3343
- Andrew Wetzel
Assistant Professor of Physics and Astronomy, University of California, Davis
One Shields Avenue, Physics Department, Davis, CA 95616
Email: awetzel@ucdavis.edu, Phone: +1 701-426-9762

Publications (*Students advised)

As of April 2023, 12 first-author papers, 4 second-author papers, 26 co-authored papers, over 3,700 citations on Google scholar, h -index=30.

First- and second-author refereed publications

1. **Ma, X.**, Quataert, E., Wetzel, A., et al., 2021, *The contribution of globular clusters to cosmic reionization*, Monthly Notices of the Royal Astronomical Society, 504, 4062-4071
2. **Ma, X.**, Quataert, E., Wetzel, A., et al., 2020, *No missing photons for reionization: moderate ionizing photon escape fractions from the FIRE-2 simulations*, Monthly Notices of the Royal Astronomical Society, 498, 2001-2017
3. **Ma, X.**, Grudić, M. Y., Quataert, E., et al., 2020, *Self-consistent proto-globular cluster formation in cosmological simulations of high-redshift galaxies*, Monthly Notices of the Royal Astronomical Society, 493, 4315-4332
4. **Ma, X.**, Hayward, C. C., Casey, C. M., et al., 2019, *Dust attenuation, dust emission, and dust temperature in galaxies at $z \geq 5$: a view from the FIRE-2 simulations*, Monthly Notices of the Royal Astronomical Society, 487, 1844-1864
5. Smith, A., **Ma, X.**, Bromm, V., et al., 2019, *The physics of Lyman- α escape from high-redshift galaxies*, Monthly Notices of the Royal Astronomical Society, 484, 39-59
6. **Ma, X.**, Hopkins, P. F., Garrison-Kimmel, S., et al., 2018, *Simulating galaxies in the reionization era with FIRE-2: galaxy scaling relations, stellar mass functions, and luminosity functions*, Monthly Notices of the Royal Astronomical Society, 478, 1694-1715
7. **Ma, X.**, Hopkins, P. F., Boylan-Kolchin, M., et al., 2018, *Simulating galaxies in the reionization era with FIRE-2: morphologies and sizes*, Monthly Notices of the Royal Astronomical Society, 477, 219-229
8. Kim, J.-h., **Ma, X.**, Grudić, M. Y., et al., 2018, *Formation of Globular Cluster Candidates in Merging Proto-galaxies at High Redshift: A View from the FIRE Cosmological Simulations*, Monthly Notices of the Royal Astronomical Society, 474, 4232-4244
9. **Ma, X.**, Hopkins, P. F., Wetzel, A. R., et al., 2017, *The Structure and Dynamical Evolution of the Stellar Disk of a Simulated Milky Way-Mass Galaxy*, Monthly Notices of the Royal Astronomical Society, 467, 2430-2444
10. Colbrook*, M. J., **Ma, X.**, Hopkins, P. F., and Squire, J., 2017, *Scaling laws of passive-scalar diffusion in the interstellar medium*, Monthly Notices of the Royal Astronomical Society, 467, 2421-2429
11. **Ma, X.**, Hopkins, P. F., Feldmann, R., et al., 2017, *Why do high-redshift galaxies show diverse gas-phase metallicity gradients?*, Monthly Notices of the Royal Astronomical Society, 466, 4780-4794
12. **Ma, X.**, Hopkins, P. F., Kasen, D., et al., 2016, *Binary Stars Can Provide the ‘Missing Photons’ Needed for Reionization*, Monthly Notices of the Royal Astronomical Society, 459, 3614-3619
13. **Ma, X.**, Hopkins, P. F., Faucher-Giguère, C.-A., Zolman*, N., et al., 2016, *The Origin and Evolution of the Galaxy Mass–Metallicity Relation*, Monthly Notices of the Royal Astronomical Society, 456, 2140-2156
14. **Ma, X.**, Kasen, D., Hopkins, P. F., et al., 2015, *The Difficulty of Getting High Escape Fraction of Ionizing Photons from High-redshift Galaxies: A View from the FIRE Cosmological Simulations*, Monthly Notices of the Royal Astronomical Society, 453, 960-975

15. **Ma, X.**, Wang, T., 2013, *Covering Factor of Warm Dust in Quasars: View from WISE All-Sky Data Release*, Monthly Notices of the Royal Astronomical Society, 430, 3445-3452
16. Obreschkow, D., **Ma, X.**, Meyer, M., et al., 2013, *Confronting Cold Dark Matter Predictions with Observed Galaxy Rotations*, The Astrophysical Journal, 766, 137 (11pp)

Other refereed publications (†with significant contribution)

1. †Sameie*, O., et al. (including **Ma, X.**), 2023, *Formation of proto-globular cluster candidates in cosmological simulations of dwarf galaxies at $z > 4$* , Monthly Notices of the Royal Astronomical Society, in press
2. Wetzel, A., et al. (including **Ma, X.**), 2023, *Public data release of the FIRE-2 cosmological zoom-in simulations of galaxy formation*, The Astrophysical Journal Supplement Series, 265, 44
3. Hopkins, P. F., et al. (including **Ma, X.**), 2023, *FIRE-3: updated stellar evolution models, yields, and microphysics and fitting functions for applications in galaxy simulations*, Monthly Notices of the Royal Astronomical Society, 519, 3154-3181
4. Porter, L. E., et al. (including **Ma, X.**), 2022, *Spatially resolved gas-phase metallicity in FIRE-2 dwarfs: late-time evolution of metallicity relations in simulations with feedback and mergers*, Monthly Notices of the Royal Astronomical Society, 515, 3555-3576
5. Ma, L., Hopkins, P. F., **Ma, X.**, et. al, 2021, *Seeds don't sink: even massive black hole 'seeds' cannot migrate to galaxy centers efficiently*, Monthly Notices of the Royal Astronomical Society, 508, 1973-1985
6. Emami, N., et al. (including **Ma, X.**), 2021, *Testing the Relationship between Bursty Star Formation and Size Fluctuations of Local Dwarf Galaxies*, The Astrophysical Journal, 922, 217
7. Grudić, M. Y., et al. (including **Ma, X.**), 2021, *A model for the formation of stellar associations and clusters from giant molecular clouds*, Monthly Notices of the Royal Astronomical Society, 506, 3239-3258
8. Hemler, Z. S., et al. (including **Ma, X.**), 2021, *Gas-Phase Metallicity Gradients of the IllustrisTNG50 Galaxy Population*, Monthly Notices of the Royal Astronomical Society, 506, 3024-3048
9. Bellardini, M. A., et al. (including **Ma, X.**), 2021, *3-D gas-phase elemental abundances across the formation histories of Milky Way-mass galaxies in the FIRE simulations: initial conditions for chemical tagging*, Monthly Notices of the Royal Astronomical Society, 505, 4586-4607
10. Yu, S., et al. (including **Ma, X.**), 2021, *The bursty origin of the Milky Way thick disc*, Monthly Notices of the Royal Astronomical Society, 505, 889-902
11. Stern, J., et al. (including **Ma, X.**), 2021, *Virialization of the Inner CGM in the FIRE Simulations and Implications for Galaxy Disks, Star Formation, and Feedback*, The Astrophysical Journal, 911, 88
12. †Beniamini, P., Kumar, P., **Ma, X.**, Quataert, E., 2021, *Exploring the epoch of hydrogen reionization using FRBs*, Monthly Notices of the Royal Astronomical Society, 502, 5134
13. †Kimock*, B., et al. (including **Ma, X.**), 2021, *The Origin and Evolution of Lyman-alpha Blobs in Cosmological Galaxy Formation Simulations*, The Astrophysical Journal, 909, 119
14. Torrey, P., et al. (including **Ma, X.**), 2020, *The Impact of AGN Wind Feedback in Simulations of Isolated Galaxies with a Multiphase ISM*, Monthly Notices of the Royal Astronomical

- Society, 497, 5292
15. Zick, T. O., et al. (including **Ma, X.**), 2020, *Towards Studying Hierarchical Assembly in Real Time: A Milky Way Progenitor Galaxy at $z = 2.36$ under the Microscope*, Monthly Notices of the Royal Astronomical Society, 493, 5653-5661
 16. Hopkins, P. F., et al. (including **Ma, X.**), 2020, *Radiative Stellar Feedback in Galaxy Formation: Methods and Physics*, Monthly Notices of the Royal Astronomical Society, 491, 3702
 17. Su, K.-Y., et al. (including **Ma, X.**), 2020, “Cosmic Rays or Turbulence can Suppress Cooling Flows (Where Thermal Heating or Momentum Injection Fail)”, Monthly Notices of the Royal Astronomical Society, 491, 1190
 18. †Binggeli*, C., Zackrisson, E., **Ma, X.** et al., 2019, *Balmer breaks in simulated galaxies at $z > 6$* , Monthly Notices of the Royal Astronomical Society, 489, 3827
 19. Liang, L., et al. (including **Ma, X.**), 2019, *On the dust temperatures of high redshift galaxies*, Monthly Notices of the Royal Astronomical Society, 489, 1397
 20. Cochrane, R. K., et al. (including **Ma, X.**), 2019, *Predictions for the spatial distribution of the dust continuum emission in $1 < z < 5$ star-forming galaxies*, Monthly Notices of the Royal Astronomical Society, 488, 1779
 21. Su, K.-Y., et al. (including **Ma, X.**), 2019, *The failure of stellar feedback, magnetic fields, conduction, and morphological quenching in maintaining red galaxies*, Monthly Notices of the Royal Astronomical Society, 487, 4393
 22. Emami, N., et al. (including **Ma, X.**), 2019, *A Closer look at Bursty Star Formation with $L_{H\alpha}$ and L_{UV} Distributions*, The Astrophysical Journal, 881, 71
 23. Garrison-Kimmel, S., et al. (including **Ma, X.**), 2018, *The origin of the diverse morphologies and kinematics of Milky Way-mass galaxies in the FIRE-2 simulations*, Monthly Notices of the Royal Astronomical Society, 481, 4133
 24. Sanderson, R. E., et al. (including **Ma, X.**), 2018, *Reconciling observed and simulated stellar halo masses*, The Astrophysical Journal, 869, 12 (18pp)
 25. Su, K.-Y., et al. (including **Ma, X.**), 2018, “*Discrete Effects in Stellar Feedback: Individual Supernovae, Hypernovae, and IMF Sampling in Dwarf Galaxies*”, Monthly Notices of the Royal Astronomical Society, 480, 1666
 26. Hopkins, P. F., et al. (including **Ma, X.**), 2018, *FIRE-2 Simulations: Physics versus Numerics in Galaxy Formation*, Monthly Notices of the Royal Astronomical Society, 480, 800
 27. †Escala, I., et al. (including **Ma, X.**), 2018, *Modeling chemical abundance distributions for dwarf galaxies in the Local Group: the impact of turbulent metal diffusion*, Monthly Notices of the Royal Astronomical Society, 474, 2194
 28. Guszejnov, D., Hopkins, P. F., **Ma, X.**, 2017, *Comparing models for IMF variation across cosmological time in Milky Way-like galaxies*, Monthly Notices of the Royal Astronomical Society, 472, 2107-2116
 29. Su, K.-Y., et al. (including **Ma, X.**), 2017, *Feedback first: the surprisingly weak effects of magnetic fields, viscosity, conduction, and metal diffusion on galaxy formation*, Monthly Notices of the Royal Astronomical Society, 471, 144-166
 30. †Muratov, A. L., et al. (including **Ma, X.**), 2017, *Metal flows of the circumgalactic medium, and the metal budget in galactic halos*, Monthly Notices of the Royal Astronomical Society, 468, 4170-4188

Non-refereed publications

1. Binggeli, C, et al. (including **Ma, X.**), 2020, *Extreme variations in star formation activity in the first galaxies*, Proceedings of the International Astronomical Union, Volume 341, pp. 226-230
2. **Ma, X.**, 2019, *Cosmological simulations with ‘realistic’ feedback: What do we learn and how to test with observations?*, The Art of Measuring Galaxy Physical Properties, held November 18–22, 2019 in Milano, Italy.
3. **Ma, X.**, 2019, *Understanding galaxy formation in the reionization era using the FIRE simulations*, Proceedings of the International Astronomical Union, Volume 352, pp. 64-68