

Theoretical Astrophysics, California Institute of Technology MC 350-17, 1200 E. California Boulevard, CA 91125, USA  
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### Appointments:

<i>Ira S. Bowen Professor of Theoretical Astrophysics</i> , California Institute of Technology	2022 - present
<i>Professor, Theoretical Astrophysics</i> , California Institute of Technology	2017 - 2022
<i>Assistant Professor, Theoretical Astrophysics</i> , California Institute of Technology	2013 - 2017
<i>Einstein Fellow</i> , University of California at Berkeley (Host: Prof. Eliot Quataert)	2011 - 2013
<i>Miller Fellow</i> , University of California at Berkeley	2008 - 2011

### Education:

<i>Ph.D.</i> Astronomy, Harvard University (Advisor: Prof. Lars Hernquist) “ <i>A Physical Model for the Fueling and Evolution of Quasars in Galaxy Mergers</i> ”	2008
<i>M.A.</i> Astronomy, Harvard University	2005
<i>B.A.</i> Astrophysics, Princeton University (Advisor: Prof. Neta Bahcall) <i>Summa Cum Laude, with Distinction in Astrophysical Sciences</i>	2004

### Selected Awards & Honors:

American Astronomical Society High-Energy Astrophysics Division Mid-Career Award	2023
Ira S. Bowen Professorship (Recognizing Leadership and Service)	2022
Caltech Graduate Student Council Mentoring Award	2016
American Astronomical Society Helen B. Warner Prize for Astronomy	2016
National Science Foundation CAREER (Faculty Early Career Development) Award	2015
Alfred P. Sloan Foundation, Sloan Research Fellowship Award	2014
Harvard-Smithsonian Center for Astrophysics, Bart J. Bok Prize	2012
Astronomical Society of the Pacific, Robert J. Trumpler Award	2011
Beatrice Tinsley Visiting Scholar, University of Texas at Austin	2010

### Professional Services, Outreach, & Synergistic Activities

Served on grant and award selection committees (including NSF CAREER, NASA Hubble & Einstein Fellowships), telescope time allocation committees (for NASA, NSF, DOE, NRAO, NAOJ [Japan]), computing time allocation committees (NASA, NSF, DOE), science or local organizing committees for > 35 international scientific conferences, multiple external review and non-Caltech university-level proposal review committees. Served as proposal referee for European Research Council (2008,14,15,17, 21), NSF, NASA, and journal referee for Nature, Science, Physical Review, Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Physics Reports, Astronomy & Astrophysics, Journal of Computational Physics. Member: American Astronomical Society and American Physical Society.

Created scientific animations for feature films “Deep Field” (2019), “Voyage of Time” (2016), “Star Men” (2015); television including BBC World News (2017) and NHK Japan’s “Cosmic Front NEXT” (2015); reference animations for Disney-Pixar studios; Science and Sky & Telescope online exhibits; 50th anniversary Star Trek Convention (2017); LA Doctor Who Convention (2020, 2022) planetarium shows at Shafraan Planetarium (Cleveland; 2013, 2017), Tartu Observatory (Estonia; 2015), California Academy of Sciences (2022), Mannheim Planetarium (Germany; 2022)

Served as panelist or public speaker at various high school (local and international), undergraduate, and amateur astronomer (e.g. LA Astronomical Society, Griffith Observatory) events (> 27 such events since 2016). Public speaker at various public observing nights and outreach events organized by Caltech and city of Pasadena. Press panelist at events for television shows and films including “Star Trek,” “The Expanse,” “Voyage of Time,” “The Time Machine,” “Doctor Who.”

Developed and made public new computational algorithms and codes for fluid, magnetic, radiation, particle, solid-body, and gravitational dynamics, used widely by dozens of research groups in astrophysics, as well as engineering and fluid dynamics

Mentored 25 undergraduate students through Caltech summer undergraduate research fellowship (SURF) and related programs (2014-2022). Organized astronomy visualization and outreach program for high school students and high school teachers from the Creative Arts Media and Design program at Pasadena High School, supervised ~ 6 high school summer research students (2016, 2017, 2019, 2021).

Developed interactive series of classroom demonstrations of astrophysical concepts in new California state science curriculum (2016, 2017). Teacher at various graduate-level Summer Schools: Flatiron Institute Kavli Summer Program 2018, UC Santa Cruz Astro-Computing Summer School [Galaxy Simulations, 2010; Star Formation, 2013, 2014], ICC Durham Novicosmo Cosmology school 2007.

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### Students & Postdocs Advised:

Postdocs: Andrew Wetzel (Caltech-Carnegie Joint Theory Postdoc), Ji-Hoon Kim (Einstein Fellow), Chris Hayward (Burke Center Postdoc), Christine Corbett-Moran (NSF Fellow), Paul Torrey (MIT-Caltech Joint Postdoc), Shea Garrison-Kimmel (Einstein Fellow), Astrid Lamberts (TAPIR Postdoc), Anne Medling (Hubble Fellow), Coral Wheeler (Burke Institute Prize Fellow), Robyn Sanderson (NSF Fellow), Jonathan Squire (Sherman Fairchild Fellow), Eve Lee (Sherman Fairchild Fellow), Lina Necib (Burke Fellow), Suoqing Ji (Burke Fellow), Cameron Hummels (NSF Fellow), Clement Bonnerot (Burke Fellow), Fangzhou Jiang (Caltech-Carnegie Theory Postdoc), Georgia Panopoulou (Hubble Fellow), Andrew Emerick (Caltech-Carnegie Theory Postdoc), Juliette Becker (51 Pegasi B Fellow), Iryna Butsky (Burke Fellow), Kyle Kremer (NSF/Einstein Fellow), Sinan Degar (IPAC Fellow), Nicole Sanchez (NSF MPS Ascend Fellow), Raphael Skolidis (TAPIR Postdoc)

Graduate Students: Xiangcheng Ma (Physics), David Guszejnov (Physics), Denise Schmitz (Astronomy), Matt Orr (Physics), Mike Grudic (Physics), Hannalore Gerling-Dunsmore (Physics), Kung-Yi Su (Physics), Ivanna Escala (Astronomy), Wendy [Ge] Chen (Physics), Xuejian [Jacob] Shen (Physics), Zhihui Li (Astronomy), Yanlong Shi (Physics), Nadine Soliman Hassan (Astronomy), Sam Ponnada (Astronomy), Linhao Ma (Physics), Isabel Sands (Physics), Catherine Felce (Physics), Yashvardhan Tomar (Astronomy)  
*Secondary Advisor:* Antonija Oklopčić (Astronomy), Victor Robles (Cinvestav, Mexico)

Undergraduate Students: Nailen Matschke (SURF 2014), Nick Zolman (SURF 2014), Hyunseok Lee (SURF 2015), David Khatami (Summer 2015), Kareem El-Badry (Summer 2015), Matthew Colbrook (Summer 2015), Charles Watson (Summer 2016), Gefei Dang (SURF 2016), Rafael Fueyo-Gomez (SURF 2016), Eric Moseley (Thesis 2017), Stefania Moroianu (Cam-SURF 2017), Ben Calvin (SURF 2017), Daniel Cushey (SURF 2017), Matthias Raives (Thesis 2015), Clarke Esmerian (Thesis 2016), Tianyi Hu (Thesis 2016), Andrew Rothstein (SURF 2018), Anise Rau (SURF 2018), Grace Lawrence (Summer 2018), Dhruv Muley (SURF 2019), Yadira Gaibor (WAVE 2020), Elizabeth Yunerman (SURF 2020), Yanhui Yang (Summer 2020), Suyash Kumar (Carnegie Summer Fellow 2020), Daria Bonds (WAVE 2021), Eitan Rapaport (SURF 2022), Darren Rhodes (SURF 2022), Ellen Min (SURF 2022), Juan Quiroz (SURF 2022), Sylvia Wang (SURF 2022), Shalini Kurinchi-Vandahn (SURF 2022, Thesis 2022)

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### Teaching & Department Service:

Courses taught: Cosmology (2014,15,16,20,22), Galaxy Structure and Formation (2017,18,19,20,21,22), High-Energy Astrophysics (2018, 19), Applications of Classical Physics (2014, 16, 18, 22), The Interstellar Medium (2014, 16), Graduate Student Journal Club (2015, 22), Seminar In Contemporary Extragalactic Astronomy (2022).

Executive Officer (Department Chair) for Astronomy (July 2019-Nov 2022),  
 Faculty staffing/search committee (Astronomy 2016/17/18/19; Physics 2017/18/19/20/21/22),  
 Graduate admissions (Astronomy 2013/14/16/17/20/21/22; Physics 2014/15/16/17/18),  
 Graduate Qualifying Exam (Astronomy 2015/16/17/18/20/22\*; Physics 2018/19\*/20),  
 Colloquium committee (Astronomy & Physics, 2014/15\*/16/17/18\*/19/22),  
 Astronomy Nominations committee (2020/21/22),  
 Promotion and Tenure committees (2019), Caltech-Carnegie CCJAC committee (2021)  
 Burke Postdoctoral Fellow Selection Committee (2014/15/16/17/18/19/20/21/22),

Postdoctoral Studies Committee (CIT-wide, 2020/21/22).  
(chaired committees marked \*)

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### Primary Research Interests:

Theoretical astrophysics broadly defined. Galaxy formation and evolution. Star formation and origins of stars and planets. Inter-stellar, circum-galactic, and inter-galactic medium physics. Cosmic rays. Nature of dark matter, astrophysical dark matter constraints and tests. Origins, growth, and evolution of super-massive black holes, AGN and quasars. Astrophysical turbulence and space plasma physics. Large-scale structure and cosmology. Planetesimal formation and astrophysical dust and particle dynamics. Numerical methods for astrophysics and space plasmas. “Feedback” processes on astrophysical scales.

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### Publications & Invited Talks:

See <http://www.tapir.caltech.edu/~phopkins/Site/Publications.html> for a complete list

Publications: 419 peer-reviewed publications (122 lead-author), with total citations ~37,500 (~17,500 lead-author), ~416,000 reads (~190,000 lead-author), and *h*-index of 102 (63 lead-author).

Talks: >200 invited talks including colloquia, invited seminars and international astronomy conference talks, at institutions in North and South America, Europe, Asia, and Australia.

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### Selected Media Highlights:

Animations of scientific simulations featured in “Voyage of Time” (Director Terrence Malick, Narrators Brad Pitt & Cate Blanchett), a nationally-distributed IMAX feature film (2016), “Star Men” (Director Alison E. Rose, 2015), and symphonic film “Deep Field” (Director/composer Eric Whitacre, 2019), and various television programs and planetarium shows

Television Interviews, NHK Japan “Cosmic Front NEXT” Episode “Mysteries of Ancient Supermassive Black Holes” (July 2015), Science Channel “How the Universe Works” (four episodes, June 2019; six episodes each in 2020; 2021; 2022)

Press Briefings, American Astronomical Society Meetings 224 (2014), 226 (2015), 228 (2016); Helen Warner Plenary Prize Talk 229 (2017); High-Energy Astrophysics Division Plenary Prize Talk (2023)

Panelist, H. G. Wells 150th Birthday Film Panel, LA Public Library (September 2016); “The Science Behind *The Expanse*,” Caltech (January 2017); Star Trek 50th Anniversary Convention (August 2017); Gallifrey One (Dr. Who Convention; February 2020, 2023)

Radio Interview, TBS eFM South Korea “This Morning,” discussing black holes (November 2014), BBC World News (July 2017, April 2019), YouTube “SciShow Space” (2014, 2018)

Invited public talk at “Pixar University” Lecture Series, Disney-Pixar Headquarters (“Making Galaxies on a Computer,” August 2014), various public talks at conferences and scientific workshops

Magazine interviews & coverage:

**Scientific American:** “Planet Formation: It’s a Drag,” Marcus Woo, October 2018; “LIGO Discoveries Will Help Scientists Run Stellar Autopsies on Colliding Black Holes,” Shannon Hall, June 2016

**CNN/AP Newswire:** “This is what it looks like when a star is born,” Ashley Strickland, May 2021; “New stars found in the Milky Way were born outside of it,” Aaron Dubrow July 2020

**Popular Mechanics** “Astronomers Created the Most Detailed Computer Model of the Galaxy,” Jay Bennett, September 2016; “We’ve Finally Discovered What’s Driving the Most Impossibly Bright Galaxies in the Universe,” William Herkewitz, September 2015

**Time Magazine:** “Millions of Stars May Be Made of Nothing But Metal,” Nash Jenkins, July 2014

**LA Times:** “Why Were Some Ancient Galaxies so Bright?,” Amina Khan, September 2015

**Newsweek:** “What Happens When a Star is Born, According to Scientists,” Ed Browne, May 2021

**The Independent:** “Scientists build Starforge, world’s most realistic simulation of stars being born,” Adam Smith, May 2021; “Scientists find Stream of Stars in our Galaxy that Appear to have Come from Somewhere Else,” Andrew Griffin, July 2020

**Science:** “The Galaxy Builders,” Adrian Cho, June 2018; “Galaxy simulations are at last matching reality,” Adrian Cho, May 2018, “Why Are Some Galaxies a Thousand Times Brighter than the Milky Way?,” Daniel Clery, September 2015; “A Quest for Cosmic Karma,” News Focus, Yudhijit Bhattacharjee, July 2009; “Coming Into Focus: A Universe Shaped By Violent Galaxies,” Robert Irion, September 2005

**Physics Today:** “Supernovae, Supercomputers, and Galactic Evolution,” Philip Hopkins, April 2017

**Sky & Telescope:** “The Alignment of the Milky Way’s Entourage, Explained,” Monica Young, February 2021; “Milky Way May be Made with Swapped Gas,” Camille Carlisle, July 2017; “Missing Dwarf Galaxies Never Were,” Camille Carlisle, June 2016; “Making the Brightest, Rarest Galaxies,” Monica Young, September 2015; “Why Galaxies Delay Star Birth,” Camille Carlisle, February 2014; “A Quasar In Every Galaxy?” Robert Irion, special issue July 2006; “Galaxy Merger Movies,” Robert Naeye, May 2006

**PNAS:** “Dwarf galaxies pose new questions about dark matter and the early universe that models are struggling to answer,” Adam Mann, October 2019

**Nature Research Highlights:** “Feedback gets a stellar review,” Paul Woods, June 2022

**Science News:** “Watch this beautiful, high-resolution simulation of how stars are born,” Maria Temming, May 2021; “Astronomers Find Stellar Stream of Extragalactic Origin in the Vicinity of the Sun,” Enrico de Lazaro, July 2020; “Stars Born in Outflows May Populate Halos of Milky Way-Like Galaxies,” Staff, April 2020; “Milky Way Captured Few Dwarf Galaxies from Nearby Large Magellanic Cloud,” Staff, October 2019; “Half of the Milky Way comes from Other Galaxies,” Ashley Yeager, July 2017; “Possible perp found in mystery of Milky Way’s missing galaxy pals,” Chris Crockett, June 2016; “Lopsided Stellar Disks Help Black Holes Guzzle Gas,” Ron Cowen, March 2010

**CNet:** “Astronomers create most realistic simulation of stars being born, and it’s beautiful,” Jackson Ryan, May 2021

**Quanta:** “The Universe is not a Simulation, But we can Simulate It,” Natalie Wolchover, June 2018

**Io9:** “A New Class of Stars is Made Entirely of Metal,” Mark Strauss, July 2014

**Tech Times:** “How a Texas Supercomputer Solved an Interstellar Mystery,” Robin Burks, Dec. 2013

**Engadget:** “Supercomputer gives most accurate picture yet of star formation,” Steve Dent, Dec. 2014

**Medium:** “Dwarf galaxies pose a new problem for models of the early universe,” Christopher Carroll, October 2019

**Universe Today:** “In Wildly Different Environments, Stars End Up Roughly the Same,” Carolyn Petersen, August 2022; “A Stellar Stream of Stars, Stolen from Another Galaxy,” Evan Gough, July 2020; “Using the Missing Physics of Stellar Feedback to Accurately Simulate Galaxies from the Big Bang to Today,” Shannon Hall, November 2013

**New Scientist:** “Watch the best ever simulation of stars being born in a cosmic cloud,” Chen Ly, January 2022; “Warped Stars Feed Black Holes to Fatten Them Up,” April 2010

**Social Media:** Coverage of MNRAS Grudic et al., 2021 (1371G) reached the front page of Nerdist, Reddit, Science News, Astronomy Picture of the Day, Daily Kos (May 2021). Coverage of MNRAS Angles-Alcazar et al., 2017, 470, 1050 reached the front page of Gizmodo (Gawker media network), Reddit, and Science News (July 2017). Coverage of ApJ Letter Wetzell, Hopkins et al. 2016, 827, L23 reached the front page of several international news & media sites including BoingBoing and Nature World News (September 2016). Coverage of MNRAS Hopkins et al., 2014, 445, 581, reached the front page of Yahoo!, Business Insider, and Science Daily News (June 2014), and coverage of other Hopkins et al. papers reached the Yahoo or Google News front pages in 2018, 2019, 2022. Coverage of the ApJ paper “Some Stars are Totally Metal” reached the front page of Reddit, io9 (the Gawker media network), Fark, and Slashdot, as well as PBS “SciShow Space” (July 2014).

See <http://www.tapir.caltech.edu/~hopkins/Site/Press.html> for a complete list

**Grants & Proposals:****GRANTS AWARDED AS PI OR CO-PI:**

NSF CAREER (Faculty Early Career Development Award)	NSF.1455342	\$796,298	07/15-07/22
Alfred P. Sloan Research Fellowship	BR2014-022	\$50,000	11/15-11/16
JPL PDRDF (Prime Sponsor: NASA)	JPL 1674184	\$201,188	06/21-06/23
JPL R&TD (Prime Sponsor: NASA)	JPL 1611573	\$9,000	09/18-10/19
JPL R&TD (Prime Sponsor: NASA)	JPL 1589742	\$205,000	09/17-10/18
NASA Astrophysics Theory Proposal (ATP)	17-ATP17-0214	\$460,232	06/18-03/23
NASA Astrophysics Theory Proposal (ATP)	NNX15AT06G	\$246,226	10/15-10/18
NASA Astrophysics Theory Proposal (ATP)	NNX14AH35G	\$448,722	07/14-07/17
NASA HST Treasury Proposal	HST-15654	\$199,408	06/21-05/24
NASA HST Theory Proposal	HST-15800	\$229,503	12/19-11/22
NSF Astronomy & Astrophysics Grant (AAG)	NSF.AAG.2009234	\$433,007	09/20-09/23
NSF Astronomy & Astrophysics Grant (AAG)	NSF.AAG.1911233	\$185,656	09/19-09/22
NSF Collaborative Research (CDS&E)	NSF.AAG.2108314	\$330,903	09/21-09/24
NSF Collaborative Research (CDS&E)	NSF.AAG.18575	\$258,525	09/19-09/21
NSF Collaborative Research (CDS&E)	NSF.1715847	\$331,561	09/17-09/20
NSF Collaborative Research (CDS&E)	NSF.1411920	\$325,254	07/14-07/17
NSF Petascale Computing Resource Allocations (PRAC)	NSF.1713353	\$20,064	06/17-06/19
NSF PRAC Supplement	NSF.1455342	\$5,000	04/19-03/20
SOFIA Science Center	08-0237	\$31,050	06/20-06/22
NASA Einstein Postdoctoral Fellowship Program	PF1-120083	\$279,378	09/11-08/13

**COMPUTING TIME ALLOCATIONS AWARDED AS PI:**

NSF LSCP (Large-Scale Community Partnership)	AST 21010	1.5e8 CPU-hrs	03-21-04/24
NSF LRAC (Leadership Computing Allocations)	AST 20016	1.0e8 CPU-hrs	03-21-04/21
NSF LRAC	NSF.20019	5.0e7 CPU-hrs	03-20-04/21
NSF PRAC (Petascale Computing Allocations)	NSF.1455342	1.0e8 CPU-hrs	04/19-03/20
NSF PRAC	NSF.1713353	1.6e8 CPU-hrs	06/17-06/19
NSF XSEDE (Extreme Science & Discovery Environment)	TG-AST130039	6.3e6 CPU-hrs	09/16-09/17
NSF XSEDE	TG-AST130039	7.0e6 CPU-hrs	09/15-09/16
NSF XSEDE	TG-AST130039	5.0e6 CPU-hrs	09/14-09/15
NSF XSEDE	TG-AST140064	3.2e6 CPU-hrs	06/16-06/17
NSF XSEDE	TG-AST140064	1.2e6 CPU-hrs	09/14-09/15
NSF XSEDE	TG-AST130039	3.6e6 CPU-hrs	09/13-09/14
NSF XSEDE	TG-AST120025	1.1e6 CPU-hrs	09/13-09/14
NSF XSEDE	TG-AST120025	1.8e6 CPU-hrs	09/12-09/13
NSF XSEDE	TG-AST120025	1.8e6 CPU-hrs	09/12-09/13
NASA HECC (High-End Computing Capability)	SMD-16-7592	6.0e7 CPU-hrs	09/20-09/23
NASA HECC	SMD-16-7592	2.0e7 CPU-hrs	09/19-09/20
NASA HECC	SMD-16-7592	2.0e7 CPU-hrs	09/18-09/19
NASA HECC	SMD-16-7592	1.8e7 CPU-hrs	09/17-09/18
NASA HECC	SMD-16-7592	1.8e7 CPU-hrs	09/16-09/17
NASA HECC	SMD-16-7223	1.8e7 CPU-hrs	09/16-09/17
NASA HECC	SMD-15-6382	1.2e7 CPU-hrs	09/15-09/16
NASA HECC	SMD-14-5548	0.5e6 CPU-hrs	09/14-09/15
DOE OLCF Titan Director's Discretionary Allocation	AST123	4.0e6 CPU-hrs	09/16-04/17
DOE ALCF Mira Director's Discretionary Allocation	GalaxiesOnFIRE	2.2e6 CPU-hrs	09/16-04/17

(Total time 7.7e8 CPU-hrs, with NSF-estimated dollar equivalent > \$10,000,000 based on allocation years)

**MAJOR GRANTS AWARDED AS CO-I:**

JWST Public Release Imaging Survey (PI James Dunlop)	PRIMER-GO-01837	TBD	09/23-08/25
SpIES Spitzer Legacy Survey (PI Gordon Richards)	SSC-GO-9-90045	\$440,250	10/12-09/15
Hubble Multi-Cycle Treasury Proposal (PI Sandra Faber)	HST-GO-12060	\$6,586,000	09/10-12/13