

# Cameron B. Hummels

---

California Institute of Technology  
Cahill Center for Astrophysics  
MC 249-17  
1200 East California Blvd  
Pasadena, CA 91125

phone: 626.395.2765  
fax: 626.568.9352  
chummels@gmail.com  
<http://chummels.org>

**RESEARCH INTERESTS** computational hydrodynamics, galaxy formation and evolution, intergalactic and circumgalactic medium, stellar feedback, synthetic observations, high performance computing, data visualization

**EDUCATION** **Ph.D. Astronomy**, Columbia University, July 2012  
*Thesis*: “Comparing Simulations and Observations of Galaxy Evolution: Methods for Constraining the Nature of Stellar Feedback”  
*Advisors*: Greg Bryan, David Schiminovich  
**M.A. Astronomy**, Wesleyan University, 2005  
**B.A. Computer Science**, Pomona College, 2001

**EMPLOYMENT** **NSF Astronomy and Astrophysics Postdoctoral Fellow**, Caltech, 2015 - present  
*Sponsor*: Phil Hopkins  
**Postdoctoral Fellow**, University of Arizona, 2012 - 2015  
*Sponsor*: Brant Robertson

**AWARDS AND HONORS** Caltech Astronomy Citizenship Award, 2016  
NSF Astronomy and Astrophysics Postdoctoral Fellowship, 2014  
Columbia Astronomy APPLAUSE Award, 2009  
NASA Astronomy Ambassador to New York City & State, 2009

**GRANTS AND PROPOSALS** NSF SPA 2017 (NSF.1764420): “Sixteenth Annual Symposium of the NSF Astronomy and Astrophysics Postdoctoral Fellows”, (Co-PI with Abby Crites, **\$28,746**)  
NSF AAPF 2015 (NSF.1501443): “Investigating the Nature of the Circumgalactic Medium Using Realistic Synthetic Observations”, (PI, **\$278,000**)  
NASA HST 2014 (AR-13917): “The COS Cold Absorber Puzzle: Understanding the Metallicity and Phase of the Circumgalactic Medium” (PI, **\$112,000**)  
NASA HST 2014 (AR-13919): “MAST Interface to Synthetic Telescopes with yt MISTY: Observing Simulations of the Intergalactic Medium”, (Co-PI with Molly Peeples, **\$115,000**)

**COMPUTING GRANTS** NSF Petascale Computing Resource Allocations (Blue Waters): “Galaxy Formation at Ultra-High Resolution”, (Co-I with Phil Hopkins, **320,000,000 CPU-hrs**) 2017-2019  
NSF Petascale Computing Resource Allocations (Blue Waters): “Petascale Adaptive Mesh Simulations of Milky Way-type Galaxies and Their Environments”, (Co-I with Brian O’Shea, **170,000,000 CPU-hrs**) 2016-2018  
NSF XSEDE (Stampede): “The Effects of Stellar Feedback and Gas Accretion on the Evolution of Galaxies”, (PI, **4,000,000 CPU-hrs**) 2012-2016

**SOFTWARE DEVELOPMENT** TRIDENT Synthetic Observation Generator, Core Developer, 2014 - present  
 YT Analysis Suite, Core Developer, 2010 - present  
 ENZO Hydrodynamics Code, Developer, 2007 - present

**OBSERVING EXPERIENCE** Arecibo (GALEX Arecibo SDSS Survey): 100 hours, 2009-2011  
 CTIO TLP (Design, Construction & Observation): 100 hours, 2007-2008  
 KPNO 36" (U-Band SNe Photometry): 5 nights, 2005  
 LCO Swope 40" (Grid Giant Star Survey): 150 hours, 2001 - 2003

**TEACHING & OUTREACH** **Director, Organizer, & Lecturer**, Public Outreach, Caltech Astro, 2015 - present  
 Oversaw all aspects of planning and executing ~40 outreach events (~7000 attendees) per year: stargazing, lectures, Astronomy on Tap, sidewalk astronomy.  
**Organizer**, Week of Astronomy, Pasadena City of Astronomy, 2016, 2018  
 Oversaw planning and executing city-wide astronomy festival (~2000 attendees) with science demos, observing, and Astronomy on Tap  
**Director, Organizer, & Lecturer**, Public Outreach, Columbia Astro, 2005 - 2012  
 Oversaw all aspects of planning and executing ~40 outreach events (~5000 attendees) per year: stargazing, lectures, Astronomy on Tap, sidewalk astronomy.  
**Mentor & Organizer**, Rooftop Variables, Columbia University, 2008 - 2012  
 Organized program to mentor elementary teachers in science education; Mentored Scott Misner, 8th grade teacher at Isaac Young MS and class  
**Founder & Organizer**, Astrophoto Exhibition, Columbia University, 2009  
 Planned and hosted *From Earth to the Universe* photography exhibit on Columbia's campus for two weeks with 10,000+ attendees  
**Organizer**, 365 Days of Astronomy Podcast Submission, 2009  
 Planned and recorded 16 10 minute educational podcasts for 365DOA  
**Lab Instructor**, Columbia University, 6 Semesters, 2005 - 2008  
 Astronomy 1403: "Earth, Moon & Planets"  
 Astronomy 1404: "Beyond the Solar System"  
**Mentor**, Project ASTRO, Middletown, CT, 2004 - 2005  
 Partnered with local teachers to facilitate an Astronomy curriculum for 5th and 6th grade classes

**SELECTED PUBLIC TALKS** Astronomy on Tap, Los Angeles, November 2018  
 Qatar University, Doha, Qatar, September 2018  
 Astronomy on Tap, Chicago, July 2018  
 Solar Eclipse Festival, Fossil, OR, August 2017  
 Caltech Astronomy, Pasadena, July 2016  
 Caltech Reel Science, Pasadena, Feb 2016  
 Pima Community College, Tucson, March 2015  
 University of Arizona, Tucson, February 2014  
 Phoenix ComicCon, Phoenix, May 2013  
 Columbia University, New York, May 2012  
 Amateur Astronomers Incorporated, New Jersey, January 2010  
 Columbia University, New York, December 2009

**SELECTED  
RESEARCH  
TALKS**

**Invited Seminar:** University of California, Berkeley, TAC, February 2019  
**Invited Seminar:** University of California, Davis, January 2019  
**Colloquium:** University of California, Santa Barbara, November 2018  
**Invited Seminar:** University of Washington, October 2018  
**Conference Talk:** GalFresca, Caltech, August 2018  
**Conference Talk:** Santa Cruz Galaxy Workshop, August 2018  
**Conference Talk:** CGM Workshop, Northwestern, August 2018  
**Conference Talk:** Intergalactic Interconnections, Marseille, July 2018  
**Conference Talk:** COSMOS Meeting, Copenhagen, June 2018  
**Conference Talk:** Astro Visualization Workshop, IPAC Caltech, June 2018  
**Conference Talk:** Esalen CGM Conference, March 2018  
**Co-Organizer:** NSF Symposium, Maryland, January 2018  
**Colloquium:** University of California, San Diego, November 2017  
**Colloquium:** Carnegie Institute, October 2017  
**Co-Organizer:** Galaxies and their Halos, Caltech, September 2017  
**Conference Talk:** Santa Cruz Galaxy Workshop, August 2017  
**Conference Talk:** What Matters in Galaxies, Durham UK, June 2017  
**Colloquium:** New Mexico State University, April 2017  
**Invited Lecturer:** LSST Data Science Fellowship Program, NOAO, April 2017  
**Conference Talk:** NSF Symposium, Texas, January 2017  
**Invited Seminar:** Center for Computational Astrophysics, December 2016  
**Invited Seminar:** Harvard ITC, May 2016  
**Invited Seminar:** Carnegie Institute, May 2016  
**Conference Talk:** Python in Astronomy Workshop, Washington, March 2016  
**Invited Seminar:** University of California, Santa Cruz, February 2016  
**Invited Seminar:** Ohio State, December 2015  
**Colloquium:** Pomona College, November 2015  
**Conference Talk:** Mocking the Universe, STSci, July 2015  
**Colloquium,** University of Arizona, February 2015  
**Invited Seminar:** University of California, Santa Cruz, January 2015  
**Conference Talk:** Santa Cruz Galaxy Workshop, August 2014  
**Conference Talk:** Stellar Feedback Program, KITP, May 2014  
**Conference Talk:** CGM Workshop, Notre Dame, January 2014  
**Invited Seminar:** UC Santa Cruz, March 2013  
**Winter School:** Galaxy Evolution, Hebrew University, January 2013  
**Invited Seminar:** Georgia Tech, February 2012  
**Co-Organizer:** YT Users Workshop, University of Chicago, January 2012  
**Invited Seminar:** University of Chicago, January 2012  
**Invited Seminar:** McMaster University, Canada, January 2012  
**Dissertation Talk:** AAS Meeting, Austin, January 2012  
**Conference Talk:** Enzo Developers Workshop, Columbia, October 2011  
**Conference Talk:** Communicating Astronomy with the Public, South Africa, March 2010

**UNDERGRAD  
STUDENTS  
ADVISED**

Andrew Rothstein (Caltech), 2018  
Charles Watson (Pomona), 2016  
Gefei Dang (Caltech), 2016  
Rafael Fueyo-Gomez (Caltech), 2016

**ACADEMIC  
SERVICE**

**Review Panel Member**, FINESST Program, 2019 - present  
**Science Advisory Committee**, Deep Synoptic Array, OVRO, January 2019  
**LOC**, TMT Science Meeting, Caltech, December 2018  
**Co-Organizer**, NSF AAPF Annual Symposium, January 2018  
**Co-Organizer**, Galaxies and their Halos Conference, Caltech, September 2017  
**Co-Organizer**: YT Users Workshop, University of Chicago, January 2012  
**Review Panel Member**, DiRAC High Performance Computing Allocations, 2017 - present  
**Review Panel Member**, NSF Astronomy and Astrophysics Research Grants (AAG), 2014 - present  
**Review Panel Member**, NASA Astrophysical Theory Program (ATP), 2016 - present  
**Referee**, Monthly Notices of the Royal Astronomical Society, 2013 - present  
**Referee**, Astrophysical Journal, 2013 - present  
**Member**, American Astronomical Society, 2003 - present

**PUBLICATIONS**

1. “The Impact of Enhanced Halo Resolution on the Simulated Circumgalactic Medium”,  
**Hummels, C.**; Smith, B; Hopkins, P; et al., *arXiv* 1811.12410 (2018)
2. “The Origins of the Circumgalactic Medium in the FIRE Simulations”  
Hafen, Z. et al. (including **Hummels, C.**), *arXiv* 1811.11753 (2018)
3. “FIRE-2 simulations: physics versus numerics in galaxy formation”,  
Hopkins, P. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 480, 800 (2018)
4. “Figuring Out Gas and Galaxies in Enzo (FOGGIE). I. Resolving Simulated Circumgalactic Absorption at  $2 < z \leq 2.5$ ”,  
Peeples, M. et al. (including **Hummels, C.**), *arXiv* 1810.06566 (2018)
5. “A VLT/MUSE galaxy survey towards QSO Q1410: looking for a WHIM traced by BLAs in inter-cluster filaments”,  
Pessa, I et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 477, 2991 (2018)
6. “xGASS: total cold gas scaling relations and molecular-to-atomic gas ratios of galaxies in the local Universe”,  
Catinella, B. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 476, 875 (2018)
7. “TRIDENT: a universal tool for generating synthetic absorption spectra from astrophysical simulations”,  
**Hummels, C.**; Smith, B.; Silvia, D.; *The Astrophysical Journal*, 847, 59 (2017)
8. “GRACKLE: a Chemistry and Cooling Library for Astrophysics”,  
Smith, B. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 466, 2217 (2017)

- PUBLICATIONS**
9. “The AGORA High-Resolution Galaxy Simulations Comparison Project. II: Isolated Disk Test”  
Kim, J. et al. (including **Hummels, C.**), *The Astrophysical Journal*, 833, 202 (2016)
  10. “The ASTROPY Problem”  
Muna, D. et al. (including **Hummels, C.**), *eprint arXiv:1610.03159* (2016)
  11. “Kinetic energy from supernova feedback in high-resolution galaxy simulations”,  
Simpson, C., Bryan, G., **Hummels, C.**, & Ostriker, J., *The Astrophysical Journal*, 809, 69 (2015)
  12. “Cosmological simulations of galaxy formation with cosmic rays”,  
Salem, M., Bryan, G. L., & **Hummels, C.**, *The Astrophysical Journal Letters*, 797, L18 (2014)
  13. “ENZO: an adaptive mesh refinement code for astrophysics”,  
Bryan, G. et al. (including **Hummels, C.**), *Astrophysical Journal Supplements*, 211, 19 (2014)
  14. “The AGORA high-resolution galaxy simulations comparison project”,  
Kim, J. et al. (including **Hummels, C.**), *Astrophysical Journal Supplements*, 210, 14 (2014)
  15. “The GALEX Arecibo SDSS Survey - VIII. Final data release. The effect of group environment on the gas content of massive galaxies”,  
Catinella, B. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 436, 34 (2014)
  16. “Constraints on hydrodynamical subgrid models from quasar absorption line studies of the simulated circumgalactic medium”,  
**Hummels, C.**; Bryan, G.; Smith, B.; and Turk, M., *Monthly Notices of the Royal Astronomical Society*, 430, 1548 (2013)
  17. “The GALEX Arecibo SDSS Survey. VI. Second data release and updated gas fraction scaling relations”,  
Catinella, B. et al. (including **Hummels, C.**), *Astronomy & Astrophysics*, 544, A65 (2012)
  18. “Adaptive mesh refinement simulations of galaxy formation: exploring numerical and physical parameters”,  
**Hummels, C.**; Bryan, G., *Astrophysical Journal*, 749, 140 (2012)
  19. “The GALEX Arecibo SDSS Survey - IV. Baryonic mass-velocity-size relations of massive galaxies”,  
Catinella, B. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 420, 1959 (2012)
  20. “The GALEX Arecibo SDSS Survey. V. The Relation between the H I Content of Galaxies and Metal Enrichment at Their Outskirts”,  
Moran, S. et al. (including **Hummels, C.**), *Astrophysical Journal*, 745, 66 (2012)
  21. “The GALEX Arecibo SDSS Survey - II. The star formation efficiency of massive galaxies”,  
Schiminovich, D. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 408, 919 (2010)
  22. “The GALEX Arecibo SDSS Survey - I. Gas fraction scaling relations of massive galaxies and first data release”,  
Catinella, B. et al. (including **Hummels, C.**), *Monthly Notices of the Royal Astronomical Society*, 403, 683 (2010)
  23. “Lunar outgassing, transient phenomena, and the return to the moon. II. predictions and tests for outgassing/regolith interactions”,  
Crotts, A. & **Hummels, C.**, *Astrophysical Journal*, 707, 1506 (2009)

- PUBLICATIONS** 25. “A two micron all sky survey view of the Sagittarius Dwarf Galaxy. II. Swope Telescope spectroscopy of M giant stars in the dynamically cold Sagittarius Tidal Stream”,  
Majewski, S. et al. (including **Hummels, C.**), *Astronomical Journal*, 128, 245 (2004)
26. “Exploring halo substructure with giant stars. III. first results from the Grid Giant Star Survey and discovery of a possible nearby Sagittarius tidal structure in Virgo”,  
Kundu, A. et al. (including **Hummels, C.**), *Astrophysical Journal Letters*, 576, L125 (2002)

**REFERENCES**

**Philip Hopkins**

Professor of Theoretical Astrophysics  
California Institute of Technology  
1200 E. California Boulevard, MC 350-17  
Pasadena, CA 91125  
(626) 395-2563, phopkins@caltech.edu

**Greg Bryan**

Professor of Astronomy  
Columbia University  
550 W 120th St, MC 5246  
New York, NY 10027  
(212) 854-6837, gbryan@astro.columbia.edu

**Jason X. Prochaska**

Professor of Astronomy and Astrophysics  
University of California, Santa Cruz  
1156 High Street, MS: UCO / LICK  
Santa Cruz, CA 95064  
(831) 459-2135, xavier@ucolick.org