
Joseph N. Burchett
Curriculum Vitae

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Univ. of California – Santa Cruz
Dept. of Astronomy & Astrophysics
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Education

Ph.D. in Astronomy	Summer 2017
Institution: University of Massachusetts	
Dissertation advisor: Prof. Todd M. Tripp	
M.S. in Physics and Astronomy	Spring 2011 (begun Fall 2009)
Institution: University of Louisville	
Thesis advisor: Dr. James T. Lauroesch	
B.S. in Mathematics	Spring 2005
Institution: University of Louisville	
Concentration: Computational and Applied Mathematics	

Grants as PI

Total: \$767,000

Hubble Space Telescope Theory Grant (2019)	\$168,000
NASA/Keck Principal Investigator Data Award (2019)	\$14,100
Hubble Space Telescope General Observer Grant (2017)	\$320,000
Hubble Space Telescope Archival Research Grant (2017)	\$133,000
UMass Dissertation Research Grant (2015)	\$1000
Massachusetts Space Grant (2015)	\$1800
Hubble Space Telescope Archival Research Grant (2014)	\$118,000
UMass Dissertation Research Grant (2014)	\$1000
Sigma Xi Grants-In-Aid of Research (2014)	\$1200
Massachusetts Space Grant (2013)	\$5500
NASA Space Science Student Ambassador (2010-2011)	\$2600
Graduate Student Council Travel Award (2010)	\$300
Graduate Research and Creative Activities Grant (2010)	\$500
Graduate Student Council Travel Award (2009)	\$300

Telescope Proposals and Observing

Keck II – <i>Keck Cosmic Web Imager, MOSFIRE</i>	2018A, 2018B, 2019A
- Integral field spectroscopy of outflows from star-forming galaxies and Ly α nebulae	
- Spectroscopy of z~1 galaxies	
Hubble Space Telescope (PI) – <i>COS</i>	2017
- Spectroscopy of QSOs probing the halos of very nearby dwarf galaxies	
Hubble Space Telescope (PI) – <i>COS</i>	2017
- Archival study of QSOs probing large-scale structure	

- Hubble Space Telescope (PI) – *COS* 2014
- Extensive analysis of archival far-ultraviolet QSO spectra
- MMT (Co-I) - Hectospec 2014A, 2014B, 2016A
- Designed surveys for two separate multi-object spectroscopy observing campaigns:
 - galaxies associated with C IV absorbers
 - spectroscopic follow-up of X-ray observed galaxy clusters
- Karl G. Jansky Very Large Array (PI) 2016A
- H I emission mapping of environments around C IV absorbers
- WIYN 0.9-m (PI) - *Half-degree Imager* 2015A, 2016A
- Broadband imaging of galaxies around QSO sightlines
- WIYN 3.5-m (PI) - *Hydra* 2014A
- Designed survey and conducted multi-object spectroscopy of galaxies associated with QSO absorbers
- Gemini North (Co-I) – *GMOS* 2015A
- Conducted multi-object spectroscopy of galaxies in QSO fields
- Bok 90-inch – *90 Prime* 2014B, 2010B
- Broadband imaging of galaxies around QSO sightlines
 - Medium-band imaging of the Clowes-Campusano Large Quasar Group
- Green Bank Telescope (Co-I) 2011B, 2012A
- Onsite and remote L-band observations of H I in galaxies for the RESOLVE survey
- SOAR - *Goodman Spectrograph* 2011B, 2012A
- Optical spectroscopy (long-slit and using image slicer) for the RESOLVE survey

Research/Teaching Positions

Postdoctoral fellow (UC – Santa Cruz) 2017-present

As the Inter[stellar and galactic] Medium Program of Studies Fellow, I am leading a number of research projects involving the gaseous halos of galaxies, or circumgalactic medium. To study these gas reservoirs and their host galaxies, I use a wide array of data from across the electromagnetic spectrum: ultraviolet spectroscopy of QSOs, multi-object optical spectroscopy, integral field spectroscopy, optical imaging, and x-ray imaging/spectroscopy.

Research Assistant (UMass - Amherst) 2012-2017

For my doctoral work, I conducted a survey of metal-enriched gaseous environments in and around nearby galaxies using data from the Cosmic Origins Spectrograph aboard the Hubble Space Telescope, my own observations from various ground-based facilities, and public galaxy survey archives such as the Sloan Digital Sky Survey.

Lecturer: Modern Astronomy Summer College Course (UMass - Amherst) 2016

This summer program provides an immersive experience for high school students and features lectures, labs, and observing opportunities at the UMass educational observatory. To enhance student-student and student-instructor interactivity as well as cater to varied learning styles, my lectures leveraged team-based learning classroom technologies and active learning strategies.

Graduate Teaching Assistant (UNC – Chapel Hill) 2011-2012

I supported and led sessions in introductory as well as advanced undergraduate treatment of “Stars, Galaxies, and Cosmology”. This course extensively employed collaborative learning

education models. Also, I led astronomy laboratory sessions using remote observations via the PROMPT telescope array in Chile.

Graduate Teaching Assistant (U. of Louisville) 2009-2011
Position included instruction of undergraduate laboratories and recitation sections in general physics, kinematics and sound, electricity and magnetism, and general astronomy. Additional responsibilities: tutoring for all undergraduate physics courses, grading of exams and homework for large lecture sections.

Consultant: Modern Physics for Scientists and Engineers 2010
I composed both instructor and student editions of a solutions manual for this undergraduate sophomore-level text published by Elsevier. I provided descriptive, worked-out solutions to all end-of-chapter problems for Dr. John C. Morrison, the primary author.

Students Mentored

Iryna Butsky – Iryna is a graduate student at the University of Washington whose thesis work is primarily theoretical, employing large hydrodynamical simulations. I mentored Iryna on a project where we established predictions of the ultraviolet signatures of diffuse gas in galaxy clusters using the cluster simulation RomulusC. The project has resulted in a first-author paper for Iryna.

David Abramov – With David, a Master’s student in Computational Media (CM) at UCSC, and Angus Forbes, his faculty advisor in CM, I am developing IGM-Vis. IGM-Vis is a web-based visualization and analysis framework for CGM and IGM data that incorporates galaxy surveys and QSO spectra to enable real-time exploratory analysis. David’s background is in computer science rather than astrophysics, and this intersectional collaboration has led to the first IGM-Vis paper’s acceptance to the prestigious data visualization conference EuroVis 2019.

Marijana Smailagic – A graduate student at UCSC, Marijana is analyzing low-resolution QSO spectra. I assisted her with technical matters in spectroscopy as well as communicating her scientific methods and results, culminating in her first 1st-author paper at UCSC.

Michael Moshinsky – I served as Michael’s primary research advisor for his Summer 2014 REU project and through his senior thesis research. His training included accompanying me on observing runs, taking and reducing imaging data, and measuring galaxy spectral lines.

Alexandra Burkott – Beginning in Summer 2016, I served as Alexandra’s graduate student career mentor, advising on graduate entrance exams, navigating the application process, etc.

Awards/Honors

Astronomy Graduate Program Fellowship (UMass 2017)
Merzbacher Summer Research Fellowship (Univ. of North Carolina 2011)
Manuel Schwartz Award for Outstanding Graduate Student (UofL 2011)
William Marshall Bullitt Award for the Best Student Paper (UofL 2010) –
“Enhanced Public Outreach with Asteroseismology”
NASA Space Science Student Ambassador (2010)

Academic Service and Membership

<i>Keck/FOBOS Extragalactic Science Lead</i>	2019
<i>Hubble Space Telescope Cycle 27 Panel Review</i>	2019
<i>UCSC Postdoc Representative</i>	2017-Present
<i>Astrophysical Journal Referee</i>	2017-Present
<i>Monthly Notices of the Royal Astronomical Society Referee</i>	2017-Present
<i>Hubble Space Telescope Mid-Cycle Reviewer</i>	2017-2018
<i>UMass Astronomy Department Colloquium Committee</i>	2014-2016
<i>Sigma Xi Professional Research Society</i>	2014-2017
<i>American Astronomical Society</i>	2013-Present
<i>Organizer of morning coffee and arXiv discussion hour</i>	2012-Present

Selected Talks and Posters

- Seminar: *NOAO FLASH*, Tucson, AZ, November 2019
- Seminar: *UC – Santa Cruz FLASH*, November 2019
- Invited talk: UT - Austin, November 2019
- Invited talk: University of Chicago, November 2019
- Invited talk: *CGM Berlin 2019*, October 2019
- Contributed talk: *Keck Science Meeting*, September 2019
- Contributed talk: *Santa Cruz Galaxy Evolution Workshop*, August 2019
- Invited talk: *What Matter(s) Between Galaxies?*, Spineto, Italy, June 2019
- Seminar: UC-Irvine, April 2019
- Colloquium: CSU – East Bay, March 2019
- Seminar: Tea Talk, Stanford, December 2018
- Colloquium: UC-Santa Cruz, November 2018
- Contributed talk: *Santa Cruz Galaxy Evolution Workshop*, August 2018
- Invited talk: Northwestern U. CGM Workshop, July 2018
- Colloquium: San Diego State Univ., June 2018
- Invited seminar: Astrophysics Seminar, U. Notre Dame, April 2018
- Contributed talk: *WHIM and Galaxy Cluster Outskirts*, Guntersville, AL, June 2018
- Contributed talk: AAS Winter Meeting, National Harbor, MD, January 2018
- Invited seminar: University of Louisville, Louisville, KY, April 2017
- Dissertation talk: AAS Winter Meeting, Grapevine, TX, January 2017
- Invited talk: FLASH, UC - Santa Cruz, November 2016
- Invited seminar: UW - Seattle, November 2016
- Seminar: Tea Talk, Caltech, November 2016

- Seminar: Galaxy Lunch, Yale University, October 2016
- Seminar: GalRead, Princeton University, October 2016
- Seminar: Journal Club, Space Telescope Science Institute, October 2016
- Invited talk: CASA/JILA Seminar, University of Colorado – Boulder, October 2016
- Contributed talk: *Crossing the Rubicon*, Santarcangelo di Romagna, September 2016
- Contributed talk: *Chandra Science for the Next Decade*, Cambridge, MA, August 2016
- Invited talk: Large Scale Seminar, Harvard University, March 2016
- Contributed talk: AAS Winter Meeting, Kissimmee, FL, January 2016
- Invited talk: IMPS Seminar, UC - Santa Cruz, December 2015
- Contributed poster: *IGM@50*, Spineto, Italy, July 2015
- Public outreach talk: Astronomical Society of Greater Hartford, November 2014
- Invited talk: *The CGM at Notre Dame*, Notre Dame University, January 2014
- Contributed poster: *Intergalactic Interactions*, Royal Observatory, Edinburgh, Scotland, June 2013
- Public outreach talk (NASA Ambassador): Rauch Planetarium, Louisville, KY, March 2011

Software/Programming Languages

Python, IDL, IRAF, C, C++, CASA, SQL, QT, Javascript

Charity

Founding board member of Star Duck Charities, a 501(c)(3) nonprofit organization dedicated to improving the lives of at-risk orphan children. Fundraising efforts have raised over \$100,000 for local youth.

Public Outreach

Co-founder of *Astronomy on Tap: Santa Cruz*

- Modeled after the popular national Astronomy on Tap series (astronomyontap.org), I am an original co-founder of the Santa Cruz edition and continue to produce each monthly event acting as sound engineer, local media promoter, and speaker.

“Ask an astronomer” – Springfield Charter Prep School

- Program where 1st-grade students may ask a ‘real astronomer’ any questions about space. Students first formulated their questions in several categories, and I attended their class to answer them in person.

“Stars: Sound and Science” - NASA Space Science Student Ambassador

- My project focused on turning asteroseismology data into audio and involved building an audio-visual installation depicting the ‘sounds’ of different variable stars and their places on the H-R diagram, a public performance of musical compositions made entirely from asteroseismology data, and a public talk explaining the science behind the sounds.

Public talk at monthly meeting - Astronomical Society of Greater Hartford

- My talk “The gaseous halos of galaxies: hidden tempestuous lifelines on large cosmic scales” illustrated how the gas flows in and out of galaxies drive their evolution.

Publications

8 first-author (114 citations), 24 total journal articles (488 citations)

1. “Revealing the Dark Threads of the Cosmic Web”
Burchett, J. N., Elek, O., Tejos, N., Prochaska, J. X., Tripp, T. M., Bordoloi, R., and Forbes, A.G.
Astrophysical Journal Letters, v. 891, p. L35 (2020)
2. “The COS Absorption Survey of Baryon Harbors (CASBaH): Warm-hot Circumgalactic Gas Reservoirs Traced by Ne VIII Absorption”
Burchett, J. N., Tripp, T. M., Prochaska, J. X., Werk, J. K., Tumlinson, J., Howk, J. C., Willmer, C. N. A., Lehner, N., Meiring, J. D., Bowen, D. V., Bordoloi, R., Peebles, M. S., Jenkins, E. B., O’Meara, J. M., Tejos, N., and Katz, N.
Astrophysical Journal Letters, v. 877, p. L20 (2019)
3. “IGM-Vis: Analyzing Intergalactic and Circumgalactic Medium Absorption Using Quasar Sightlines in a Cosmic Web Context”
Burchett, J. N., Abramov, D., Otto, J., Artenegara, C., Prochaska, J. X., and Forbes, A.G.
Computer Graphics Forum, v. 38, i. 3, p.491 (2019)
4. “Warm-hot gas in X-ray bright galaxy clusters and the depleted circumgalactic medium in dense environments”
Burchett, J. N., Tripp, T. M., Wang, Q. D., Willmer, C. N. A., Bowen, D. V., Jenkins, E. B.
MNRAS, v. 475, p. 2067 (2018)
5. “A Deep Search for Faint Galaxies Associated with Very Low-redshift C IV Absorbers. III. The Mass- and Environment-dependent Circumgalactic Medium”
Burchett, J. N., Tripp, T. M., Bordoloi, R., Werk, J. K., Prochaska, J. X., Tumlinson, J., Willmer, C. N. A., O’Meara, J. M., and Katz, N.
Astrophysical Journal, v. 832, p. 124 (2016)
6. “A Deep Search for Faint Galaxies Associated with Very Low-redshift C IV Absorbers. II. Program Design, Absorption-line Measurements, and Absorber Statistics”
Burchett, J. N., Tripp, T. M., Prochaska, J. X., Werk, J. K., Tumlinson, J., O’Meara, J. M., Bordoloi, R., Katz, N., and Willmer, C. N. A.
Astrophysical Journal, v. 815, p. 2 (2015)
7. “A Deep Search for Faint Galaxies Associated with Very Low-redshift C IV Absorbers: A Case with Cold-accretion Characteristics”
Burchett, J. N., Tripp, T. M., Werk, J. K., Howk, J. C., Prochaska, J. X., Ford, A. B., Davé, R.
Astrophysical Journal Letters, v. 779, p. L17 (2013)

8. “Ultraviolet Perspectives on Diffuse Gas in the Largest Cosmic Structures”
Burchett, J. N., Nagai, D., Butsky, I., Tremmel, M., Bordoloi, R., Bryan, G., Cai, Z., Canning, R., Chen, H.-W., Coil, A., Fielding, D., Fumagalli, M., Johnson, S., and 21 others
Astro2020 Decadal Survey White Paper (2019)
9. “Black hole feedback and the evolution of massive early-type galaxies”
Martín-Navarro, I.; **Burchett, J.N.**, Mezcua, M.
MNRAS, v.491, p.1311 (2020)
10. “The COS Absorption Survey of Baryon Harbors: The Galaxy Database and Cross-correlation Analysis of O VI Systems”
Prochaska, J. X., **Burchett, J. N.**, Tripp, T. M., Werk, J. K., Willmer, C. N. A., Howk, J. C., Lange, S., Tejos, N., Meiring, J. D., Tumlinson, J., Lehner, N., Ford, A.B., Davé, R.
Astrophysical Journal Supplement Series, v. 243, i. 2, p. 24 (2019)
11. “Ultraviolet Signatures of the Multiphase Intracluster and Circumgalactic Media in the RomulusC Simulation”
Butsky, I., **Burchett, J. N.**, Nagai, D., Tremmel, M., Quinn, T. R., Werk, J. K.
MNRAS, v. 490, i. 3, p. 4292 (2019)
12. “Quantifying the effect of black hole feedback from the central galaxy on the satellite populations of groups and clusters”
Martín-Navarro, I.; **Burchett, J.N.**, Mezcua, M.
Astrophysical Journal Letters, v. 884, i. 2, id. L45 (2019)
13. “A single fast radio burst localized to a massive galaxy at cosmological distance”
Bannister, K. W., Deller, A. T.; Phillips, C.; Macquart, J. -P.; Prochaska, J. X.; Tejos, N.; Ryder, S. D.; Sadler, E. M.; Shannon, R. M.; Simha, S.; Day, C. K.; McQuinn, M., North-Hickey, F. O.; Bhandari, S.; Arcus, W. R.; Bennert, V. N.; **Burchett, J.**; Bouwhuis, M.; Dodson, R.; and 34 others
Science, v. 365, i. 6543, p. 565 (2019)
14. “The Red Dead Redemption Survey of Circumgalactic Gas About Massive Galaxies. I. Mass and Metallicity of the Cool Phase”
Berg, M. A., Howk, J. C.; Lehner, N.; Wotta, C. B.; O’Meara, J. M.; Bowen, D. V.; **Burchett, J. N.**; Peebles, M. S.; Tejos, N.
Astrophysical Journal, v. 883, issue 1, article 5 (2019)
15. “The Power Spectrum of the Lyman-alpha Forest at $z < 0.5$ ”
Khaire, V., Walther, M., Hennawi, J. F., Oñorbe, J., Lukić, Z., Prochaska, J. X., Tripp, T. M., **Burchett, J. N.**, Rodriguez, Christian
MNRAS, v. 486, p. 769 (2019)

16. “Tentative Detection of the Circumgalactic Medium of the Isolated Low-Mass Dwarf Galaxy WLM”
Zheng, Yong; Putman, M.; Emerick, A.; McQuinn, K. B. W.; Werk, J. K.; Lockman, F. J.; Oppenheimer, B. D.; Fox, A.; Kirby, E.; **Burchett, J. N.**
MNRAS, v. 490, p. 467 (2019)
17. “Feedback from supermassive black holes transforms centrals into passive galaxies by ejecting circumgalactic gas”
Oppenheimer, B. D.; Davies, J. J.; Crain, R. A.; Wijers, N. A.; Schaye, J.; Werk, J. K.; **Burchett, J. N.**; Trayford, J. W.; Horton, R.
MNRAS, v. 491, p. 2939
18. “Evolution of the Cool Gas in the Circumgalactic Medium (CGM) of Massive Halos – A Keck Cosmic Web Imager (KCWI) Survey of Ly α Emission around QSOs at $z \approx 2$ ”
Cai, Z.; Cantalupo, S.; Prochaska, J. X.; Arrigoni Battaia, F.; **Burchett, J.N.**; Li, Q.; Chisholm, J.; Bundy, K.; Hennawi, J. F.
Astrophysical Journal Supplement Series, in press (2019)
19. “Quasar Sightline and Galaxy Evolution (QSAGE) Survey - I. The Galaxy Environment of OVI Absorbers up to $z=1.4$ around PKS 0232-04”
Bielby, R. M., Stott, J. P., Cullen, F., Tripp, T. M., **Burchett, J.N.**, Fumagalli, M., Morris, S. L., Tejos, N., Crain, R. A., Bower, R. G., Prochaska, J. X.
MNRAS, v. 486, i. 1, p. 21 (2019)
20. “Probing the dynamical state, baryon content, and multiphase nature of galaxy clusters with bright background QSOs”
Ge, C., Wang, Q. D., **Burchett, J. N.**, Tripp, T. M., Sun, M., Li, Z., Gu, Q., Ji, L.
MNRAS, v. 481, p. 4111 (2018)
21. “Extreme circumgalactic H I and C III absorption around the most massive, quenched galaxies”
Smailagić, M., Prochaska, J. X., **Burchett, J. N.**, Zhu, G., Ménard, B.
Astrophysical Journal, v. 867, p. 106 (2018)
22. “On the CGM Fundamental Plane: The Halo Mass Dependency of Circumgalactic H I”
Bordoloi, R., Prochaska, J. X., Tumlinson, J., Werk, J. K., Tripp, T. M., **Burchett, J. N.**
Astrophysical Journal, v. 864, article 132 (2018)
23. “The COS-Halos Survey: Metallicities in the Low-Redshift Circumgalactic Medium”
Prochaska, J. X., Werk, J. K., Worseck, G., Tripp, T. M., Tumlinson, J., **Burchett, J. N.**, Fox, A. J., Fumagalli, M., Lehner, N., Peebles, M. S., Tejos, N.
Astrophysical Journal, v. 837, p. 169 (2017)
24. “The RESOLVE Survey Atomic Gas Census and Environmental Influences on Galaxy Gas Reservoirs”

Stark, D. V., Kannappan, S. J., Eckert, K. D., Florez, J., Hall, K. R., Watson, L. C., Hoverstein, E. a., **Burchett, J. N.**, Guynn, D. T., Baker, A. D., and 10 coauthors
Astrophysical Journal, v. 832, p. 126 (2016)

25. “The COS-Dwarfs Survey: The Carbon Reservoir around Sub-L* Galaxies”
Bordoloi, R., Tumlinson, J., Werk, J. K., Oppenheimer, B. D., Peebles, M. S., Prochaska, J. X., Tripp, T. M., Katz, N., Davé, R., Fox, A. J., Thom, C., Ford, A. B., Weinberg, D. H., **Burchett, J. N.**, and Kollmeier, J. A.
Astrophysical Journal, v. 796, p. 136 (2014)
26. Instructor Solutions Manual for *Modern Physics for Scientists and Engineers*,
Burchett, J. N.
Elsevier (2010)