

# Tony Mroczkowski, Ph.D.

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## Research Interests and Motivations

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Radio, millimeter, and submillimeter-wave instrumentation • Science case for and design of the Atacama Large Aperture Submm Telescope (AtLAST; see [22]) • Observational cosmology and large scale structure of the Universe • X-ray, radio, and Sunyaev-Zeldovich effect (SZE) observations of galaxy clusters.

My research motivations and themes can be summarized:

★ **Science:** Galaxy clusters, the largest gravitationally bound objects to form in the Universe, serve as probes of cosmology as well as gigantic laboratories for a wide range of astrophysical phenomena. In studying galaxy clusters, I rely on the Sunyaev-Zeldovich (SZ) effect (see e.g. [127, 20]), which is the inverse Compton scattering of photons from the Cosmic Microwave Background (CMB) by hot electrons in large scale structures. This effect, which has redshift independent surface brightness (i.e. does not dim with distance), allows us to measure the same hot, ionized gas from the ground that normally we would have to observe from space, using X-ray satellites, with the added benefit that the SZ effect is now probing farther systems, much further back in time (e.g. [23, 38]).

★ **Instrumentation:** Progress toward understanding the Universe is coupled with advances in instrumentation, particularly those revealing properties of the Universe that are invisible to the human eye (e.g. radio, mm, submm, and X-ray). I have always tried to strike a balance between radio/mm/submm instrument development and observational cosmology, including work to develop new techniques for analyzing data, often complementing these observations with X-ray data.

★ **Looking forward:** The radio/mm/submm regime is poised to revolutionize our ability to map the SZ in clusters to exquisite detail, at a dynamic range that will finally reveal their properties and evolution, allowing us to use clusters as unbiased probes of cosmology. Examples include upgrades to the Atacama Large Millimeter/Submillimeter Array (ALMA) [40] and the Green Bank Observatory (GBO), potential new bands for the Square Kilometer Array Observatory (SKAO), and new observatories such as AtLAST.

★ **Sustainability:** We have a responsibility as astronomers, instrumentationalists, and members of society to adhere to the principles of sustainable development and to engage the local communities hosting our facilities. For this reason, the AtLAST design study in particular is 1) aiming to produce a design for an upgradeable facility that will operate for > 30 years, serving several generations of Ph.D. students, 2) aiming to power the observatory entirely through renewable energy sources, and 3) engaging with the local communities to help build their role in the project. Coupled to this motivation, we are examining the impact of climate change and are working to adapt to this reality [11, 74].

## Education

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Columbia University, Graduate School of Arts and Sciences Advisor: Amber Miller

**Ph.D. in Astronomy**, defended 24 Sept. 2008, conferred 20 May 2009

Dissertation: *The Sunyaev-Zel'dovich Array: Constraining a new pressure profile for fitting SZE observations of galaxy clusters*

**Thesis Committee:** Greg Bryan, Zoltan Haiman, Amber Miller, Frits Paerels, & Caleb Scharf

**M.Phil. and M.A. in Astronomy**, 19 May 2004

Cooper Union, Nerken School of Engineering

Advisor: Toby Cumberbatch

**B.S. in Engineering**, with an Electrical Engineering thesis, May 2001

## Honorary/Volunteer Positions

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**Associate Editor** for the Journal of Astronomical Telescopes, Instruments, and Systems ([JATIS](#))

## Research Positions and Experience

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**Associate Astronomer/Sub-mm Instrument Scientist**

Feb 2016–present

European Southern Observatory (ESO)

Line Manager: Eric Emsellem

*Indefinite appointment (associate-level faculty) since Feb 2021.*

- Project Scientist for ALMA Band 2, the ALMA project now in Phase I that will deliver receiver cartridges covering 67-116 GHz on sky [95, 122].

- Contact scientist responsible for overseeing several ALMA development studies and projects from ESO, which heads the European ALMA region.
- Conduct a vigorous scientific research program alongside my functional duties (roughly 50% of the time). In this, I have helped build the science case for the successor to MUSTANG-2, I oversee major portions of AtLAST development, and I mentor students and postdocs who are now advancing the state of the art in the analysis of ALMA, MUSTANG-2, and ACT observations.

### National Research Council Fellow

Aug 2013–Jan 2016

U.S. Naval Research Laboratory

Advisor: Tracy Clarke

*The National Research Council Research Associateship Program (NRC RAP) is a prestigious postdoctoral fellowship program conducted by the U.S. government and hosted by premier governmental research laboratories.*

- Key member of the NRL team commissioning the VLA Ionospheric and Transient Experiment (VLITE) [97], a low frequency instrument on the Very Large Array (VLA).
- Performed first successful SZ observations with the Goddard IRAM Superconducting Millimeter Observer (GISMO) on the IRAM 30-m telescope at Pico de Veleta. See [159].
- Collaborated on the development of kinetic inductance detectors (KIDs) and direct detection spectrometers for use in CMB and epoch of reionization intensity mapping [144, 145, 151, 164, 166, 167].
- Led the analysis of *Chandra* X-ray spectroscopic and imaging data on radio-selected clusters.

### Einstein Postdoctoral Fellow (2<sup>nd</sup>-3<sup>rd</sup> Year)

July 2011–July 2013

NASA Jet Propulsion Laboratory (JPL)

Advisor: Jonas Zmuidzinas

*The Einstein Postdoctoral Fellowship is a prestigious postdoctoral fellowship program that is now incorporated into the NASA Hubble Fellowship Program (NHFP). This appointment was concurrent with being a visiting postdoctoral fellow at Caltech.*

- Improved designs and geometric layout of the KIDs for the MAKO project [182] on the Caltech Submillimeter Observatory (CSO).
- Active role in analysis and observations with Bolocam and MUSIC using the CSO. My role with the Bolocam 1 & 2 mm data led to the first resolved measurement of the kinetic SZE in an individual cluster(see [181, 177]).

### Postdoctoral Scholar / 1<sup>st</sup> Year Einstein Fellow

Aug 2008–July 2011

University of Pennsylvania (U Penn)

Advisor: Mark Devlin

- Led much of the cryogenic and electronics re-design and testing of BLAST-Pol, the polarization rebuild/upgrade to the Balloon-borne Large Aperture Submillimeter Telescope (BLAST) [197].
- Led new observations and analysis with the Multiplexed SQUID-TES Array at Ninety Gigahertz (MUSTANG), an  $8 \times 8$  element bolometric array for the Green Bank Telescope (GBT) built to observe at a 3.3 mm wavelength (90 GHz). At 9" resolution, MUSTANG was the highest resolution instrument to image the Sunyaev-Zeldovich effect to date.
- Coauthored the science cases for the NSF proposals to fund observations performed with MUSTANG and MUSTANG-1.5, and continued as a co-PI on the successful proposal to build its successor, MUSTANG-2.

### Ph.D. Student, thesis project on the Sunyaev-Zeldovich Array

Jan 2003 – Aug 2008

Columbia University

Advisor: Amber Miller

- Active role in the design, cryogenic testing, characterization, and integration of the 30 & 90 GHz receivers and backend electronics for the Sunyaev-Zeldovich Array (SZA; see [202]). The SZA became part of the Combined Array for Research in Millimeter-wave Astronomy (CARMA) in 2008.
- Early lead role in commissioning and observations with the SZA. The effort to get the instrument running included debugging, data quality assessment, as well as development, design, and fabrication of many components used in the SZA.
- Tested and developed improved models for parameter extraction from interferometric observations of the SZE using Monte Carlo Markov Chain (MCMC) fitting techniques. These models included the first application of the generalized NFW profile (Nagai et al. 2007) to SZE-measured pressure profiles [201]. The generalized NFW profile was adopted soon after as the Arnaud et al. 2010 “universal pressure profile”, and is still the standard in the analysis of SZ and X-ray pressure profiles.

## Teaching and Mentoring Experience

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### Mentoring Roles at ESO

2017-present

- Primary advisor (secondary: Bruno Leibundgut) to Sankalp Choudhuri, who is on the Deutsche Akademische Austauschdienst ([DAAD](#)), or German Academic Exchange Service, studentship and is working on studies of the SZ signals from lower mass systems. Sankalp started in October 2022.
- Primary advisor (secondary: Gergö Popping) to Joshiwa van Marrewijk, who is part of the International Max Planck Research Schools ([IMPRS](#)) program working on studies of galaxy clusters and the impact of environment on their member galaxies using ALMA and ACT observations of the SZ effects [e.g. [4](#)] and new tools for forecasting observations in the face of atmospheric effects [e.g. [23](#)]. Joshiwa will defend in October 2024.
- Co-advisor with Eugene Churazov to Luca Di Mascolo, who was an IMPRS student at the Max Planck Institute for Astrophysics (MPA). Together with Eugene, I guided Luca throughout his PhD on ALMA/ACA joint-likelihood visibility-space model fitting (i.e. in the native Fourier domain). These are perhaps the most advanced tools for the analysis of interferometric SZ observations in existence. Luca graduated in spring 2020 and became a postdoc in Trieste with a prestigious cluster cosmology group including Stefano Borgani, Elena Rasia, Alex Saro, and many others.
- Advisor to visiting student Jean-Paul Breuer from Masaryk University in Brno, Czechia (home advisor: Norbert Werner). Under my joint supervision, he successfully completed his first paper [[88](#)], though his one year visit was interrupted by the onset of the COVID-19 pandemic.
- Main advisor to Pablo Gómez Toribio, an ESO Summer Student in 2020 coming from the Universitat Politècnica de Catalunya, in Barcelona. We have submitted for publication a paper [[74](#)] on the outcomes from this project, which addresses the effect of climate change and geography on water vapor in the Atacama Desert.

### Mentoring Roles as a Postdoc

2009-2013

Role in mentoring several undergraduates and graduate students at U. Penn and Caltech, including Elio Angilè, Nicole Czakon, Phil Korngut, Alex Young, and Ashley Reichardt.

### Graduate Teaching Assistant, Columbia University

2001-2003

Laboratory classes for *Earth, Moon, and Planets* and *Beyond the Solar System*, which are introductory undergraduate astronomy courses for non-majors.

### Machine Shop Teaching Assistant, the Cooper Union,

1999-2001

Hands-on machine shop class for engineering undergraduates.

## Press Releases and Highlights

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[ALMA Science Highlight](#) on the Spiderweb Proto-cluster

April 2023

ALMA/ESO Press Release: [Astronomers witness the birth of a very distant cluster of galaxies from the early Universe](#) [[38](#)]

March 2023

[GBO press release](#) on MUSTANG-2 imaging of the cavities in MS0735.6+7421 [[44](#)]

Dec 2022

[Workshop on Renewable Energy Communities in San Pedro de Atacama](#)

Aug 2022

Discussion of local community engagement in the AtLAST project.

[The AtLAST team says goodbye to Richard Hills](#)

Aug 2022

Richard was an incredibly patient and kind mentor, guiding AtLAST's optical design.

[NRAO image release](#) on low-frequency VLA imaging of the Perseus cluster [[82](#)]

Nov 2020

Joint press release from the [Green Bank Observatory](#), [European Space Agency](#), and [Subaru](#) optical telescope on a merging cluster from the CAMIRA survey [[79](#)].

Nov 2020

[Astronomy sets new records with revolutionary telescope](#) with AtLAST

May 2020

[UKRI press release](#) on AtLAST

Apr 2020

Our SZ measurement of the shock in the Bullet Cluster [[106](#)] was a highlight on the [ALMA Science Portal](#) as well as an [A&A highlight](#).

Oct 2019

1st SZ observation with GISMO from the IRAM 30-m Telescope

Mar 2015

## Collaborations, Professional Societies, and Community Service

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Member of the Simons Observatory ([SO](#)) collaboration

Aug 2022

Member of <a href="#">CMB-S4</a>	Jun 2021
Member of the European Astronomical Society ( <a href="#">EAS</a> )	Jun 2021
Member of the Atacama Cosmology Telescope ( <a href="#">ACT</a> ) collaboration	Apr 2020
Founding member of the Atacama Large Aperture Submm Telescope ( <a href="#">AtLAST</a> )	Jan 2018
Member of the AtLAST Coordination Committee, along with Claudia Cicone and Pamela Klaassen, and head of the Telescope Design work package.	
<b>Member</b> of the International Astronomical Union (IAU)	Sept 2015
NASA endorsed member of the Athena Study Science Team (ASST)	2015-2022
Member of the <a href="#">MUSTANG-2</a> collaboration	Oct 2014
Refereed several publications in e.g. A&A, ApJ, MNRAS, and SPIE JATIS	
Served on review committees for NASA APRA, NSF, <i>Chandra</i> , CARMA, and ALMA observing proposals.	
Served on review committees for ALMA and AtLAST design reviews.	

## Grants, Observing Proposals, and Awards

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**HORIZON-INFRA-2024-DEV-01-03** Horizons Europe Phase II Design Study *Consolidating plans for the Atacama Large Aperture Submillimeter Telescope* (as co-PI; PI Claudia Cicone; 4.0M€)

ESO Exceptional Performance Award for 2022

**NSF AST 2206082/2206083** (as co-I; PI Jack Sayers): *Collaborative Research: Constraining galaxy cluster merger dynamics with hydrodynamical simulations and novel multi-probe observations of 10 objects*

**INFRADEV-01-2019-2020 Horizons 2020 Design Study** *Towards an Atacama Large Aperture Submillimeter Telescope (AtLAST)* (as co-PI; PI Claudia Cicone; 3.5M€) I am a co-leader in the steering committee for this research infrastructure design study, and leader of the Telescope Design work package. See [81, 50, 22].

**NSF ATI 1509093** (as co-I; PI Mark Devlin; \$346k): *MUSTANG2: An Advanced 90 GHz Camera for the GBT*

**NSF AST 1309032** (as co-I; PI Mark Devlin; \$545k): *High Resolution Observations of the Sunyaev-Zeldovich Effect in Clusters of Galaxies at 90 GHz Using the GBT*

**NASA ADAP 18-ADAP18-0040** (as co-I; PI Esra Bulbul; \$360k) *Probing Gas Motions in Cluster Outskirts with X-ray and SZ Effect Observations*

**NSF AST 1007905** (as co-I; PI Mark Devlin; \$546k): *High Resolution Observations of the Sunyaev-Zeldovich Effect in Clusters of Galaxies and High-z Galaxies at 90 GHz Using the GBT*

**ESO Science Support Discretionary Fund (SSDF)** awards in 2018 and 2023 for collaboration and student support

**ESO Office for Science** funding and support for the Galaxy Cluster Formation Workshops ([GCF2017](#) & [GCF2021](#))

**Radionet funding** to support underrepresented and underfunded students attending the Galaxy Cluster Formation Workshop ([GCF2017](#))

**Observing proposals as PI:** many GBT/MUSTANG\*, IRAM 30-meter (GISMO, NIKA, NIKA2), and ALMA proposals; several CARMA and APEX proposals; one XMM-*Newton*\*\* , JCMT, and CSO proposal.

\*Awarded support under the NRAO Student Observer Support (SOS) program.

\*\*Awarded support under the NASA Astrophysics Data Analysis Program (ADAP).

**Observing proposals as co-I:** many GBT/MUSTANG, ALMA, and *Chandra* proposals; Several IRAM 30-meter (GISMO, NIKA, NIKA2), MeerKAT, CARMA, APEX, XMM-*Newton*, VLA, VLT, and JCMT proposals

## Conference Organization and Invited Talks

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Member of the Science Organizing Committee (SOC) for <b>mm Universe 2025</b>	June 2025
Workshop on mm astronomy to be hosted the University of Chicago	



Member of the Science Organizing Committee (SOC) for <i>The promise and challenges of the ALMA Wide-band Sensitivity Upgrade</i> at ESO	June 2024
Member of the Science Organizing Committee (SOC) for <b>AtLAST 2024</b>	May 2024
Invited speaker at the <b>2023 Merging Cluster Workshop</b> at Yonsei University in Seoul	Dec 2023
Member of the Science Organizing Committee (SOC) for <b>mm Universe 2023</b> Workshop on mm astronomy at IRAM in Grenoble	June 2023
Invited speaker at <b>Cosmology on Safari:</b> Conference on theoretical perspectives and cosmological probes of cosmology.	Mar 2023
Invited participant at <b>Mapping the invisible Universe:</b> Workshop on single-dish sub-mm astronomy at the Lorentz Center in Leiden	Aug/Sept 2022
SOC and proposal team member of <b>IAU-GA FM#6:</b> Dynamics of the ICM: Radio and X-ray Observations and Theory	Aug 2022
Colloquium (invited, online) at the University of Oslo	Jan 2022
Chair, ALMA Front End Receiver Development Workshop ( <b>ALMA-FED 2021</b> )	Sept 2021
Invited Talk at <b>EAS2021-S3</b> session on Galaxy clusters and AGNs	June 2021
Co-Chair of the Galaxy Cluster Formation Workshop II ( <b>GCF2021</b> ) at ESO	June 2021
Invited Talk at Academia Sinica (ASIAA)	Jan 2020
Invited Talk, NASA Cosmic Origins Far-IR Science Interest Group (IR SIG)	Nov 2020
Invited Talk, ALMA Jet and Disk Study Group at the Joint ALMA Observatory (JAO)	Oct 2020
Invited Talk, University of Barcelona Cosmology Group	July 2020
Invited Joint Talk on AtLAST to the INAF community	May 2020
Invited (remote) seminar, Institut de Ciències de l'Espai (ICE/CSIC-IEEC)	Apr 2020
LOC of B-modes from Space ( <b>Bmode2019</b> )	Dec 2019
Co-Organizer and SOC member of the <b>ALMA Development Workshop 2019</b>	June 2019
Co-Chair for the International Workshop on Submm Astronomy (Purple Mountain Observatory)	Feb 2019
SOC member for <b>CMB in HD</b> at the Simons Foundation	Dec 2018
Invited seminar at l'Osservatorio Astronomico di Trieste (OATs)	Oct 2018
Member of the SOC for <b>ICM 2018:</b> MPA/ESO Workshop on the Intra-Cluster Medium	Oct 2018
Co-Chair of AtLAST2018 Part II: Science Workshop	Sept 2018
Invited Talk for the Caltech Observational Cosmology Group	Mar 2018
SOC member for Snowcluster 2018	Mar 2018
Co-Chair of <b>AtLAST2018 Part I:</b> Technical Aspects	Jan 2018
Invited Talk at the ISSI Bern workshop <b>Clusters of Galaxies: Physics &amp; Cosmology</b> This led to the publication of the SZ and cluster outskirts reviews [127, 128]	Nov 2017
Co-Chair of Galaxy Cluster Formation Workshop ( <b>GCF2017</b> ) at ESO	July 2017
SOC member for <b>Getting Ready for ALMA Band 5</b> workshop held at ESO	Feb 2017
Organizer of the <b>ALMA Developers'</b> and <b>ALMA Bands 2/2+3</b> Workshops (Chalmers)	May 2016
Co-Organizer of Galaxy Cluster Discussion Group ( <b>GCDG</b> ) at ESO	2016 – 2019
Invited Special Seminar at Academia Sinica (ASIAA)	Aug 2015
SOC member for Snowcluster 2015	Mar 2015
Organizer of the astronomy talks at the Naval Research Lab	2013–2016
SOC member for Snowcluster 2013	Mar 2013
Invited Talk at NASA Goddard Space Flight Center	Oct 2014
Invited Talk at Max Planck Institute for Astrophysics (MPA)	July 2014
Invited Talk at Institut de Ciències de l'Espai (ICE)	July 2014
Colloquium (invited) at Academia Sinica (ASIAA)	Feb 2013
Co-chair of a special session on High-resolution SZE, AAS 220th Meeting	June 2012
Invited Talk at Institut de Ciències de l'Espai (ICE)	May 2012
Co-organizer ALMA Community Day at U. Penn	Mar 2011
Colloquium (invited) at Michigan State University	Oct 2010

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## Skills and Languages

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Languages: English (US native, mother tongue), Catalan (beginner, familial use), German (beginner), Polish (beginner).

Programming Languages: Python, MATLAB, Octave, Bash shell, C.

Programs: HFSS, CST Microwave Studio, Cadence, Solidworks, AutoCAD.

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## Personal References

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**Dr. Tracy Clarke**, Research Astronomer

Division of Remote Sensing, U.S. Naval Research Laboratory

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**Prof. Mark Devlin**, Reese W. Flower Professor of Astronomy and Astrophysics

Department of Physics and Astronomy, University of Pennsylvania

209 S. 33rd St., Philadelphia, PA 19104

[devlin@physics.upenn.edu](mailto:devlin@physics.upenn.edu), +1 215 573 7521

**Dr. Luca Di Mascolo**, Postdoc, former student<sup>1</sup>

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**Prof. Francisca (Ciska) Kemper**, ICREA Research Professor

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## Publications

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Statistics: 124 refereed publications (198 total). H-index of 36. See [NASA ADS list](#).

- [1] B. Hadzhiyska, S. Ferraro, B. Ried Guachalla, E. Schaan, et al. Evidence for large baryonic feedback at low and intermediate redshifts from kinematic Sunyaev-Zel'dovich observations with ACT and DESI photometric galaxies. *arXiv e-prints*, page arXiv:2407.07152, July 2024. [arXiv:2407.07152](#), [doi:10.48550/arXiv.2407.07152](#).
- [2] Simon R. Dicker, Karen Pérez Sarmiento, Brian Mason, Tanay Bhandarkar, et al. Sensitive 3 mm Imaging of Discrete Sources in the Fields of Thermal Sunyaev-Zel'dovich Effect-Selected Galaxy Clusters. *ApJ*, 970(1):84, July 2024. [arXiv:2403.09855](#), [doi:10.3847/1538-4357/ad4e35](#).
- [3] Mark Booth, Pamela Klaassen, Claudia Cicone, Tony **Mroczkowski**, et al. AtLAST Science Overview Report. *arXiv e-prints*, page arXiv:2407.01413, July 2024. [arXiv:2407.01413](#), [doi:10.48550/arXiv.2407.01413](#).
- [4] J. van Marrewijk, L. Di Mascolo, A. S. Gill, N. Battaglia, et al. XLSSC 122 caught in the act of growing up: Spatially resolved SZ observations of a  $z=1.98$  galaxy cluster. *A&A accepted*, September 2024. [arXiv:2310.06120](#), [doi:10.1051/0004-6361/202348213](#).
- [5] I. Marini, P. Popesso, G. Lamer, K. Dolag, et al. Detecting Galaxy Groups and AGNs populating the local Universe in the eROSITA era. *A&A accepted*, July 2024. [arXiv:2404.12719](#), [doi:10.1051/0004-6361/202450442](#).
- [6] Roberto Puddu, Patricio A. Gallardo, Tony **Mroczkowski**, Pierre Dubois-dit-Bonclaudé, et al. A physical optics characterization of the beam shape and sidelobe levels for the Atacama Large Aperture Submillimeter Telescope (AtLAST). *arXiv e-prints*, page arXiv:2406.16602, June 2024. [arXiv:2406.16602](#), [doi:10.48550/arXiv.2406.16602](#).
- [7] Patricio A. Gallardo, Roberto Puddu, Tony **Mroczkowski**, Martin Timpe, et al. The Optical Design Concept for the Atacama Large Aperture Submillimeter Telescope (AtLAST). *arXiv e-prints*, page arXiv:2406.11502; Submitted to SPIE proceedings, June 2024. [arXiv:2406.11502](#), [doi:10.48550/arXiv.2406.11502](#).

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<sup>1</sup>I have often heard that references ought to include former students/postdocs, rather than just current and former mentors, as students give a unique perspective on a candidate, and can attest to one's mentoring skills.

- [8] Matthias Reichert, Martin Timpe, Hans Kaercher, Tony **Mroczkowski**, et al. Technical requirements flow-down for the concept design of the novel 50-meter Atacama Large Aperture Submm Telescope (AtLAST). *arXiv e-prints*, page arXiv:2406.08611, June 2024. [arXiv:2406.08611](#), [doi:10.48550/2406.08611](#).
- [9] E. M. Silich, E. Bellomi, J. Sayers, J. ZuHone, et al. Improved Constraints on Mergers with SZ, Hydrodynamical simulations, Optical, and X-ray (ICM-SHOX). Paper II: Galaxy cluster sample overview. In *European Physical Journal Web of Conferences*, volume 293 of *European Physical Journal Web of Conferences*, page 00050, June 2024. [arXiv:2404.04379](#), [doi:10.1051/epjconf/202429300050](#).
- [10] Mark Booth, Pamela Klaassen, Claudia Cicone, Tony **Mroczkowski**, et al. The key science drivers for the Atacama Large Aperture Submillimeter Telescope (AtLAST). *arXiv e-prints*, page arXiv:2405.20140, May 2024. [arXiv:2405.20140](#), [doi:10.48550/arXiv.2405.20140](#).
- [11] Aleksej Kiselev, Matthias Reichert, and Tony **Mroczkowski**. Energy Recovery System for Large Telescopes. *arXiv e-prints*, page arXiv:2404.17311; Submitted to SPIE proceedings, April 2024. [arXiv:2404.17311](#), [doi:10.48550/arXiv.2404.17311](#).
- [12] John Orlowski-Scherer, Thomas J. Maccarone, Joe Bright, Tomasz Kaminski, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: Probing the Transient and Time-variable Sky. *arXiv e-prints*, page arXiv:2404.13133, April 2024. [arXiv:2404.13133](#), [doi:10.48550/arXiv.2404.13133](#).
- [13] S. P. Sikhosana, M. Hilton, G. Bernardi, K. Kesebonye, et al. The MeerKAT Massive Distant Clusters Survey: A Radio Halo in a Massive Galaxy Cluster at  $z = 1.23$ . *arXiv e-prints*, page arXiv:2404.03944, April 2024. [arXiv:2404.03944](#), [doi:10.48550/arXiv.2404.03944](#).
- [14] Eelco van Kampen, Tom Bakx, Carlos De Breuck, Chian-Chou Chen, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: Surveying the distant Universe. *arXiv e-prints*, page arXiv:2403.02806, March 2024. [arXiv:2403.02806](#), [doi:10.48550/arXiv.2403.02806](#).
- [15] Martin A. Cordiner, Alexander E. Thelen, Thibault Cavalié, Richard Cosentino, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: Planetary and Cometary Atmospheres. *arXiv e-prints*, page arXiv:2403.02258, March 2024. [arXiv:2403.02258](#), [doi:10.48550/arXiv.2403.02258](#).
- [16] Daizhong Liu, Amelie Saintonge, Caroline Bot, Francisca Kemper, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) science: Gas and dust in nearby galaxies. *arXiv e-prints*, page arXiv:2403.01202, March 2024. [arXiv:2403.01202](#), [doi:10.48550/arXiv.2403.01202](#).
- [17] Minju M. Lee, Alice Schimek, Claudia Cicone, Paola Andreani, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: The hidden circumgalactic medium. *arXiv e-prints*, page arXiv:2403.00924, March 2024. [arXiv:2403.00924](#), [doi:10.48550/arXiv.2403.00924](#).
- [18] Sven Wedemeyer, Miroslav Barta, Roman Brajsa, Yi Chai, et al. Science development study for the Atacama Large Aperture Submillimeter Telescope (AtLAST) – Solar and stellar observations. *arXiv e-prints*, page arXiv:2403.00920, March 2024. [arXiv:2403.00920](#), [doi:10.48550/arXiv.2403.00920](#).
- [19] Pamela Klaassen, Alessio Traficante, Maria T. Beltrán, Kate Pattle, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: Our Galaxy. *arXiv e-prints*, page arXiv:2403.00917, March 2024. [arXiv:2403.00917](#), [doi:10.48550/arXiv.2403.00917](#).
- [20] Luca Di Mascolo, Yvette Perrott, Tony **Mroczkowski**, Stefano Andreon, et al. Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: Resolving the Hot and Ionized Universe through the Sunyaev-Zeldovich effect. *arXiv e-prints*, page arXiv:2403.00909, March 2024. [arXiv:2403.00909](#), [doi:10.48550/arXiv.2403.00909](#).
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Last update: July 26, 2024