

# Curriculum Vitae

Richard Teague

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RESEARCH EXPERIENCE	<b>Center for Astrophysics   Harvard &amp; Smithsonian</b> <i>Submillimeter Array Fellow</i>	Sep. 2019 –
	<b>University of Michigan</b> <i>Postdoctoral Researcher</i>	May 2017 – Jul. 2019
	<b>Max-Planck-Institute for Astronomy</b> <i>Postdoctoral Researcher</i>	Jan. 2017 – Apr. 2017
EDUCATION	<b>Max-Planck-Institute for Astronomy</b> , Heidelberg, Germany Ph.D. in Astronomy (Magna Cum Laude)	Oct. 2013 – Jan. 2017
	<b>University of Edinburgh</b> , Edinburgh, United Kingdom MPhys Astrophysics (First Class Honours)	Sep. 2008 – May 2013
HONOURS & AWARDS	<b>Harvard Data Science Initiative Research Fund (\$9,700)</b> <i>Regularized Maximum Likelihood Imaging: A New Method for Detecting Planets</i>	Mar. 2020
	<b>Ernst Patzer Award</b> <i>Awarded for the best refereed publication by a young scientist.</i>	Nov. 2016
	<b>Pre-Honours Certificate of Merit</b> <i>Awarded for top 5% performance in pre-honours exams.</i>	May 2011
	<b>Pre-Honours Certificate of Merit</b> <i>Awarded for top 5% performance in pre-honours exams.</i>	May 2010
PUBLICATION SUMMARY	<b>15 lead author papers</b> , including one published in <i>Nature</i> , and 45 co-author papers, totaling <b>1295 citations</b> ( <a href="#">ADS</a> ). A full publication list can be found at the end of the CV.	
OBSERVATIONAL TIME SUMMARY	I have been awarded over <b>82 hours</b> (200 hours) of time on <b>ALMA</b> as PI (co-I), <b>20 hours</b> (165 hours) on <b>IRAM</b> telescopes as PI (co-I), <b>16 hours</b> (30 hours) on the <b>SMA</b> as PI (co-I) and <b>8 hours</b> (18 hours) on <b>JWST</b> as co-PI (co-I). I have also been a co-investigator on projects for the <b>VLA</b> , the <b>VLT</b> and the <b>Magellan</b> telescopes, with awards of 50 hours, 25 hour and 2 nights, respectively. A break down of PI proposals can be found at the end of the CV.	
PROFESSIONAL SERVICES	<b>SMA Interferometry School SOC</b> <i>SMA, Hilo, Hawaii, USA</i>	Mar. 2021
	<b>Advanced Data Analysis Techniques for ALMA SOC</b> <i>NRAO, Charlottesville, Virginia, USA [postponed due to Covid-19]</i>	Oct. 2020
	<b>SMA Seminar Organizer</b> <i>Departmental Seminar Series</i>	2020 - 2021
	<b>Visualizing the Kinematics of Planet Formation SOC</b> <i>Flatiron Institute, New York City, USA</i>	Oct. 2019
	<b>Postdoc and Research Scientist DEI Representative</b> <i>Department Diversity, Equity and Inclusion Committee Member</i>	2018 – 2019
	<b>Equi-Tea Organizer</b> <i>Diversity, Equity and Inclusion Journal Club</i>	2018 – 2019
	<b>Stars, Planets and Formation Seminar Organizer</b> <i>Departmental Seminar Series</i>	2018 – 2019
	<b>Conversations on Equity and Inclusion Co-organizer</b> <i>Joint Physics / Astronomy / Space Sciences DEI Colloquium Series</i>	2018 – 2019
	<b>NESSF External Reviewer</b>	2018, 2020

	<b>Heidelberg MPG Student Workshop Organizer</b>	2016
	<b>PSF Coffee Organizer</b>	2015 – 2017
	<i>Departmental Seminar Series</i>	
	<b>MPIA Student Representative</b>	2015 – 2017
	<b>MPIA Student Workshop Organizer</b>	2015, 2016
	<b>IMPRS Graduate Student Representative</b>	2013 – 2017
	<b>Referee for AAS, A&amp;A, MNRAS and Nature journals</b>	
SUPERVISION	<b>Haochuan Yu</b> Beijing Normal University	2020 -
	<i>Undergraduate student.</i>	
	<b>Alessandra Canta</b> Harvard University	2020 -
	<i>Undergraduate student. Co-supervised with Karin Öberg, Harvard</i>	
	<b>Felipe Alcaron</b> University of Michigan	2019 – 2020
	<i>Graduate student. Co-supervised with Ted Bergin and Ke Zhang, UMich.</i>	
	<b>Jenny Calahan</b> University of Michigan	2019 – 2020
	<i>Graduate student. Co-supervised with Ted Bergin and Ke Zhang, UMich.</i>	
TALKS & SEMINARS	<b>Deryl Long</b> University of Michigan	2019
	<i>Undergraduate student. Co-supervised with Ted Bergin and Ke Zhang, UMich.</i>	
	<b>Case Hazewinkel</b> University of Michigan	2019
	<i>Undergraduate student. Co-supervised with Ted Bergin, UMich.</i>	
	<b>Jeanne Kwon</b> University of Michigan	2018 – 2019
	<i>Undergraduate Research Opportunity Program</i>	
	<b>Julian Penzinger</b> Ludwig Maximilian University	2016, 2018
	<i>Summer student. Co-supervised with Dmitry Semenov, MPIA.</i>	
	<b>Munich Join Astronomical Colloquium</b>	Oct. 2021
	<i>Mapping the Assembly of Planetary Systems in 6 Dimensions</i>	(invited)
	<b>ETH Zurich Exoplanets &amp; Habitability Seminar</b>	May. 2021
	<i>Witnessing the Assembly of Planetary Systems</i>	(invited)
	<b>Cambridge Exoplanet Center Seminar</b>	May. 2021
	<i>Witnessing the Assembly of Planetary Systems</i>	(invited)
	<b>Towards the Comprehensive Characterization of Exoplanets: Science at the Interface of Multiple Measurement Techniques</b>	Apr. 2021
	<i>Transforming ALMA into a Planet Hunting Facility</i>	
	<b>McMaster University Astrophysics Seminar</b>	Apr. 2021
	<i>Witnessing the Assembly of Planetary Systems</i>	(invited)
	<b>Circumplanetary Disks II</b>	Mar. 2021
	<i>Observations and Observational Predictions</i>	(invited)
	<b>Max Planck Research Group Selection Symposium</b>	Feb. 2021
	<i>Witnessing the Assembly of Planetary Systems</i>	(invited)
	<b>Caltech Dix Planetary Science Department Seminar</b>	Feb. 2021
	<i>Planet Formation in Six Dimensions</i>	(invited)
	<b>Five Years After HL Tau: A New Era in Planet Formation</b>	Dec. 2020
	<i>Observing the Kinematics of Gaseous Substructures</i>	
	<b>Research Unit Transition Disks (RUTD) Conference</b>	Oct. 2020
	<i>Observing the Dynamics of Planet Disk Interactions</i>	(invited)
	<b>From Clouds to Planets II: The Astrochemical Link</b>	Oct. 2020
	<i>ALMA's 3D View of Planet Formation [postponed due to Covid-19]</i>	(invited)
	<b>Exoplanets III</b>	July 2020
	<i>Kinematical Detection and Characterizing of Protoplanets with ALMA</i>	

	<b>MPIA Königstuhl Colloquium</b> <i>Visualizing the Assembly of Planetary Systems</i>	July 2020 (invited)
	<b>JPL Astrophysics Colloquium</b> <i>Witnessing the Dynamics of Planetary Assembly</i>	Nov. 2019 (invited)
	<b>Visualizing the Kinematics of Planet Formation</b> <i>Exploiting ALMA's Potential for Planet Hunting</i>	Oct. 2019
	<b>Gordon Research Seminar</b> <i>Unveiling the Dynamics of Planet Formation</i>	June 2019
	<b>IAU Symposium 350: Laboratory Astrophysics</b> <i>The Physical Conditions of Planet Formation with Molecular Excitation</i>	Apr. 2019 (invited)
	<b>Planet-Forming Disks</b> <i>Unveiling the Dynamics of Planet Formation</i>	Mar. 2019 (invited)
	<b>NAOJ Theoretical Astronomy Seminar</b> <i>Observing the Kinematics of Planet-Disk Interactions with ALMA</i>	Oct. 2018 (invited)
	<b>LMU Munich Astronomy Colloquium</b> <i>Using Kinematics to Search for Embedded Protoplanets</i>	Aug. 2018 (invited)
	<b>University of Tübingen Astronomy Seminar</b> <i>Kinematical Detections of Embedded Protoplanets</i>	Aug. 2018 (invited)
	<b>Astrophysical Frontiers in the Next Decade and Beyond</b> <i>The First Kinematical Detection of Embedded Protoplanets</i>	Apr. 2018
	<b>Magnetic Fields or Turbulence</b> <i>A Spatially Resolved Search for Turbulence in TW Hya</i>	Feb. 2018
	<b>MPIA Patzer Awards Colloquium</b> <i>Measuring Turbulence in TW Hya with ALMA: Methods and Limitations</i>	Nov. 2016 (invited)
	<b>MPIA Königstuhl Colloquium</b> <i>Observing the Earliest Stages of Planet Formation</i>	Nov. 2016 (invited)
	<b>Astrochemistry with ALMA Cycle 4</b> <i>Detecting Turbulence in Protoplanetary Disks</i>	Jun. 2016 (invited)
	<b>Sant-Cugat Forum on Astrophysics</b> <i>Turbulence in Protoplanetary Disks: Methods and Limitations</i>	Apr. 2016
	<b>Protoplanetary Discussions</b> <i>Turbulence in TW Hya</i>	Mar. 2016
	<b>Chemical Diagnostics of Star and Planet Formation</b> <i>Deuterium Fraction in Protoplanetary Disks</i>	Jan. 2015 (invited)
	<b>ZAG - IPAG - MPIA Workshop on Planet Formation</b> <i>Deuterium Fraction in DM Tau</i>	Jan. 2015 (invited)
SUCCESSFUL TELESCOPE PROPOSALS (AS PI)	<b>JWST co-PIs: Cugno, G. &amp; Teague, R., 8 hours, 2153,</b> <i>Detecting a Young 2 Jupiter Mass Planet Embedded in the Disk of HD 163296</i>	Cycle 1
	<b>SMA PI: Teague, R., 6 hours, 2020A-S033, B ranked</b> <i>A 3D Exploration of an Edge-On Self-Gravitating Disk</i>	2020b
	<b>SMA PI: Teague, R., 10 hours, 2020A-S033, A ranked</b> <i>A 3D Exploration of an Edge-On Self-Gravitating Disk</i>	2020a
	<b>ALMA PI: Teague, R., 13.8 hours, 2019.1.01357.S, A ranked</b> <i>Constraining the H<sub>2</sub> Surface Density Profile in IM Lup</i>	2019
	<b>ALMA PI: Teague, R., 3.0 hours, 2019.1.00794.S, B ranked</b> <i>Detecting the Photoevaporative Wind in IM Lup</i>	2019
	<b>ALMA PI: Teague, R., 33.2 hours, 2019.1.00419.S, B ranked</b> <i>Mapping the 3D Kinematic Structure of Planet Formation</i>	2019
	<b>ALMA PI: Teague, R., 20.2 hours, 2018.A.00021.S, DDT</b> <i>Confirmation of an Embedded Planet in the Disk of TW Hya</i>	2019

	<b>Magellan/MagAO PI: Teague, R.</b> , 6 hours <i>Searching for Wide Separation Planets in AS 209</i>	2018
	<b>ALMA PI: Teague, R.</b> , 6.7 hours, 2018.1.00980.S, A ranked <i>An Unambiguous Detection of a Magnetic Field in a Protoplanetary Disk</i>	2018
	<b>ALMA PI: Teague, R.</b> , 5.3 hours, 2016.1.00440.S, A ranked <i>Model Independent Study of Turbulence and Temperature in TW Hya</i>	2016
	<b>IRAM PdBI PI: Teague, R.</b> , 19.9 hours, W14BI, C ranked <i>Disk Diagnostics with Deuteration</i>	2014
(AS CO-I)	Including over 200 hours with <b>ALMA</b> , 150 hours with <b>IRAM</b> telescopes, 30 hours with the <b>SMA</b> , 50 hours with the <b>VLA</b> , 25 hours with <b>VLT</b> (X-shooter and SPHERE), 2 nights with <b>Magellan</b> (MagAO/MagAOx) and 18 hours with <b>JWST</b> .	
OUTREACH	<b>University of Michigan Lowbrow Astronomers</b> <i>How to Find Baby Planets</i>	Nov. 2020
SCHOOL PARTICIPATION	<b>45th Saas-Fee Course</b> <i>From Protoplanetary Disks to Planet Formation</i>	2015
	<b>Heidelberg Graduate School on Fundamental Physics</b>	2015
	<b>DIANA Protoplanetary Disk School</b>	2014
OBSERVING EXPERIENCE	<b>Sub-Millimeter Array</b> <i>Monthly rota</i>	Sep. 2019 –
	<b>MPG/ESO 2.2m</b> <i>14 nights</i>	2016
TEACHING	<b>Wavefront Analysis Laboratory Instructor</b>	2014
PUBLICATIONS (LEAD AUTHOR)	<b>Teague, R.</b> & Loomis, R. A., ApJ, 899 <i>The Excitation Conditions of CN in TW Hya</i>	
	<b>Teague, R.</b> , Jankovic, M. R., Haworth, T. J., et al., MNRAS, 495 <i>A Three Dimensional View of Gomez's Hamburger</i>	
	<b>Teague, R.</b> , 2019, IAU Proceedings Series, 350 <i>Tracing The Physical Conditions of Planet Formation with Molecular Excitation</i>	
	<b>Teague, R.</b> , Bae, J., Huang, J., Bergin, E. 2019, ApJL, 884 <i>Spiral Structure in the Gas Disk of TW Hya</i>	
	<b>Teague, R.</b> , Bae, J., Bergin, E. 2019, Nature, 574 <i>Meridional Flows in the Disk Around a Young Star</i>	
	<b>Teague, R.</b> , 2019, Journal of Open Source Software, 4 <i>GoFish: Fishing for Line Observations in Protoplanetary Disks</i>	
	<b>Teague, R.</b> , 2019, RNAAS, 3 <i>[non-refereed] Statistical Uncertainties in Moment Maps of Line Emission</i>	
	<b>Teague, R.</b> , 2019, Journal of Open Source Software, 4 <i>eddy: Extracting Protoplanetary Disk Dynamics with Python</i>	
	<b>Teague, R.</b> , Bae, J., Birnstiel, T. & Bergin, E., 2018, ApJ, 868 <i>Evidence For A Vertical Dependence on the Pressure Structure in AS 209</i>	
	<b>Teague, R.</b> & Foreman-Mackey, D., 2018, RNAAS, 2 <i>[non-refereed] A Robust Method to Measure Centroids of Spectral Lines</i>	
	<b>Teague, R.</b> , Henning, T., Guilloteau, S., et al., 2018, ApJ, 864 <i>Temperature, Mass, and Turbulence: A Spatially Resolved Multiband Non-LTE Analysis of CS in TW Hya</i>	
	<b>Teague, R.</b> , Bae, J., Bergin, E. A., et al., 2018, ApJL, 860 <i>A Kinematical Detection of Two Embedded Jupiter-mass Planets in HD 163296</i>	

**Teague, R.**, Semenov, D., Gorti, U., et al., 2017, ApJ, 835  
*Surface Density Perturbations in the TW Hydrae Disk at 95 au Traced by Molecular Emission*

**Teague, R.**, Guilloteau, S., Semenov, D., et al., 2016, A&A, 592  
*Measuring turbulence in TW Hya with ALMA: methods and limitations*

**Teague, R.**, Semenov, D., Guilloteau, S., et al., 2015, A&A, 574  
*Chemistry in disks. IX. Observations and modelling of  $\text{HCO}^+$  and  $\text{DCO}^+$  in DM Tauri*

(CO-AUTHOR)

All papers with a substantial component of student supervision are marked.

Benisty, M., Bae, J., Facchini, S., et al., ApJ, in press

*A Circumplanetary Disk Around PDS 70c*

Andrews, S. M., Elder, W., Zhang, S., et al., ApJ, in press

*Limits on Millimeter Continuum Emission from Circumplanetary Material in the DSHARP Disks*

Long, F., Andrews, S. M., Vega, J., et al., ApJ, in press

*The Architecture of the V892 Tau System: the Binary and its Circumbinary Disk*

Rich, E., **Teague, R.**, Monnier, J., et al. ApJ, 913

*Are Small Dust Grains actually coupled to the Gas in Protoplanetary Disks?*

Pegues, J., Öberg, K. I., Bergner, J. B., et al., ApJ, 911

*An ALMA Survey of Chemistry in Disks around Late-Type M-Stars*

Facchini, S., **Teague, R.**, Bae, J., et al. ApJ, in press

*The chemical inventory of the planet-hosting disk PDS 70*

Boehler, Y., Ménard, F., Robert, C. M. T., et al. ApJ, in press

*Vortex-like kinematic signal, spirals, and beam smearing effect in the HD 142527 disk*

Bae, J., **Teague, R.**, Zhu, Z., ApJ, 912

*Tightly-Wound Spirals Driven by Buoyancy Resonance in Protoplanetary Disks*

Cleeves, L. I., Loomis, R. A., **Teague, R.**, et al., ApJ, 911

*The TW Hya Rosetta Stone Project IV: A hydrocarbon rich disk atmosphere*

Pegues, J., Czekala, I., Andrews, S. M., ApJ, 908

*Dynamical Masses and Stellar Evolutionary Model Predictions of Low-Mass M-Stars*

Harrison, R. E., Looney, L. W., Stephens, I. W., et al., ApJ, 908

*ALMA CN Zeeman Observations of AS 209: Limits on Magnetic Field Strength and Magnetically Driven Accretion Rate*

Garufi, A., Podio, L., Codella, C., et al., A&A, 645

*ALMA chemical survey of disk-outflow sources in Taurus (ALMA-DOT V)*

Calahan, J., Bergin, E. A., Zhang, K., et al., ApJ, 908

*[student paper] Uncovering the Thermal Profile of a Typical Gaseous Protoplanetary Disk*

Wölfler, L., Facchini, S., Kurtovic, N. T., et al. A&A, 648

*A highly non-Keplerian protoplanetary disc*

Terwisscha, J. v. S., Hogerheijde, M. R., Cleeves, L. I., et al., ApJ, 906

*Spatially resolved emission of formaldehyde hints at low-temperature gas-phase formation*

Öberg, K., Cleeves, L. I., Bergner, J., et al., AJ, 161

*Radial and vertical distributions of DCN and  $\text{DCO}^+$  in the TW Hya disk*

Podio, L., Garufi, A., Codella, C., et al., A&A, 644

*ALMA chemical survey of disk-outflow sources in Taurus (ALMA-DOT II)*

Alarcón, F., **Teague, R.**, Zhang, K., et al., ApJ, 905

*[student paper] Chemical Evolution in a Protoplanetary Disk with Dust Substructures*

White, J. A., Kóspál, Á., Hughes, A. G. Hughes, et al., 2020, ApJ, 904

*ALMA and VLA Observations of EX Lupi in its Quiescent State*

Stephens, I. W., Fernández-López, M., Li, Z.-H., et al., 2020, ApJ, 901

*Low Level Carbon Monoxide Line Polarization in two Protoplanetary Disks*

Hall, C., Dong, R., **Teague, R.**, et al., ApJ, 904

*Kinematic Evidence for Gravitational Instability*

Long, D. E., Zhang, K., **Teague, R.**, et al., 2020, ApJL, 895

*[student paper] Hints of a Population of Solar System Analog Planets from ALMA*

Facchini, S., Benisty, M., Bae, J., et al., 2020, A&A, 639  
*Annular substructures in the transition disks around LkCa 15 and J1610*

Garufi, A., Codella, C., Rygl, K., et al., 2020, A&A, 636  
*ALMA chemical survey of disk-outflow sources in Taurus (ALMA-DOT I)*

Rosotti, G., **Teague, R.**, Dullemond, C., et al., 2020, MNRAS, 495  
*The Efficiency of Dust Trapping in Ringed Protoplanetary Discs*

Semenov, D. & **Teague, R.** 2020, Europhysics News, 51  
*Accretion disks around young stars: the cradles of planet formation*

Huang, J., Andrews, S. M., Dullemond, C. P., et al., 2020, ApJ, 891  
*A multi-frequency ALMA characterization of substructures in the GM Aur protoplanetary disk*

Rosotti, G., Benisty, M., Juhász, A., et al., 2020, MNRAS, 491.  
*Spiral arms in the proto-planetary disc HD100453 detected with ALMA*

Bae, J., Zhu, Z., Baruteau, C., et al., 2019, ApJL, 884  
*An Ideal Testbed for Planet-disk Interaction: Two Giant Protoplanets in Resonance Shaping the PDS 70 Disk*

Isella, A., Benisty, M., **Teague, R.**, et al., 2019, ApJL, 879  
*Detection of Continuum Submillimeter Emission Associated with Candidate Protoplanets*

Cleeves, L. I., Loomis, R. A., **Teague, R.**, et al., 2019, BAAS, 51  
*Realizing the Unique Potential of ALMA to Probe the Gas Reservoir of Planet Formation*

Lyra, W., Haworth, T., Bitsch, B., et al., 2019, BAAS, 51  
*Planet formation – The case for large efforts on the computational side*

Gallo, E., **Teague, R.**, Plotkin, R. M., et al., 2019, MNRAS, 488  
*ALMA observations of A0620-00: fresh clues on the nature of quiescent black hole X-ray binary jets*

Schwarz, K., **Teague, R.**, Bergin, E., et al., 2019, ApJL, 876.  
*Line Ratios Reveal N<sub>2</sub>H<sup>+</sup> Emission Originates above the Midplane in TW Hydrae*

Keppler, M., **Teague, R.**, Bae, J., et al., 2019, A&A, 625  
*[student paper] Highly structured disk around the planet host PDS 70 revealed by high-angular resolution observations*

Semenov, D., Favre, C., Fedele, D., et al., 2018, A&A, 617  
*Chemistry in disks. XI. Sulfur-bearing species as tracers of protoplanetary disk physics and chemistry: the DM Tau case*

Flaherty, K. M., Hughes, A. M., **Teague, R.**, et al., 2018, ApJ, 856  
*Turbulence in the TW Hya Disk*

Fedele, D., Tazzari, M., Booth, R., et al., 2018, A&A, 610  
*ALMA continuum observations of the protoplanetary disk AS 209. Evidence of multiple gaps opened by a single planet*

Flock, M., Nelson, R. P., Turner, N. J., et al., 2017, ApJ, 850  
*Radiation Hydrodynamical Turbulence in Protoplanetary Disks: Numerical Models and Observational Constraints*

Dutrey, A., Guilloteau, S., Piétu, V., et al., 2017, A&A, 607  
*The Flying Saucer: Tomography of the thermal and density gas structure of an edge-on protoplanetary disk*

Beuther, H., Linz, H., Henning, T., et al., 2017, A&A, 605  
*Multiplicity and disks within the high-mass core NGC 7538 IRS1.*

Parfenov, S. Y., Semenov, D. A., Henning, T., et al., 2017, MNRAS, 468  
*On the methanol emission detection in the TW Hya disc: the role of grain surface chemistry and non-LTE excitation*

van Boekel, R., Henning, T., Menu, J., et al., 2017, ApJ, 837  
*Three Radial Gaps in the Disk of TW Hydrae Imaged with SPHERE*

Haworth, T. J., Ilee, J. D., Forgan, D. H., et al., 2016, PASA, 33  
*Grand Challenges in Protoplanetary Disc Modelling*

Feng, S., Beuther, H., Semenov, D., et al., 2016, A&A, 593  
*Inferring the evolutionary stages of the internal structures of NGC 7538 S and IRS1 with chemistry*