Curriculum Vitae

Richard Teague

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Research Experience

Center for Astrophysics | Harvard & Smithsonian — Sep. 2019 –
Submillimeter Array Fellow

University of Michigan — May 2017 – Jul. 2019
Postdoctoral Researcher

Max-Planck-Institute for Astronomy — Jan. 2017 – Apr. 2017
Postdoctoral Researcher

Education

Max-Planck-Institute for Astronomy, Heidelberg, Germany
Ph.D. in Astronomy (Magna Cum Laude) — Oct. 2013 – Jan. 2017

University of Edinburgh, Edinburgh, United Kingdom
MPhys Astrophysics (First Class Honours) — Sep. 2008 – May 2013

Honours & Awards

Harvard Data Science Initiative Research Fund ($9,700) — Mar. 2020
Regularized Maximum Likelihood Imaging: A New Method for Detecting Planets

Ernst Patzer Award — Nov. 2016
Awarded for the best refereed publication by a young scientist.

Pre-Honours Certificate of Merit — May 2011
Awarded for top 5% performance in pre-honours exams.

Pre-Honours Certificate of Merit — May 2010
Awarded for top 5% performance in pre-honours exams.

Publication Summary

18 lead author papers, including one published in *Nature*, and 38 co-author papers, totaling **1071 citations** (ADS). A full publication list can be found at the end of the CV.

Observational Time Summary

I have been awarded over **82 hours** (200 hours) of time on ALMA as PI (co-I), **20 hours** (165 hours) on IRAM telescopes as PI (co-I) and **16 hours** (30 hours) on the SMA as PI (co-I). A break down of proposals can be found at the end of the CV.

Professional Services

SMA Interferometry School SOC — Mar. 2021
SMA, Hilo, Hawaii, USA

Advanced Data Analysis Techniques for ALMA SOC — Oct. 2020
NRAO, Charlottesville, Virginia, USA [postponed due to Covid-19]

SMA Seminar Organizer — 2020 - 2021
Departmental Seminar Series

Visualizing the Kinematics of Planet Formation SOC — Oct. 2019
Flatiron Institute, New York City, USA

Postdoc and Research Scientist DEI Representative — 2018 – 2019
Department Diversity, Equity and Inclusion Committee Member

Equi-Tea Organizer — 2018 – 2019
Diversity, Equity and Inclusion Journal Club

Stars, Planets and Formation Seminar Organizer — 2018 – 2019
Departmental Seminar Series

Conversations on Equity and Inclusion Co-organizer — 2018 – 2019
Joint Physics / Astronomy / Space Sciences DEI Colloquium Series

NESSF External Reviewer — 2018, 2020

Heidelberg MPG Student Workshop Organizer — 2016

PSF Coffee Organizer 2015 – 2017
Departmental Seminar Series

MPIA Student Representative 2015 – 2017

MPIA Student Workshop Organizer 2015, 2016

IMPRS Graduate Student Representative 2013 – 2017

Referee for AAS, A&A, MNRAS and Nature journals

SUPERVISION

Haochuan Yu Beijing Normal University 2020
Undergraduate student.

Alessandra Canta Harvard University 2020
Undergraduate student. Co-supervised with Karin Öberg, Harvard

Felipe Alcaron University of Michigan 2019 – 2020
Graduate student. Co-supervised with Ted Bergin and Ke Zhang, UMich.

Jenny Calahan University of Michigan 2019 – 2020
Graduate student. Co-supervised with Ted Bergin and Ke Zhang, UMich.

Deryl Long University of Michigan 2019
Undergraduate student. Co-supervised with Ted Bergin and Ke Zhang, UMich.

Case Hazewinkel University of Michigan 2019
Undergraduate student. Co-supervised with Ted Bergin, UMich.

Jeanne Kwon University of Michigan 2018 – 2019
Undergraduate Research Opportunity Program

Julian Penzinger Ludwig Maximilian University 2016, 2018
Summer student. Co-supervised with Dmitry Semenov, MPIA.

TALKS & SEMINARS

Planet-forming Disks: From Surveys to Answers Sep. 2021
Lorentz Center Workshop *(invited)*

ETH Zurich Exoplanets & Habitability Seminar May. 2021
Title TBD *(invited)*

Circumplanetary Disks II Mar. 2021
Observations and Observational Predictions *(invited)*

Caltech Dix Planetary Science Department Seminar Feb. 2021
Planet Formation in Six Dimensions *(invited)*

Five Years After HL Tau: A New Era in Planet Formation Dec. 2020
Observing the Kinematics of Gaseous Substructures

Research Unit Transition Disks (RUTD) Conference Oct. 2020
Observing the Dynamics of Planet Disk Interactions *(invited)*

From Clouds to Planets II: The Astrochemical Link Oct. 2020
ALMA's 3D View of Planet Formation [postponed due to Covid-19] *(invited)*

Exoplanets III July 2020
Kinematical Detection and Characterizing of Protoplanets with ALMA

MPIA Königstuhl Colloquium July 2020
Visualizing the Assembly of Planetary Systems *(invited)*

JPL Astrophysics Colloqium Nov. 2019
Witnessing the Dynamics of Planetary Assembly *(invited)*

Visualizing the Kinematics of Planet Formation Oct. 2019
Exploiting ALMA's Potential for Planet Hunting

Gordon Research Seminar June 2019
Unveiling the Dynamics of Planet Formation

IAU Symposium 350: Laboratory Astrophysics Apr. 2019
The Physical Conditions of Planet Formation with Molecular Excitation (invited)

Planet-Forming Disks Mar. 2019
Unveiling the Dynamics of Planet Formation (invited)

NAOJ Theoretical Astronomy Seminar Oct. 2018
Observing the Kinematics of Planet-Disk Interactions with ALMA (invited)

LMU Munich Astronomy Colloquium Aug. 2018
Using Kinematics to Search for Embedded Protoplanets (invited)

University of Tübingen Astronomy Seminar Aug. 2018
Kinematical Detections of Embedded Protoplanets (invited)

Astrophysical Frontiers in the Next Decade and Beyond Apr. 2018
The First Kinematical Detection of Embedded Protoplanets

Magnetic Fields or Turbulence Feb. 2018
A Spatially Resolved Search for Turbulence in TW Hya

MPIA Patzer Awards Colloquium Nov. 2016
Measuring Turbulence in TW Hya with ALMA: Methods and Limitations (invited)

MPIA Königstuhl Colloquium Nov. 2016
Observing the Earliest Stages of Planet Formation (invited)

Astrochemistry with ALMA Cycle 4 Jun. 2016
Detecting Turbulence in Protoplanetary Disks (invited)

Sant-Cugat Forum on Astrophysics Apr. 2016
Turbulence in Protoplanetary Disks: Methods and Limitations

Protoplanetary Discussions Mar. 2016
Turbulence in TW Hya

Chemical Diagnostics of Star and Planet Formation Jan. 2015
Deuterium Fraction in Protoplanetary Disks (invited)

ZAG - IPAG - MPIA Workshop on Planet Formation Jan. 2015
Deuterium Fraction in DM Tau (invited)

Successful Telescope Proposals (as PI)

SMA PI: **Teague, R.**, 6 hours, 2020A-S033, B ranked 2020b
A 3D Exploration of an Edge-On Self-Gravitating Disk

SMA PI: **Teague, R.**, 10 hours, 2020A-S033, A ranked 2020a
A 3D Exploration of an Edge-On Self-Gravitating Disk

ALMA PI: **Teague, R.**, 13.8 hours, 2019.1.01357.S, A ranked 2019
Constraining the H2 Surface Density Profile in IM Lup

ALMA PI: **Teague, R.**, 3.0 hours, 2019.1.00794.S, B ranked 2019
Detecting the Photoevaporative Wind in IM Lup

ALMA PI: **Teague, R.**, 33.2 hours, 2019.1.00419.S, B ranked 2019
Mapping the 3D Kinematic Structure of Planet Formation

ALMA PI: **Teague, R.**, 20.2 hours, 2018.A.00021.S, DDT 2019
Confirmation of an Embedded Planet in the Disk of TW Hya

Magellan/MagAO PI: **Teague, R.**, 6 hours 2018
Searching for Wide Separation Planets in AS 209

ALMA PI: **Teague, R.**, 6.7 hours, 2018.1.00980.S, A ranked 2018
An Unambiguous Detection of a Magnetic Field in a Protoplanetary Disk

ALMA PI: **Teague, R.**, 5.3 hours, 2016.1.00440.S, A ranked 2016
Model Independent Study of Turbulence and Temperature in TW Hya

IRAM PdBI PI: **Teague, R.**, 19.9 hours, W14BI, C ranked 2014
Disk Diagnostics with Deuteration

(as Co-I) Including over 200 hours with **ALMA**, 150 hours with **IRAM** telescopes, 30 hours with the **SMA**, 50 hours with the **VLA**, 25 hours with **VLT** (X-shooter and SPHERE), and 2 nights with **Magellan** (MagAO/MagAOx).

OUTREACH

Unversity of Michigan Lowbrow Astronomers Nov. 2020
How to Find Baby Planets

SCHOOL PARTICIPATION

45th Saas-Fee Course 2015
From Protoplanetary Disks to Planet Formation

Heidelberg Graduate School on Fundamental Physics 2015

DIANA Protoplanetary Disk School 2014

OBSERVING EXPERIENCE

Sub-Millimeter Array Sep. 2019 –
Monthly rota

MPG/ESO 2.2m 2016
14 nights

TEACHING

Wavefront Analysis Laboratory Instructor 2014

PUBLICATIONS (LEAD AUTHOR)

Disk Dynamics Collaboration, et al., PASA, submitted
[corresponding author]Vizualizing the Kinematics of Planet Formation

Teague, R., Hull, C. L. H., Bergin, E. A., et al., ApJ, submitted
Sub-mm Polarization in the Disk of TW Hya

Teague, R. Loomis, R. A., ApJ, 899
The Excitation Conditions of CN in TW Hya

Teague, R., Jankovic, M. R., Haworth, T. J., et al., MNRAS, 495
A Three Dimensional View of Gomez's Hamburger

Teague, R., 2019, IAU Proceedings Series, 350
Tracing The Physical Conditions of Planet Formation with Molecular Excitation

Teague, R., Bae, J., Huang, J., Bergin, E. 2019, ApJL, 884
Spiral Structure in the Gas Disk of TW Hya

Teague, R., Bae, J., Bergin, E. 2019, Nature, 574
Meridional Flows in the Disk Around a Young Star

Teague, R., 2019, Journal of Open Source Software, 4
GoFish: Fishing for Line Observations in Protoplanetary Disks

Teague, R., 2019, RNAAS, 3
[non-refereed] Statistical Uncertainties in Moment Maps of Line Emission

Teague, R., 2019, Journal of Open Source Software, 4
eddy: Extracting Protoplanetary Disk Dynamics with Python

Teague, R., Bae, J., Birnstiel, T. & Bergin, E., 2018, ApJ, 868
Evidence For A Vertical Dependence on the Pressure Structure in AS 209

Teague, R. & Foreman-Mackey, D., 2018, RNAAS, 2
[non-refereed] A Robust Method to Measure Centroids of Spectral Lines

Teague, R., Henning, T., Guilloteau, S., et al., 2018, ApJ, 864
Temperature, Mass, and Turbulence: A Spatially Resolved Multiband Non-LTE Analysis of CS in TW Hya

Teague, R., Bae, J., Bergin, E. A., et al., 2018, ApJL, 860
A Kinematical Detection of Two Embedded Jupiter-mass Planets in HD 163296

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 HCO^+ and DCO^+ in DM Tauri

(CO-AUTHOR) All papers with a substantial component of student supervision are marked.

Bae, J., **Teague, R.**, Zhu, Z., ApJ, in press
Tightly-Wound Spirals Driven by Buoyancy Resonance in Protoplanetary Disks

Facchini, S., **Teague, R.**, Bae, J., et al. ApJ, submitted
The chemical inventory of the planet-hosting disk PDS 70

Pegues, J., Czekala, I., Andrews, S. M., ApJ, in press
Dynamical Masses and Stellar Evolutionary Model Predictions of Low-Mass M-Stars

Harrison, R. E., Looney, L. W., Stephens, I. W., et al., ApJ, in press
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, in press
ALMA chemical survey of disk-outflow sources in Taurus (ALMA-DOT V)

Calahan, J., Bergin, E. A., Zhang, K., et al., ApJ, in press
[student paper] Uncovering the Thermal Profile of a Typical Gaseous Protoplanetary Disk

Wölfer, L., Facchini, S., Kurtovic, N. T., et al. ApJ, in press
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 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, in press
[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., Juhazs, 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 âĂŤ 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 N2H+ 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 7538IRS1.

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