

Dr. Johanna M. Vos

jvos@amnh.org ♦ johannavos.github.io

Professional Appointments

Royal Society – Science Foundation Ireland University Research Fellow Dublin Institute of Advanced Studies, Ireland	2023–
Postdoctoral Fellow Department of Astrophysics, American Museum of Natural History, USA	2018–2023
Principal’s Career Development Teaching Scholar Institute for Astronomy, University of Edinburgh, UK	2014–2018

Education

Institute for Astronomy, University of Edinburgh <i>PhD in Astronomy</i> Advisor: Prof. Beth A. Biller 2018 Winton Astronomy Thesis Prize	2014–2018
Trinity College Dublin <i>BA (Mod) Physics with Astrophysics</i> Graduated with First Class Honours (I)	2010–2014

Grants & Awards

Royal Society - Science Foundation Ireland University Research Fellowship	2022
Hubble Space Telescope General Observer Grant, <i>Space Telescope Science Institute</i>	2021
Keck PI Data Award, <i>NASA Jet Propulsion Laboratory</i>	2021
Hubble Space Telescope General Observer Grant, <i>Space Telescope Science Institute</i>	2019
Cool Stars 20 Conference Grant, <i>Boston University</i>	2018
Winton Thesis Prize, <i>University of Edinburgh</i>	2018
Principal’s Go Abroad Fund, <i>University of Edinburgh</i>	2018
Exoclipse Conference Grant, <i>Boise State University</i>	2017
Principal’s Career Development Teaching Scholarship <i>University of Edinburgh</i>	2014
First Class Book Prize, <i>Trinity College Dublin</i>	2011, 2012, 2013
Entrance Exhibition Scholarship, <i>Trinity College Dublin</i>	2010

Teaching Experience

Guest Lecturer , <i>Stanford University</i> Peering into Darkness: Research Practices in Contemporary Art & Astrophysics	2021
Instructor , <i>American Museum of Natural History</i> Designed and delivered “Stars” course for After School Program	2019–2020
Head Teaching Assistant , <i>University of Edinburgh</i> Courses: Physics Experimental Lab, Computational Observational Astronomy Lab	2016–2018
Teaching Assistant , <i>University of Edinburgh</i> Courses: Maths for Physics, Introductory Astrophysics, Discovering Astronomy	2014–2018

Research Advising

Undergraduate/Master's Students

Everett MacArthur, <i>Columbia University</i>	2022–Present
Mohammad Refat, <i>The Graduate Center, City University of New York</i>	2021–Present
Jose Adorno, <i>Queens College, City University of New York</i> → <i>University of Miami</i>	2020–2021
Allison McCarthy, <i>University of Alabama</i> → <i>Boston University</i>	2019–2020
+7 students as co-mentor	

High-School Students

BL Cadet, <i>Uncommon Prep Charter School</i>	2021–2022
Amelia Lobo-Jost, <i>Humanities Preparatory Academy High School</i>	2021–2022
Omar Piron, <i>Washington Heights Expeditionary Learning School</i>	2021–2022
Azul Ruiz Diaz, <i>Brooklyn Technical High School</i>	2020–2021
Jai Glazer, <i>The Dalton School</i>	2020–2021
Sophia Ameneyro, <i>University Neighborhood High School</i>	2020–2021
Izzy Lapidus, <i>Fiorello H. LaGuardia High School of Performing Arts</i>	2019–2020
Otis McCallum, <i>The Beacon School</i>	2019–2020
William McCartney, <i>New Explorations Into Science and Technology + Math</i>	2019–2020
Elko Gerville-Reache, <i>School of the Future</i>	2018–2019
Raunak Amanna, <i>Brooklyn Technical High School</i>	2018–2019
Nima Brivanlou, <i>Lycée Français de New York</i>	2018–2019

Service

Grant Reviewer: <i>NASA, Swiss National Science Foundation</i>	2020–Present
Telescope Time Allocation Committees: <i>NASA Keck, TESS, ESO</i>	2019–Present
Journal Referee, <i>ApJ, ApJL, AJ, JGRP</i>	2018–Present
Scientific Organizing Committee, Cloud Zwei Con , Ringberg Castle, Germany	2023
MSc Thesis External Examiner, <i>Stockholm University</i>	2022
Scientific Organizing Committee, Cloud Nine Con , Virtual	2021
American Astronomical Society Meeting Chambliss Poster Judge	2020, 2021
Astrophysics Seminar Organizer, <i>American Museum of Natural History</i>	2018–2020
Postgraduate Forum Astronomy Representative, <i>University of Edinburgh</i>	2017–2018
Astronomy Postgraduate Committee Member, <i>University of Edinburgh</i>	2015–2016

Talks & Seminars

★ indicates invited or plenary talks

Contributed Talk, Cloud Zwei Con , Ringberg Castle, Max Planck Society	2023
★ Colloquium, University of Massachusetts Amherst	2023
★ ExoCoffee, Max Planck Institute for Astronomy, Heidelberg	2023
★ Exoplanets and Stars Seminar, Yale University	2022
★ Dean's Digital Café, New York Institute of Technology	2022
Contributed Talk, Flatiron Exoplanet Atmospheres Symposium, CCA, Flatiron Institute	2022
Contributed Talk, Other Worlds Laboratory, UC Santa Cruz	2022
Contributed Talk, Brown Dwarf–Exoplanet Connection Splinter, Exoplanets IV	2022
★ Seminar, Carnegie Earth and Planets Laboratory	2022
★ Colloquium, Queens College, City University of New York	2022

Contributed Talk, CHAMPS Exoplanet Early Career Highlight Seminar	2022
Contributed Talk, AAS Meeting 239 (cancelled due to Covid-19)	2022
Contributed Talk, Gotham Fest 2021, New York	2021
★ Colloquium, University of California, Santa Cruz	2021
★ Colloquium, University of Texas at Austin	2021
★ Colloquium, Center for Space and Habitability, University of Bern	2021
★ Colloquium, Trinity College Dublin	2021
Contributed Talk, American Astronomical Society Meeting 237	2021
★ Colloquium, Center for Computational Astrophysics, Flatiron Institute	2020
Contributed Talk, Exo-Webb Seminar Series	2020
★ Colloquium, NASA Goddard Space Flight Center	2020
Contributed Talk, American Astronomical Society Meeting 235, Honolulu, HI	2020
Contributed Talk, Gotham Fest 2019, New York	2019
★ Colloquium, Dublin Institute for Advanced Studies	2019
Contributed Talk, Other Worlds Laboratory, UC Santa Cruz, CA	2019
★ Review Talk, BDEXOCON, University of Delaware	2019
★ Colloquium, American Museum of Natural History	2019
Dissertation Talk, American Astronomical Society Meeting 233, Seattle, WA	2019
★ Plenary Talk, Cool Stars 20, Boston, MA	2018
Contributed Talk, Scottish Exoplanet and Brown Dwarf Meeting	2017
★ Colloquium, Royal Observatory of Edinburgh	2017
★ Invited Talk, European Southern Observatories, Santiago, Chile	2017
Contributed Talk, Exoclipe, Boise, ID	2017
Contributed Talk, Scottish Exoplanet and Brown Dwarf Meeting	2015
★ Seminar, Max Planck Institute for Solar System Research	2014

Selected Telescope Time

NRAO Very Large Array, 16 hrs, Co-I	2022
ESO Very Large Telescope (CRIRES), 10 hrs, Co-I	2022
South African Large Telescope, 35 hrs, PI	2022
Gemini/IGRINS Fast Turnaround Program, 4.4 hrs, PI	2022
NASA Keck/NIRSPEC, 0.5 nights, PI	2022
NRAO Very Large Array, 11 hr, Co-I	2022
ESO New Technology Telescope, 18 nights, Co-I	2021-2022
Hubble Space Telescope (6 orbits), PI	2021
James Webb Space Telescope Cycle 1, (24.6 hr), Co-I	2021
Gemini-S/IGRINS, (21 hr), PI	2021
Gemini-N/GNIRS & Gemini-S/IGRINS (13 hr), PI	2020
Gemini-S/IGRINS, 31 hr, PI	2020
Hubble Space Telescope (16 orbits) & Very Large Array (27.6 hr), PI	2019
Spitzer Space Telescope Director's Discretionary Time, 33.1 hr, PI	2019
Spitzer Space Telescope Medium Program, 70 hr, PI	2018
James Webb Space Telescope Early Release Science, 39 hr, Collaborator	2017
Spitzer Space Telescope (30.8 hr) & Very Large Array (33 hr), Co-I	2016-2018
Hubble Space Telescope (5 orbits) & Spitzer Space Telescope (17.6 hr), Co-I	2016
ESO New Technology Telescope, 29 nights, PI	2014-2017

Diversity & Outreach Efforts

Speaker for public events in Ireland, UK & US <i>Examples: Astronomy on Tap, Pint of Science Festival, Royal Observatory Winter Talks</i>	2016–Present
Speaker for educational programs at AMNH <i>Examples: School visits, BridgeUP Scholars Program, After School Programs</i>	2018–Present
Research Mentor , CUNY Astrocom NYC & NSF REU programs <i>Research experience for undergraduate students</i>	2019–Present
Research Mentor , Science Research Mentoring Program, AMNH <i>Research experience for NYC high-school students</i>	2018–2022
Subject Matter Expert , NASA Community College Network <i>Partnership with community college instructors and their students</i>	2022–Present
Podcast Guest <i>Examples: The Planetary Society: Planetary Radio, The LIUniverse, Stemettes: Say What?</i>	2022–Present
Volunteer , Stemettes <i>Resources, consulting and presentations for girls and non-binary people interested in STEM</i>	2020–Present
Scientific Advisor & Speaker , About Us Festival UK 2022	2021–2022
Featured Scientist , 1400 Degrees	2022
Featured Scientist , 100DIGITS Campaign	2022
Featured Scientist , Million STEM	2020
STEM Ambassador , StemEast, UK & Ireland <i>Visited schools around Scotland and Ireland speaking about science research.</i>	2015–2018
Contributor , University of Edinburgh Science Magazine, Women are Boring	2018
Workshop Leader , Kickstart Program, University of Edinburgh <i>A week-long immersive university experience for secondary school students</i>	2015, 2016
Mentor , TYPE Program, Trinity College Dublin <i>Transition Year Physics Experience for secondary school students</i>	2012

Recent Press

Royal Society announces University Research Fellowships for 2022	2022
AAS 239 Winter Meeting Press Conference	2022
Stemettes Say What? Podcast: What is the deal with Academia careers?	2022
Planetary Radio Podcast: Weather on brown dwarfs, and worlds on the eve of destruction	2022
The LIUniverse Podcast: Brown Dwarfs and Ballet	2022
California Academy of Sciences Universe Update	2022
NASA Jet Propulsion Laboratory Press Release	2022
Irish Times “Research Lives” Profile	2020
NRAO’s 2020 Astronomy Highlights with Phil Plait	2020
Space.com Science & Astronomy Interview	2020
NASA Jet Propulsion Laboratory Press Release	2020

First Author Publications

★ indicates equal author contribution

1. [Patchy Forsterite Clouds in the Atmospheres of Two Exoplanet Analogs](#)

Vos, J. M.; Burningham, B.; Faherty, J. K.; Alejandro, S.; Gonzales, E. C.; Calamari, E.;

- Bardalez Gagliuffi, D.; Visscher, C.; Tan, X.; Morley, C. V.; Marley, M.; Gemma, M. E.; Whiteford, N.; Gaarn, J.; Park, G. *The Astrophysical Journal*, 944, 138, 2023.
2. [Let The Great World Spin: Revealing the Turbulent, Stormy Nature of Giant Planet Analogs with the Spitzer Space Telescope](#)
Vos, J. M.; Faherty, J. K.; Gagné J.; Marley, M.; Metchev, S.; Gizis, J.; Rice, E., L.; Cruz, K. *The Astrophysical Journal*, 924, 68, 2022.
 3. [A measurement of the wind speed on a brown dwarf](#)
 ★Allers, K. N.; ★**Vos, J. M.**; ★Biller, B. A.; ★Williams, P. K.G. *Science*, 368, 6487, 169–172, 2020.
 4. [Spitzer Variability Properties of Young Giant Planet Analogs](#)
Vos, J. M.; Biller, B. A.; Allers, K. N.; Faherty, J. K.; Liu, Michael C.; Eriksson, S.; Best, W. M. J.; Metchev, S.; Radigan, J.; Allers, K. N.; Janson, M.; Buenzli, E.; Dupuy, T. J.; Bonnefoy, M.; Manjavacas, E.; Brandner, W.; Crossfield, I.; Deacon, N.; Henning, T.; Homeier, D.; Schlieder, J., *The Astronomical Journal*, 160(1):38, 2020.
 5. [A search for variability in exoplanet analogues and low-gravity brown dwarfs](#)
Vos, J. M.; Biller, B. A.; Bonavita, M.; Eriksson, S.; Liu, Michael C.; Best, W. M. J.; Metchev, S.; Radigan, J.; Allers, K. N.; Janson, M.; Buenzli, E.; Dupuy, T. J.; Bonnefoy, M.; Manjavacas, E.; Brandner, W.; Crossfield, I.; Deacon, N.; Henning, T.; Homeier, D.; Kopytova, T. Schlieder, J., *Monthly Notices of the Royal Astronomical Society*, 483:480–502, 2019.
 6. [Variability of the lowest mass objects in the AB Doradus moving group.](#)
Vos, J. M.; Allers, K. N.; Biller, B. A.; Liu, M. C.; Dupuy, T. J.; Gallimore, J. F.; Adenuga, I. J.; Best, W. M. J., *Monthly Notices of the Royal Astronomical Society*, 474(1):1041–1053, 2018.
 7. [The Viewing Geometry of Brown Dwarfs Influences Their Observed Colors and Variability Amplitudes](#)
Vos, J. M.; Allers, K. N.; Biller, B. A., *The Astrophysical Journal*, 842(2):78, 2017.

Second Author Publications

8. [On The Detection of Exomoons Transiting Isolated Planetary-Mass Objects](#)
 Limbach, M. A.; **Vos, J. M.**; Winn, J. N.; Heller, R.; Mason, J.; Schneider, A.; Dai, F., *The Astrophysical Journal Letters*, 918, L25, 2021.
9. [Simultaneous Multiwavelength Variability Characterization of the Free-floating Planetary-mass Object PSO J318.5–22.](#)
 Biller, B. A.; **Vos, J. M.**; Buenzli, E.; Allers, K.; Bonnefoy, M.; Charnay, B.; Bézard, B.; Allard, F.; Homeier, D.; Bonavita, M.; Brandner, W.; Crossfield, I.; Dupuy, T.; Henning, T.; Kopytova, T.; Liu, M. C.; Manjavacas, E.; Schlieder, J., *The Astronomical Journal*, 155(2):95, 2018.
10. [Variability in a Young, L/T Transition Planetary–Mass Object](#)
 Biller, B. A.; **Vos, J. M.**; Bonavita, M.; Buenzli, E.; Baxter, C.; Crossfield, I. J. M.; Allers, K.; Liu, M. C.; Bonnefoy, M.; Deacon, N.; Brandner, W.; Schlieder, J. E.; Dupuy, T.; Kopytova, T.; Manjavacas, E.; Allard, F.; Homeier, D.; Henning, T., *The Astrophysical Journal Letters*, 813(2):1–6, 2015.

Co–Author Publications

11. Time-resolved Optical Polarization Monitoring of the Most Variable Brown Dwarf
Manjavacas, E.; Miles-Paez, P. A.; Karalidi, T.; **Vos, J. M.**, Galloway, M. L.; Girard, J.
submitted to *The Astronomical Journal*, 2023.
12. [The JWST Early Release Science Program for Direct Observations of Exoplanetary Systems I: High Contrast Imaging of the Exoplanet HIP 65426 b from 2 – 16 \$\mu\$ m](#)
Direct Imaging Community Early Release Science Team: Carter, A. L.; et al. +107 co-authors
incl. **Vos, J. M.**, submitted to *The Astrophysical Journal Letters*, 2022
13. [The JWST Early Release Science Program for Direct Observations of Exoplanetary Systems II: A 1 to 20 Micron Spectrum of the Planetary-Mass Companion VHS 1256–1257 b](#)
Direct Imaging Community Early Release Science Team: Miles, B. E.; et al. +101 co-authors
incl. **Vos, J. M.**, accepted for publication in *The Astrophysical Journal Letters*.
14. [Examining the Rotation Period Distribution of 40 Myr Tucana-Horologium with TESS](#)
Popinchalk, M.; Faherty, J. K.; Curtis, J. L.; Gagne, J.; Bardalez Gagliuffi, D.; **Vos, J. M.**;
Ayala, Andrew.; Gonzales, Lisseth.; Kiman, R., accepted for publication in *The Astrophysical Journal*.
15. [Redder than Red: Discovery of an Exceptionally Red L/T Transition Dwarf](#)
Schneider, A. C.; Burgasser, A. J.; Bruursemma, J.; Munn, J. A.; Vrba, F. J.; Caselden, D.;
Kabatnik, M.; Rothermich, A.; Sainio, A.; Bickle, T. P.; Dahm, S. E.; Meisner, A. M.; Kirk-
patrick, J. D.; Suarez, G.; Gagné, J.; Faherty, J. K.; **Vos, J. M.**, Kuchner, M. J.; Williams,
S. J.; Bardalez Gagliuffi, D.; Aganze, C.; Hsu, C.; Theissen, C.; Cushing, M. C.; Marocco, F.;
Casewell, S. and The Backyard Worlds: Planet 9 Collaboration, *The Astrophysical Journal Letters*, 943, 16, 2023.
16. [The TEMPO Survey I: Predicting Yields of the Transiting Exosatellites, Moons, and Planets from a 30-day Survey of Orion with the Nancy Grace Roman Space Telescope](#)
Limbach, M. A.; Soares-Furtado, M.; Vanderburg, A.; Best, W. J.; Cody A. M.; D’Onghia, E.;
Heller, R.; Hensley, B. S.; Kounkel, M.; Kraus, A.; Mann, A. M.; Robberto, M.; Rosen, A. L.;
Townsend, R.; **Vos, J. M.** and the TEMPO Collaboration, *Publications of the Astronomical Society of the Pacific*, 135, 4401, 2023.
17. [The Perkins INfrared Exosatellite Survey \(PINES\) II. Transit Candidates and Implications for Planet Occurrence around L and T Dwarfs](#)
Tamburo, P.; Muirhead, P. S.; McCarthy, A.; Hart, M.; **Vos, J. M.**; Agol, E.; Theissen, C.;
Gracia, D.; Bardalez Gagliuffi, D.; Faherty, J. K., *The Astronomical Journal*, 164, 252, 2022.
18. [An Atmospheric Retrieval of the Brown Dwarf Gliese 229B](#)
Calamari, E.; Faherty, J. K.; Burningham, B.; Gonzales, E. C.; Bardalez Gagliuffi, D. ; **Vos, J. M.**;
Gemma, M.; Whiteford, N.; Gaarn, J.; *The Astrophysical Journal*, 940, 2, 2022.
19. [Informed Systematic Method to Identify Variable Mid- and Late-T Dwarfs](#)
Oliveros-Gomez, N.; Manjavacas, E.; Ashraf, A.; Bardalez Gagliuffi, D.; **Vos, J. M.**; Faherty,
J. K.; Karalidi, T.; Apai, D.; *The Astrophysical Journal*, 939, 72, 2022.
20. [On The Unusual Variability of 2MASS J06195260–2903592: A Long-Lived Disk around a Young Ultracool Dwarf](#)
Liu, M. C.; Magnier, E.; Zhang, Z.; Gaidos, E.; Liu, P.; Biller, B. A.; **Vos, J. M.**; Dupuy, T.;

- Allers, K. N.; Shappee, B. J.; Hinkle, J. T.; Constantinou, S. N. L.; Emerson, K. J.; Dennis, M. T.; *The Astronomical Journal*, 164, 4, 2022.
21. [Disentangling the Signatures of Blended-Light Atmospheres in L/T Transition Brown Dwarfs](#)
Ashraf, A.; Bardalez Gagliuffi, D.; Manjavacas, E.; **Vos, J. M.**; Faherty, J. K., *The Astrophysical Journal*, 934, 178, 2022.
 22. [Top-of-the-atmosphere and Vertical Cloud Structure of a Fast-rotating Late T Dwarf](#)
Manjavacas, E.; Karalidi, T.; Tan, X.; **Vos, J. M.**; Lew, B. W. P.; Biller, B. A.; Oliveros-Gómez, N. L., *The Astronomical Journal*, 164, 65, 2022.
 23. [The Perkins INfrared Exosatellite Survey \(PINES\) I. Survey Overview, Reduction Pipeline, and Early Results](#)
Tamburo, P.; Muirhead, P. S.; McCarthy, A.; Hart, M.; Gracia, D.; **Vos, J. M.**; Radigan, J.; Bardalez Gagliuffi, D.; Faherty, J. K.; Theissen, C.; Agol, E.; Skinner, J.; Sagar, S., *The Astrophysical Journal*, 168 (6), 253, 2022.
 24. [A Wide Planetary Mass Companion Discovered Through the Citizen Science Project Backyard Worlds: Planet 9](#)
Faherty, J. K.; Gagné, J.; Popinchalk, M.; **Vos, J. M.**; Burgasser, A. J.; Schümann, J.; Schneider, A. C.; Davy Kirkpatrick, J.; Meisner, A. M.; Kuchner, M. J.; Bardalez Gagliuffi, D. C.; Marocco, F.; Caselden, D.; Gonzales, E.; Rothermich, A.; Casewell, S.; Debes, J. H.; Aganze, C.; Ayala, A.; Hsu, C.; Cooper, W.; Smart, R. L.; Gerasimov, R.; Theissen, C. and The Backyard Worlds Collaboration, *The Astrophysical Journal*, 923 (1), 48, 2021.
 25. [Revealing the Vertical Cloud Structure of an AB Pictoris b Analog through Keck I/MOSFIRE spectro-photometric variability](#)
Manjavacas, E.; Karalidi, T.; **Vos, J. M.**; Biller, B. A.; Lew, B. W. P., *The Astronomical Journal*, 162 (5), 179, 2021.
 26. [Longitudinally Resolved Spectral Retrieval \(ReSpect\) of WASP-43b](#)
Cubillos, P. E.; Keating, D.; Cowan, N. B.; **Vos, J. M.**; Burningham, B.; Ygouf, M.; Karalidi, T.; Zhou, Y.; Gonzales, E. C., *The Astrophysical Journal*, 915, 45, 2021.
 27. [A High-Contrast Search for Variability in HR 8799bc with VLT-SPHERE](#)
Biller, B. A.; Apai, D.; Bonnefoy, M.; Desidera, S.; Gratton, R.; Kasper, M.; Kenworthy, M.; Lagrange, A.; Lazzoni, C.; Mesa, D.; Vigan, A.; **Vos, J. M.**; Wagner, K.; Zurlo, A., *Monthly Notices of the Royal Astronomical Society*, 503(1):743–767, 2021.

White Papers & Research Notes

28. [The L/T Transition](#)
Vos, J. M. et al., White Paper for Decadal Survey on Astronomy and Astrophysics 2020 by the National Academy of Science, Engineering and Medicine, *Bulletins of the American Astronomical Society*, 2019.
29. [A Tool and Workflow for Radio Astronomical “Peeling” in CASA](#)
Williams, P. K. G.; Allers, K. N.; Biller, B. A.; **Vos, J. M.**, *Research Notes of the American Astronomical Society*, 3, 110, 2019.
30. [Mapping Ultracool Atmospheres: Time-domain Observations of Brown Dwarfs and Exoplanets](#)

Apai, D. et al., incl **Vos, J. M.**, White Paper for Decadal Survey on Astronomy and Astrophysics 2020 by the National Academy of Science, Engineering and Medicine, *Bulletins of the American Astronomical Society*, 2019.

31. [Brown Dwarfs and Directly Imaged Exoplanets in Young Associations](#)

Faherty, J. et al., incl. **Vos, J. M.**, White Paper for Decadal Survey on Astronomy and Astrophysics 2020 by the National Academy of Science, Engineering and Medicine, *Bulletins of the American Astronomical Society*, 2019.

32. [High-Resolution Spectroscopic Surveys of Ultracool Dwarf Stars & Brown Dwarfs](#)

Burgasser, A. et al., incl. **Vos, J. M.**, White Paper for Decadal Survey on Astronomy and Astrophysics 2020 by the National Academy of Science, Engineering and Medicine, *Bulletins of the American Astronomical Society*, 2019.

33. [Fundamental Physics with Brown Dwarfs: The Mass-Radius Relation](#)

Burgasser, A. et al., incl. **Vos, J. M.**, White Paper for Decadal Survey on Astronomy and Astrophysics 2020 by the National Academy of Science, Engineering and Medicine, *Bulletins of the American Astronomical Society*, 2019.

34. [IDEAS: Immersive Dome Experiences for Accelerating Science](#)

Faherty, J. et al., incl. **Vos, J. M.**, White Paper for Decadal Survey on Astronomy and Astrophysics 2020 by the National Academy of Science, Engineering and Medicine, *Bulletins of the American Astronomical Society*, 2019.