

William M. J. Best

Curriculum Vitae

University of Texas, Dept. of Astronomy
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Citizenship

United States of America

Education

- 2018 **PhD in Astronomy**, *Institute for Astronomy, University of Hawai'i*, Honolulu, HI.
Dissertation: Ultracool Demography with a Volume-Limited Census of the Solar Neighborhood
Advisors: Michael C. Liu, Eugene A. Magnier.
- 2013 **MS in Astronomy**, *Institute for Astronomy, University of Hawai'i*, Honolulu, HI.
- 2009 **MEd in Private School Leadership**, *University of Hawai'i*, Honolulu, HI.
- 1994 **BA in Physics, BA in Astronomy**, *Haverford College*, Haverford, PA.

Research Interests

Brown dwarfs, extrasolar planets, star and planet formation, low-mass stellar populations

Employment

Astronomy

- 2018–present **Postdoctoral Fellow**, *University of Texas*, Austin, TX.
Advisor: Dr. Adam L. Kraus
- A Census to the Bottom of the IMF in Westerlund 2 with JWST spectroscopy and photometry.
 - The IMF down to planetary masses in large star-forming regions with HST photometry.
- 2011–2018 **Research Assistant**, *Institute for Astronomy, University of Hawai'i*, Honolulu, HI.
Advisors: Dr. Michael C. Liu, Dr. Eugene A. Magnier, Dr. Jonathan P. Williams
- Parallax measurements (infrared) with UKIRT for 350 low-mass stars and brown dwarfs.
 - Adaptive optics imaging of brown dwarf binaries with Keck + LGS adaptive optics.
 - Large-scale searches for brown dwarfs using Pan-STARRS, 2MASS, SDSS, WISE, and UKIDSS.

Teaching

- Fall 2023– **Astronomy 301: Introduction to Astronomy**, *University of Texas*, Austin, TX.
- Fall 2021 **Astronomy 309L: Search for Extraterrestrial Life**, *University of Texas*, Austin, TX.
Lead instructor for November–December
- 2001–2011, **Mathematics and Physics Teacher**, *Punahou School*, Honolulu, HI.
- 1994–1999
- Math Department Head for five years. Supervised 24 teachers, focusing on professional growth.
 - Taught all levels of high school math, A.P. Physics C (with calculus), Astronomy, Introduction to Counseling Psychology, 9th Grade Guidance.
 - Chaired search committee for an Academy Dean position.
 - Served on Academy Curriculum Committee for three years.

UltracoolSheet

- 2020–present **Lead Curator**, *UltracoolSheet*.
Comprehensive, data-rich online catalog of low-mass stars and brown dwarfs

Advising

- 2021 **Research Experiences for Undergraduates (REU) at UT Austin**
Alyssa Leone (Youngstown State): Photometric Properties of Brown Dwarf Binaries
- 2019-2021 **UT Austin undergraduate student**
Jean Feeser: Using Old and New Approaches: Determining Luminosities of Brown Dwarfs with Spectral Type Polynomials and Machine Learning
- 2019-2020 **UT Austin undergraduate student**
Aniket Sanghi: Measuring the Substellar IMF using a 25 pc Volume-Limited Sample of L0-T8 Brown Dwarfs
- 2019 **Texas Astronomy Undergraduate Research experience for Under-represented Students (TAURUS) at UT Austin**
Alexis Lupo (UT El Paso): Performing Point Spread Function Fitting and Aperture Photometry on Hubble Space Telescope Images
- 2019 **Research Experiences for Undergraduates (REU) at UT Austin**
Madeline Wilson (UC Davis): A Method to Distinguish Binary from Single L/T Transition Dwarfs Using Only Photometry

Observing Programs as Principal Investigator

JWST (NIRSpec + NIRC2) — 9.6 hours, July 2022, PI of 13-member team

Keck (MOSFIRE) via NASA/Keck — 1 night, September 2021

Gemini (GMOS) via NOIRLab — 3.8 queue hours, May 2021

Keck (NIRC2+LGSAO) — 14 nights, 2015–2018

UKIRT (WFCAM) — 482 queue hours, 2013–January 2018

IRTF (SpeX) — 12 nights, 2013–2015

Gemini (GNIRS) — 7.3 queue hours, 2013–2015

Professional Service

- 2019 Organizing Committee for Bashfest 2019 conference
- 2021–2022 NASA Infrared Telescope Facility (IRTF) Time Allocation Committee
- 2022–2023 Referee for Astronomy & Astrophysics
- 2017–2022 Referee for The Astrophysical Journal
- 2017–2020 Referee for Monthly Notices of the Royal Astronomical Society
- 2015 University of Hawaii Telescope Time Allocation Committee

Outreach

- 2011–2022 Guest speaker 8 times, science classes, Punahou School, Honolulu, HI

- 2019–2020 Speaker, Astronomy on Tap, Austin, TX
- 2012–2013 StarLab host, Institute for Astronomy Open House, University of Hawaii
- 2011–2013 Volunteer for 5 public lectures, Institute for Astronomy, University of Hawaii
- 2012 Coordinator for 2 StarLab education events, Hawaii public elementary schools

Refereed Publications

40 total, including 7 first author and 2 second author [ADS Library](#)

First Author

- 40. **A Volume-Limited Sample of Ultracool Dwarfs. I. Construction, Space Density, and a Gap in the L/T Transition.** Best, W. M. J., Liu, M. C., Magnier, E. A., and Dupuy, T. J. 2021, *AJ*, 161, 42.
- 39. **The Hawaii Infrared Parallax Program. IV. A Comprehensive Parallax Survey of L0–T8 Dwarfs with UKIRT.** Best, W. M. J., Liu, M. C., Magnier, E. A., and Dupuy, T. J. 2020, *AJ*, 159, 257.
- 38. **Photometry and Proper Motions of M, L, and T Dwarfs from the Pan-STARRS1 3π Survey.** Best, W. M. J., Magnier, E. A., Liu, M. C., Aller, K. M., et al (15 total authors). 2018, *ApJS*, 234, 1.
- 37. **The Young L Dwarf 2MASS J11193254–1137466 Is a Planetary-mass Binary.** Best, W. M. J., Liu, M. C., Dupuy, T. J., and Magnier, E. A. 2017, *ApJL*, 843, L4.
- 36. **A Search for L/T Transition Dwarfs With Pan-STARRS1 and WISE. III. Young L Dwarf Discoveries and Proper Motion Catalogs in Taurus and Scorpius-Centaurus.** Best, W. M. J., Liu, M. C., Magnier, E. A., Bowler, B. P., et al (16 total authors). 2017, *ApJ*, 837, 95.
- 35. **A Search for L/T Transition Dwarfs With Pan-STARRS1 and WISE. II. L/T Transition Atmospheres and Young Discoveries.** Best, W. M. J., Liu, M. C., Magnier, E. A., Deacon, N. R., et al (16 total authors). 2015, *ApJ*, 814, 118.
- 34. **A Search for L/T Transition Dwarfs With Pan-STARRS1 and WISE: Discovery of Seven Nearby Objects Including Two Candidate Spectroscopic Variables.** Best, W. M. J., Liu, M. C., Magnier, E. A., Aller, K. M., et al (16 total authors). 2013, *ApJ*, 777, 84.

Significant Contributions

- 33. **The Hawaii Infrared Parallax Program. VI. The Fundamental Properties of 1000+ Ultracool Dwarfs and Planetary-Mass Objects using Optical to Mid-infrared Spectral Energy Distributions** Sanghi, A., Liu, M. C., Best, W. M. J., Dupuy, T. J., Siverd, R. J., Zhang, Z., Hurt, S. A., Magnier, E. A., Aller, K. M., and Deacon, N. R. 2023, *ApJ*, submitted.
- 32. **On the Masses, Age, and Architecture of the VHS J1256–1257AB b System.** Dupuy, T. J., Liu, M. C., Evans, E. L., Best, W. M. J., Pearce, L. A., Sanghi, A., Phillips, M. W., and Bardalez Gagliuffi, D. C. 2023, *MNRAS*, 519, 1688.
- 31. **Using Old and New Approaches: Determining Physical Properties of Brown Dwarfs with Empirical Relations and Machine Learning Models.** Feeder, S. J. and Best, W. M. J. 2022, *MNRAS*, 513, 516.

30. **Uniform Forward-Modeling Analysis of Ultracool Dwarfs. II. Atmospheric Properties of 55 Late-T Dwarfs.** Zhang, Z., Liu, M. C., Marley, M. S., Line, M. R., and Best, W. M. J. 2021, ApJ, 921, 95.
29. **Uniform Forward-Modeling Analysis of Ultracool Dwarfs. I. Methodology and Benchmarking.** Zhang, Z., Liu, M. C., Marley, M. S., Line, M. R., and Best, W. M. J. 2021, ApJ, 916, 53.
28. **The Hawaii Infrared Parallax Program. V. New T-dwarf Members and Candidate Members of Nearby Young Moving Groups** Zhang, Z., Liu, M. C., Claytor, Z. R., Best, W. M. J., Dupuy, T. J., and Siverd, R. J. 2021, ApJ, 911, 7.
27. **Direct Radio Discovery of a Cold Brown Dwarf.** Vedantham, H. K., Callingham, J. R., Shimwell, T. W., Dupuy, T., Best, W. M. J., et al (12 total authors). 2020, ApJL, 903, L33.
26. **WISE J072003.20–084651.2B Is A Massive T Dwarf.** Dupuy, T. J., Liu, M. C., Best, W. M. J., Mann, A. W., et al (24 total authors). 2019, AJ, 158, 174.
25. **A Search for Variability in Exoplanet Analogues and Low-gravity Brown Dwarfs.** Vos, J. M., Biller, B., A., Bonavita, M., Eriksson, S., Liu, M. C., Best, W. M. J., et al (21 total authors). 2019, MNRAS, 483, 480.
24. **The Pan-STARRS1 Proper-Motion Survey for Young Brown Dwarfs in Nearby Star-Forming Regions. I. Taurus Discoveries and a Reddening-Free Classification Method for Ultracool Dwarfs.** Zhang, Z., Liu, M. C., Best, W. M. J., Magnier, E. A., et al (14 total authors). 2018, ApJ, 858, 41.
23. **Identification of partially resolved binaries in Pan-STARRS1 data.** Deacon, N. R., Magnier, E. A., Best, W. M. J., Liu, M. C., et al (12 total authors). 2017, MNRAS, 468, 3499.
22. **Brown Dwarfs in Young Moving Groups from Pan-STARRS1. I. AB Doradus.** Aller, K. M., Liu, M. C., Magnier, E. A., Best, W. M. J., et al (15 total authors). 2016, ApJ, 821, 120.
21. **The Brightening of Re50N: Accretion Event or Dust Clearing?** Chiang, H.-F., Reipurth, B., Walawender, J., Connelley, M. S., Pessev, P., Geballe, T. R., Best, W. M. J., and Paegert, M. 2015, ApJ, 805, 54.
20. **Wide, Cool and Ultracool Companions to Nearby Stars from Pan-STARRS1.** Deacon, N. R., Liu M. C., Magnier, E. A., Aller, K. M., Best, W. M. J., et al (21 total authors). 2014, ApJ, 792, 119.
19. **A Parametric Modeling Approach to Measuring the Gas Masses of Circumstellar Disks.** Williams, J. P. and Best, W. M. J. 2014, ApJ, 788, 59.
18. **Two Extraordinary Substellar Binaries at the T/Y Transition and the Y-band Fluxes of the Coolest Brown Dwarfs.** Liu, M. C., Dupuy, T. J., Bowler, B. P., Leggett, S. K., and Best, W. M. J. 2012, ApJ, 758, 57.

Contributing Author

17. **Polarised radio pulsations from a new T dwarf binary** Vedantham, H. K., Dupuy, T. J., Evans, E. L., Sanghi, A., Callingham, J. R., Shimwell, T. W., Best, W. M. J., Liu, M. C., Zarka, P. 2023, A&A, in press.

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 Space Telescope** Limbach, M. A., et al (15 total authors). 2023, PASP, 135, 014401.
15. **A Uniform Retrieval Analysis of Ultra-cool Dwarfs. IV. A Statistical Census from 50 Late-T Dwarfs** Zalesky, J. A., Saboi, K., Line, M. R., Zhang, Z., Schneider, A. C., Liu, M. C., Best, W. M. J., and Marley, M. K. 2022, AJ, 936, 44.
14. **ALMA Discovery of a Disk around the Planetary-mass Companion SR 12 c** Wu, Y.-L., Bowler, B. P., Sheehan, P. D., Close, L. M., Eisner, J. A., Best, W. M. J., Ward-Duong, K., Zhu, Z., and Kraus, A. L. 2022, AJ, 930, 3.
13. **Improved Dynamical Masses for Six Brown Dwarf Companions Using Hipparcos and Gaia EDR3** Brandt, G. M., et al (11 total authors). 2021, AJ, 162, 301.
12. **The Second Discovery from the COCONUTS Program: A Cold Wide-orbit Exoplanet around a Young Field M Dwarf at 10.9 pc** Zhang, Z., Liu, M. C., Claytor, Z. R., Best, W. M. J., Dupuy, T. J., and Siverd, R. J. 2021, ApJL, 916, L11.
11. **Spitzer Variability Properties of Low-Gravity L Dwarfs** Vos, J. M., et al (20 total authors). 2020, AJ, 160, 38.
10. **3.8 μ m Imaging of 400–600K Brown Dwarfs and Orbital Constraints for WISEP J045853.90+643452.6AB** Leggett, S. K., et al (13 total authors). 2019, ApJ, 882, 117.
9. **The Hawaii Infrared Parallax Program. III. 2MASS J0249-0557 c: A Wide Planetary-mass Companion to a Low-mass Binary in the β Pic Moving Group.** Dupuy, T. J., Liu, M. C., Allers, K. N., Biller, B. A., Kratter, K. M., Mann, A. W., Shkolnik, E. L., Kraus, A. L., and Best, W. M. J. 2018, AJ, 156, 57.
8. **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, D., and Best, W. M. J. 2018, MNRAS, 474, 1041.
7. **The UKIRT Hemisphere Survey: Definition and J-band Data Release.** Dye, S., et al (26 total authors). 2018, MNRAS, 473, 5113.
6. **2MASS 0213+3648 C: A wide T3 benchmark companion to an active, old M dwarf binary.** Deacon, N. R., et al (17 total authors). 2017, MNRAS, 467, 1126.
5. **Planets Around Low-Mass Stars (PALMS). VI. Discovery of a Remarkably Red Planetary-mass Companion to the AB Dor Moving Group Candidate 2MASS J22362452+4751425.** Bowler, B. P., et al (14 total authors). 2017, AJ, 153, 18.
4. **Planet Hunters IX. KIC 8462852 – Where’s the Flux?** Boyajian, T. S., et al (30 total authors). 2016, MNRAS, 457, 3988.
3. **Two Transiting Earth-Size Planets Near Resonance Orbiting a Nearby Cool Star.** Petigura, E. A., et al (14 total authors). 2015, ApJ, 811, 102.
2. **Planets Around Low-Mass Stars (PALMS). V. Age-dating Low-mass Companions to Members and Interlopers of Young Moving Groups.** Bowler, B. P., et al (25 total authors). 2015, ApJ, 806, 62.
1. **The 2011 June 23 Stellar Occultation by Pluto: Airborne and Ground Observations.** Person, M. J., et al (47 total authors). 2013, AJ, 146, 83.

Research Notes

Updated Spectral Type Polynomials for Ultracool Dwarfs with CatWISE Photometry. Feeder, S. J., Best, W. M. J., Sanghi, A., and Liu, M. C. 2022, RNAAS, 6, 265.

Photometric Properties of L and T Dwarf Binaries. Leone, A. C., Best, W. M. J., Liu, M. C., Magnier, E. A., and Dupuy, T. J. 2021, RNAAS, 5, 12.

Performing Point-spread Function Fitting with Photutils on Hubble Space Telescope Images. Lupo, A. D. and Best, W. M. J.. 2020, RNAAS, 4, 140.

The Parallax of VHS J1256–1257 from CFHT and Pan-STARRS 1. Dupuy, T. J., Liu, M. C., Magnier, E. A., Best, W. M. J., Baraffe, I., Chabrier, G., Forveille, T., Metchev, S. A., and Tremblin, P. 2020, RNAAS, 4, 54.

Scientific Talks

May 2021 **University of Delaware**, Newark, DE, USA

Constraining Brown Dwarf Formation and Evolution in the Solar Neighborhood.

Nov. 2019 **American Museum of Natural History**, New York, NY, USA

A Volume-Limited Sample of L and T Dwarfs Defined by Parallaxes.

Jan. 2019 **233rd AAS Meeting**, Seattle, WA, USA

A Volume-Limited Sample of L and T Dwarfs Defined by Parallaxes.

July 2018 **Cool Stars 20**, Cambridge, MA, USA

A Volume-Limited Sample of L and T Dwarfs Defined by Parallaxes.

June 2016 **Cool Stars 19**, Uppsala, Sweden

Discovery of Young L Dwarfs in Taurus and Scorpius-Centaurus.

June 2014 **Cool Stars 18**, Flagstaff, AZ, USA

Building a Volume-Limited Sample of L/T Transition Dwarfs with the Pan-STARRS 1 and WISE Surveys.

Awards, Fellowships, and Honors

2017 **Student Excellence in Research Award**, University of Hawaii

1 of 3 given across all departments

2017 **ARCS Foundation 2017 Columbia Award in Astronomy**

1 University of Hawaii astronomy student awarded each year

2013 **Friends of the IfA Award**, Institute for Astronomy, University of Hawaii

Top 2nd year research project

2012 **Friends of the IfA Award**, Institute for Astronomy, University of Hawaii

Top 1st year research project

References

Dr. Adam L. Kraus, Associate Professor, Department of Astronomy, University of Texas at Austin, Austin, TX.

alk@astro.as.utexas.edu

Dr. Michael C. Liu, *Professor, Institute for Astronomy, Honolulu, HI.*

mliu@ifa.hawaii.edu +1-808-956-6666

Dr. Caitlin M. Casey, *Associate Professor, Department of Astronomy, University of Texas at Austin, Austin, TX.*

cmcasey@utexas.edu +1-512-471-3405

Dr. Eugene A. Magnier, *Professor, Institute for Astronomy, Honolulu, HI.*

eugene@ifa.hawaii.edu +1-808-956-6317

Dr. Kevin Conway, *Academy Principal (retired), Punahou School, Honolulu, HI.*

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