Megan Bedell

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Positions Held

2019 – present | **Associate Research Scientist**, Center for Computational Astrophysics, Flatiron Institute

2021 – present | **Research Associate**, American Museum of Natural History

2017 – 2019 | **Flatiron Research Fellow**, Center for Computational Astrophysics, Flatiron Institute

Education

2012 – 2017 | **University of Chicago**
Ph.D. in Astronomy & Astrophysics
Dissertation Title: Illuminating the Origins of Planets with Solar Twins
Advisor: Jacob L. Bean

2008 – 2012 | **Haverford College**
B.S. with Honors in Physics and with Highest Honors in Astronomy

Current Research Themes

- **Statistical methods for extreme precision radial velocity (EPRV) planet-finding:** I work on EPRV data analysis challenges including instrument calibration and modeling stellar variability using novel statistical approaches. I developed the influential `wobble` method for data-driven RV measurement, which is now being used by multiple EPRV groups worldwide through my open-source software implementation.
- **Next-generation exoplanet surveys:** I am a consortium member, Science Working Group member, and Data Reduction sub-group lead for the *Terra Hunting Experiment*, an upcoming EPRV mission. I am also a member of the Science Team for the *Keck Planet Finder*. I am interested in problems relating to optimal survey design and target selection for missions like these.
- **Characterization of Sun-like stars:** I am an expert in high-precision spectroscopic measurements of Sun-like stars. My PhD thesis was on the detailed characterization of 80 solar twins and their planetary systems. Most recently, I co-lead (with Annelies Mortier) the *gr8stars* collaboration, a large international effort to robustly & uniformly determine parameters and abundances of >2,000 bright, nearby, Sun-like stars that are crucial to near-future exoplanet searches.

Honors & Awards

- Outstanding Paper Award, International Astrostatistics Association *(2020)*
- Josephine DeKarman Fellow *(2016–2017)*
- Lewis & Clark Field Scholar in Astrobiology *(2016–2017)*
- Illinois Space Grant Fellow *(2016–2017)*
- University of Chicago Harper Dissertation Fellow *(2016–2017)*
- NSF Graduate Research Fellow *(2013–2016)*
- Phi Beta Kappa *(2012)*

Mentorship & Teaching

- **Graduate students** supervised through the CCA Visiting Pre-Doctoral Scholar program (est. 2019):

  - Arjun Savel (UMD College Park) — 2022–2023
  - Chris Lam (University of Florida) — 2022–2023
  - Quang Tran (UT Austin) — 2021–2022, resulting in 1 publication
  - Arvind Gupta (Penn State) — 2021–2022, resulting in 1 publication
  - Lily L. Zhao (Yale University) — 2019–2021, resulting in 1 publication
- **Undergraduates** supervised through summer programs including the Simons–NSBP Scholars Program, CUNY AstroCOM, and the Barnard Summer Research Institute:
  - Nusrat Jahan (CUNY Hunter College) — 2022
  - Lianys Feliciano (CUNY Hunter College) — 2022
  - Joann Roberts (Chicago State University) — 2020, resulting in senior thesis
  - Ilana Doran (Barnard College) — 2019–2021
  - Angus Beane (University of Pennsylvania) — 2018, resulting in 1 publication
- Instructor for the *LSST Data Science Fellowship Program* Session 10, 2019
- External examiner on thesis committees at Columbia University and Yale University
- Guest lecturer for graduate classes at Columbia University, CUNY Graduate Center, and Universidade de São Paulo
- Laboratory instructor for University of Chicago astronomy courses, 2012–2013

Leadership & Service

- Organizer, CCA Colloquium, 2021–present
- Organizer, Astronomical Data Group weekly meeting, 2019–present
- Member, Flatiron Institute Committee for Diversity, Equity, and Inclusion, 2020–present
- Member, CCA Flatiron Research Fellow Hiring Committee, 2022–2023
- Member, CCA Pre-Doctoral Scholar Hiring Committee, 2022–2023
- Member, Hiring Process Committee, 2020–2023 *[group responsible for defining and overseeing the annual postdoc hiring process at CCA]*
- Member, Director Search Committee, 2020 *[small committee responsible for overseeing hiring of new CCA director]*
- Science Organizing Committee member or chair for **7** conferences/workshops to date, including: *Sun-as-a-Star Workshop* (2023, NYC); *EPRV V* (2023, Santa Barbara); *TESS Science Conference II* (2021, virtual); *Telluric Line Hack Week* (2019, NYC); *Building Early Science with TESS* (2019, Chicago); *TESS Preparatory Workshop* (2018, NYC); *Precision Spectroscopy* (2017, São Paulo)
- Time Allocation Committee member for **3** NASA cycles to date
- Grant reviewer for NASA, NSF, and others
- Active referee for AAS, MNRAS, A&A journals

Contributions to Open Science

- Creator of the gaia-kepler.fun crossmatch database, used in >50 peer-reviewed publications to date
- Co-creator (with Annelies Mortier) of the gr8stars database, a public-access repository of high-resolution spectra for a *Gaia*-selected sample of bright Northern-hemisphere FGK stars
- Developer of the `wobble` open-source code in python + TensorFlow
- Contributor to astronomical open-source software including `eleanor`, `radvel`, `lightkurve`

Outreach & Press

- Interviewed for NPR All Things Considered, Nature, PBS News Hour, Scientific American.
- Featured profile for the Flatiron Scientist Spotlight.
- **3** first-author papers covered by press including Science News article, ESO press release [picked up by Associated Press]
- Creator of TESS Roulette interactive data viewer (https://tess.casino); 43000 pageviews
- Local organizer for NYC Dept of Education STEM Career Day, 2018
- Astronomy on Tap presenter in NYC & Chicago, co-founder of Chicago AoT branch, 2016–2018

- Presenter, Chicago Life Long Learning, 2015–2017
- Presenter, Adler Planetarium Space Visualization Lab, 2014–2017

Selected Invited Talks

- EPRV Research Coordination Network Colloquium, June 2023
- San Francisco State University Physics Colloquium, April 2023
- University of Hawaii IfA Colloquium, April 2023
- University of Pennsylvania Astro Seminar, April 2021
- Flatiron Institute Seminar, April 2021
- University of Cambridge Exo-Cam Seminar, February 2020
- University College London Seminar, February 2020
- Penn State CEHW Seminar, December 2019
- Flatiron-Wide Algorithms and Mathematics Workshop, October 2019 **[slides online]**
- Princeton IAS Seminar, September 2019
- Sagan Summer Workshop, July 2019 **[watch online]**
- American Museum of Natural History Colloquium, May 2019
- Gordon Research Conference on Origins of Solar Systems, May 2019
- Carnegie DTM Colloquium, March 2019 **[watch online]**
- Cool Stars 20 (contributed plenary talk), August 2018 **[slides online]**
- Princeton Computational Astrophysics Workshop Series, May 2018 **[materials online]**
- Vanderbilt Astro Seminar, April 2018

Publications *view on ADS*

Total Papers: 54 (43 refereed); **First-Author Papers:** 6 (+4 as senior author); **Total Citations:** 1827; **h-index:** 24

- **Gupta, A.F.*** & **Bedell, M.**, 2023, Fishing for Planets: A Comparative Analysis of EPRV Survey Performance in the Presence of Correlated Noise, arXiv e-prints
- **Tran, Q.H.***, **Bedell, M.**, Foreman-Mackey, D., et al. 2023, Joint Modeling of Radial Velocities and Photometry with a Gaussian Process Framework, AJ in press
- Ferreira, T., Meléndez, J., Lorenzo-Oliveira, D., Bean, J.L., *et al.*, 2023, A Jupiter analogue and a cold Super-Neptune orbiting the solar-twin star HIP 104045, arXiv e-prints
- Bonfanti, A., Gandolfi, D., Egger, J., Fossati, L., *et al.*, 2023, TOI-1055 B: Neptunian Planet Characterised With HARPS, TESS, and CHEOPS, AA, **671**, L8
- Behmard, A., Ness, M., Cunningham, E., & **Bedell, M.**, 2023, Elemental Abundances of Kepler Objects of Interest in APOGEE DR17, AJ, **165**, 178
- Moran, A., Mingarelli, C., **Bedell, M.**, & Good, D., 2023, Further Improving Distances to Binary Millisecond Pulsars With Gaia EDR3, arXiv e-prints
- Angus, R., Price-Whelan, A., Zinn, J., **Bedell, M.**, *et al.*, 2022, The 3D Galactocentric Velocities of Kepler Stars: Marginalizing Over Missing Radial Velocities, AJ, **164**, 25
- Zhao, L., Fischer, D., Ford, E., Wise, A., *et al.*, 2022, The EXPRES Stellar Signals Project II. State of the Field in Disentangling Photospheric Velocities, AJ, **163**, 171
- Gan, T., Lin, Z., Wang, S., Mao, S., *et al.*, 2022, TOI-530b: A Giant Planet Transiting an M-Dwarf Detected by TESS, MNRAS, **511**, 83
- Spina, L., Sharma, P., Meléndez, J., **Bedell, M.**, *et al.*, 2021, Chemical Evidence for Planetary Ingestion in a Quarter of Sun-Like Stars, Nature Astronomy, **5**, 1163
- Luger, R., **Bedell, M.**, Foreman-Mackey, D., Crossfield, I., *et al.*, 2021, Mapping Stellar Surfaces III: An Efficient, Scalable, and Open-Source Doppler Imaging Model, arXiv e-prints
- Gan, T., **Bedell, M.**, Wang, S., Foreman-Mackey, D., *et al.*, 2021, HD 183579b: A Warm Sub-Neptune Transiting a Solar Twin Detected by TESS, MNRAS, **507**, 2220
- Hedges, C., Hughes, A., Zhou, G., David, T., *et al.*, 2021, TOI-2076 and TOI-1807: Two Young, Comoving Planetary Systems Within 50 Pc Identified by TESS That Are Ideal Candidates for Further Follow Up, AJ, **162**, 54
- David, T., Contardo, G., Sandoval, A., Angus, R., *et al.*, 2021, Evolution of the Exoplanet Size Distribution: Forming Large Super-Earths Over Billions of Years, AJ, **161**, 265
- Anderson, S., Dittmann, J., Ballard, S., & **Bedell, M.**, 2021, Higher Compact Multiple Occurrence Around Metal-Poor M-Dwarfs and Late-K-Dwarfs, AJ, **161**, 203
- **Zhao, L.***, Hogg, D., **Bedell, M.**, & Fischer, D., 2021, Excalibur: A Nonparametric, Hierarchical Wavelength Calibration Method for a Precision Spectrograph, AJ, **161**, 80
- Spina, L., Nordlander, T., Casey, A., **Bedell, M.**, *et al.*, 2020, How Magnetic Activity Alters What We Learn From Stellar Spectra, ApJ, **895**, 52
- Montet, B., Feinstein, A., Luger, R., **Bedell, M.**, *et al.*, 2020, The Young Planet DS Tuc Ab Has a Low Obliquity, AJ, **159**, 112
- Vedantham, H., Callingham, J., Shimwell, T., Tasse, C., *et al.*, 2020, Coherent Radio Emission From a Quiescent Red Dwarf Indicative of Star-Planet Interaction, Nature Astronomy, **4**, 577
- Pope, B., **Bedell, M.**, Callingham, J., Vedantham, H., *et al.*, 2020, No Massive Companion to the Coherent Radio-Emitting M Dwarf GJ 1151, ApJ, **890**
- Angus, R., Morton, T., Foreman-Mackey, D., van Saders, J., *et al.*, 2019, Toward Precise Stellar Ages: Combining Isochrone Fitting With Empirical Gyrochronology, AJ, **158**, 173
- **Bedell, M.**, Hogg, D., Foreman-Mackey, D., Montet, B., & Luger, R., 2019, WOBBLE: A Data-Driven Analysis Technique for Time-Series Stellar Spectra, AJ, **158**, 164
- Feinstein, A., Montet, B., Foreman-Mackey, D., **Bedell, M.**, *et al.*, 2019, Eleanor: An Open-Source Tool for Extracting Light Curves From the TESS Full-Frame Images, PASP, **131**, 94502
- Blancato, K., Ness, M., Johnston, K., Rybizki, J., & **Bedell, M.**, 2019, Variations in α-element Ratios Trace the

Chemical Evolution of the Disk, ApJ, **883**, 34
- Kreidberg, L., Luger, R., & **Bedell, M.**, 2019, No Evidence for Lunar Transit in New Analysis of Hubble Space Telescope Observations of the Kepler-1625 System, ApJ, **877**
- Lorenzo-Oliveira, D., Meléndez, J., Yana Galarza, J., Ponte, G., *et al.*, 2019, Constraining the Evolution of Stellar Rotation Using Solar Twins, MNRAS, **485**
- Carlos, M., Meléndez, J., Spina, L., dos Santos, L., *et al.*, 2019, The Li-Age Correlation: The Sun Is Unusually Li Deficient for Its Age, MNRAS, **485**, 4052
- Ford, E., **Bedell, M.**, Ciardi, D., Dodson-Robinson, S., *et al.*, 2019, *Advanced Statistical Modeling of Ground-Based RV Surveys as Critical Support for Future NASA Earth-Finding Missions*, Astro2020: Decadal Survey on Astronomy and Astrophysics, **2020**, 466
- The MSE Science Team, Babusiaux, C., Bergemann, M., Burgasser, A., *et al.*, 2019, The Detailed Science Case for the Maunakea Spectroscopic Explorer, 2019 Edition, arXiv e-prints
- Luger, R., **Bedell, M.**, Vanderspek, R., & Burke, C., 2019, TESS Photometric Mapping of a Terrestrial Planet in the Habitable Zone: Detection of Clouds, Oceans, and Continents, arXiv e-prints
- Bergemann, M., Huber, D., Adibekyan, V., Angelou, G., *et al.*, 2019, Stellar Astrophysics and Exoplanet Science With the Maunakea Spectroscopic Explorer (MSE), arXiv e-prints
- Botelho, R., Milone, A., Meléndez, J., **Bedell, M.**, *et al.*, 2019, Thorium in Solar Twins: Implications for Habitability in Rocky Planets, MNRAS, **482**, 1690
- Mingarelli, C., Anderson, L., **Bedell, M.**, Spergel, D., & Moran, A., 2018, Improving Binary Millisecond Pulsar Distances With Gaia, arXiv e-prints
- Lorenzo-Oliveira, D., Freitas, F., Meléndez, J., **Bedell, M.**, *et al.*, 2018, The Solar Twin Planet Search. The Age-Chromospheric Activity Relation, Astronomy and Astrophysics, **619**
- **Beane, A.***, Ness, M., & **Bedell, M.**, 2018, Actions Are Weak Stellar Age Indicators in the Milky Way Disk, ApJ, **867**, 31
- Crossfield, I., Guerrero, N., David, T., Quinn, S., *et al.*, 2018, A TESS Dress Rehearsal: Planetary Candidates and Variables From K2 Campaign 17, The Astrophysical Journal Supplement Series, **239**, 5
- **Bedell, M.**, Bean, J., Meléndez, J., Spina, L., *et al.*, 2018, The Chemical Homogeneity of Sun-Like Stars in the Solar Neighborhood, ApJ, **865**, 68
- Spina, L., Meléndez, J., Karakas, A., dos Santos, L., *et al.*, 2018, The Temporal Evolution of Neutron-Capture Elements in the Galactic Discs, MNRAS, **474**, 2580
- dos Santos, L., Meléndez, J., **Bedell, M.**, Bean, J., *et al.*, 2017, Spectroscopic Binaries in the Solar Twin Planet Search Program: From Substellar-Mass to M Dwarf Companions, MNRAS, **472**, 3425
- Gandolfi, D., Barragán, O., Hatzes, A., Fridlund, M., *et al.*, 2017, The Transiting Multi-Planet System HD 3167: A 5.7 $M_\oplus$ Super-Earth and an 8.3 $M_\oplus$ Mini-Neptune, AJ, **154**, 123
- **Bedell, M.**, Bean, J., Meléndez, J., Mills, S., *et al.*, 2017, Kepler-11 Is a Solar Twin: Revising the Masses and Radii of Benchmark Planets via Precise Stellar Characterization, ApJ, **839**, 94
- Malik, M., Grosheintz, L., Mendonça, J., Grimm, S., *et al.*, 2017, HELIOS: An Open-Source, GPU-accelerated Radiative Transfer Code for Self-Consistent Exoplanetary Atmospheres, AJ, **153**, 56
- Meléndez, J., **Bedell, M.**, Bean, J., Ramírez, I., *et al.*, 2017, The Solar Twin Planet Search. V. Close-In, Low-Mass Planet Candidates and Evidence of Planet Accretion in the Solar Twin HIP 68468, Astronomy and Astrophysics, **597**
- Barragán, O., Grziwa, S., Gandolfi, D., Fridlund, M., *et al.*, 2016, EPIC 211391664b: A 32 $M_\oplus$ Neptune-Size Planet in a 10 Day Orbit Transiting an F8 Star, AJ, **152**, 193
- dos Santos, L., Meléndez, J., do Nascimento, J., **Bedell, M.**, *et al.*, 2016, The Solar Twin Planet Search. IV. The Sun as a Typical Rotator and Evidence for a New Rotational Braking Law for Sun-Like Stars, Astronomy and Astrophysics, **592**
- Tucci Maia, M., Ramírez, I., Meléndez, J., **Bedell, M.**, *et al.*, 2016, The Solar Twin Planet Search. III. The [Y/Mg] Clock: Estimating Stellar Ages of Solar-Type Stars, Astronomy and Astrophysics, **590**
- **Bedell, M.**, Meléndez, J., Bean, J., Ramírez, I., *et al.*, 2015, The Solar Twin Planet Search. II. A Jupiter Twin Around a Solar Twin, Astronomy and Astrophysics, **581**
- Meléndez, J., Bean, J., **Bedell, M.**, Ramírez, I., *et al.*, 2015, *Using Solar Twins to Explore the Planet-Star Connection With Unparallelled Precision*, The Messenger, **161**, 28

- Ramírez, I., Meléndez, J., Bean, J., Asplund, M., *et al.*, 2014, The Solar Twin Planet Search. I. Fundamental Parameters of the Stellar Sample, Astronomy and Astrophysics, **572**
- **Bedell, M.**, Meléndez, J., Bean, J., Ramírez, I., *et al.*, 2014, Stellar Chemical Abundances: In Pursuit of the Highest Achievable Precision, ApJ, **795**, 23
- Meléndez, J., Ramírez, I., Karakas, A., Yong, D., *et al.*, 2014, 18 Sco: A Solar Twin Rich in Refractory and Neutron-Capture Elements. Implications for Chemical Tagging, ApJ, **791**, 14
- Monroe, T., Meléndez, J., Ramírez, I., Yong, D., *et al.*, 2013, High Precision Abundances of the Old Solar Twin HIP 102152: Insights on Li Depletion From the Oldest Sun, ApJ, **774**
- **Bedell, M.**, Villaume, A., Weiss, L., Sliski, D., *et al.*, 2011, Monitoring Hα Emission and Continuum of UXORs: RR Tauri, AJ, **142**, 164