

Benjamin James (“BJ”) Fulton

California Institute of Technology (Caltech)
Texaco Postdoctoral Fellow

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Citizenship: USA

Education

- Doctor of Philosophy in Astronomy from the Institute for Astronomy at the University of Hawaii, Manoa, July 2017
- Master of Science in Astronomy from the Institute for Astronomy at the University of Hawaii, Manoa, September 2014
- Bachelor of Science in Physics with a Minor in Astronomy and Planetary Science from the University of California, Santa Barbara, June 2009

Publication statistics

- **Seven first author & major contributions in four second author refereed publications**
- 83 total refereed publications
- Contributions in three *Nature* publications
- 1991 citations
- h-index = 23

Research Experience

- Discovered a gap in the radius distribution of small planets found by *Kepler*. This has significant implications for our understanding of the formation and evolution of these planets ([Fulton et al. 2017](#)).
- Developed a highly extensible and open source software package for the analysis of radial velocity time-series data written in object-oriented Python (<https://github.com/California-Planet-Search/radvel>)
- Wrote software that allows the Automated Planet Finder (APF) telescope at Lick Observatory to be a fully operational and autonomous observatory. Thanks in large part to my automation and scheduling software, the telescope has been operating autonomously on a nightly basis collecting high-precision radial velocities for the last 5 years
- Developed a new technique to extract radial velocities from low signal-to-noise spectra which enabled the discovery of the Jupiter-size transiting exoplanet KELT-8b ([Fulton et al. 2015b](#))
- Published two papers ([Fulton et al. 2015a](#), [Fulton et al. 2016](#)) announcing the discovery of 5 new low-mass planets orbiting four nearby stars. These discoveries were made possible, in large part, by the APF facility.
- Worked extensively with collaborators at the Space Telescope Science Institute on a project to revolutionize the way that radial velocities are calculated from gas absorption cell spectroscopy
- Published a paper ([Fulton et al., 2013](#)) for which I modeled the Rossiter-McLaughlin (R-M) effect to measure the stellar obliquity of HAT-P-17. I ported/adapted an existing Differential Evolution Markov Chain Monte Carlo code from IDL to Python, and wrote the model calculation code from scratch to take advantage of a new semi-analytical model of the R-M effect.
- Developed an automated planet detection algorithm to search for Keplerian signals in heterogeneous radial velocity datasets and characterize pipeline completeness using injection-recovery tests ([Howard & Fulton 2016](#))
- Published a paper for which we searched for transit timing variations in the HAT-P-13 planetary system and refined the system parameters ([Fulton et al. 2011](#)). This required me to become familiar with exoplanet transit light curve modeling, and the theory of transit timing variations.
- Contributed to a paper that appeared in *Nature* ([Howard et al. 2013](#)) in which we made the first mass measurement of an Earth-size exoplanet.
- Contributed to a paper led by Peter Nugent constraining the explosion time of the nearby supernova in M101 that appeared in *Nature* ([Nugent et al. 2011](#)).
- Transformed the Byrne Observatory at Sedgwick reserve from an unused and forgotten facility, into a fully operational and robotic observatory.
- Wrote a pipeline to search for and model the effects of ellipsoidal variations, reflection and relativistic beaming in *Kepler* data
- Contributed observations for seven Minor Planet Circulars, and have been credited with the discovery of two new Mars-crossing asteroids.
- I was previously involved with a project to measure the orbital motion of astrometric binaries using lucky imaging and speckle interferometry.

Academic Awards

- Texaco prize postdoctoral fellowship at Caltech
- ARCS Foundation Honolulu 2016 Scholar of the Year
- 2016 Columbia ARCS Award in Astronomy
- Student Excellence in Research Award at the University of Hawaii at Manoa in 2015
- National Science Foundation Graduate Research Fellowship in 2014
- Physics Research Honors award upon graduation from UCSB in 2009

Publications

First Author

- **Fulton, B.J.** et al. (2017); *The California-Kepler Survey. III. A Gap in the Radius Distribution of Small Planets*, AJ, 154, 109 ([2017AJ....154..109F](#))
- **Fulton, B.J.** et al. (2016); *Three Temperate Neptunes Orbiting Nearby Stars*, ApJ, 830, 46 ([2015ApJ...830...1F](#))
- **Fulton, B.J.** et al. (2015b); *KELT-8b: A Highly Inflated Transiting Hot Jupiter and a New Technique for Extracting High-precision Radial Velocities from Noisy Spectra*, ApJ, 810, 30 ([2015ApJ...810...30F](#))
- **Fulton, B.J.** et al. (2015a); *Three Planets Orbiting HD 7924*, ApJ, 805, 175 ([2015ApJ...805..175F](#))
- **Fulton, B.J.** et al. (2014); *A Search for Planetary Eclipses of White Dwarfs in the Pan-STARRS1 Medium-deep Fields*, ApJ, 796, 114 ([2014ApJ...796..114F](#))
- **Fulton, B. J.** et al. (2013); *The Stellar Obliquity and the Long-period planet in the HAT-P-17 Exoplanetary System*, ApJ, 772, 80 ([2013ApJ...772...80F](#))
- **Fulton, B. J.** et al (2011); *Long-term Transit Timing Monitoring and Refined Light Curve Parameters of HAT-P-13b*, 2011, AJ, 142, 84 ([2011AJ....142...84F](#))

Significant Contributions

- Howard, A. W., and **Fulton, B. J.** (2016); *Limits on Planetary Companions from Doppler Surveys of Nearby Stars*, PASP, 128, 969, ([2016PASP..128k4401H](#)) - Performed all analysis, produced all plots, and wrote most of the methods section
- Street, R. A., **Fulton, B. J.** et al (2015); *Extended Baseline Photometry of Rapidly Changing Weather Patterns on the Brown Dwarf Binary Luhman-16*, ApJ, 812, 161, ([2015ApJ...812..161S](#)) – Extracted the photometry in an initial reduction (the photometry was eventually superseded in the referee process)
- Knutson, H., **Fulton, B. J.** et al (2014); *Friends of Hot Jupiters. I. A Radial Velocity Search for Massive, Long-period Companions to Close-in Gas Giant Planets*, ApJ, 785, 126, ([2014ApJ...785..126K](#)) – Performed all radial velocity analysis, and wrote some of the methods section
- Sinukoff, E.; **Fulton, B. J.**; Scuderi, L.; Gaidos, E. (2013); *Below One Earth The Detection, Formation, and Properties of Subterrestrial Worlds*, Space Science Reviews, 10.1007 (<http://dx.doi.org/10.1007/s11214-013-0019-1>) – Performed analysis and wrote text for one of the major sections of the paper involving Kepler photometry

High Impact Journals

- Gaudi, B. S. et al. (2017); *A giant planet undergoing extreme-ultraviolet irradiation by its hot massive-star host*, Nature, Volume 546, Issue 7659, pp. 514-518 ([2017Natur.546..514G](#))
- Howard, A. W. et al. (2013); *A rocky composition for an Earth-sized exoplanet*, Nature, Volume 503, Issue 7476, pp. 381-384 ([2013Natur.503..381H](#))
- Nugent, P., et al. (2011); *Supernova SN 2011fe from an exploding carbon-oxygen white dwarf star*, Nature, Volume 480, Issue 7377, pp. 344-347 ([2011Natur.480..344N](#))

Other Publications

- Christiansen et al. (2017); *Three's Company: An Additional Non-transiting Super-Earth in the Bright HD 3167 System, and Masses for All Three*, AJ, 154, 122 ([2017AJ....154..122C](#))
- Johnson et al. (2017); *The California-Kepler Survey. II. Precise Physical Properties of 2025 Kepler Planets and Their Host Stars*, AJ, 154, 108 ([2017AJ....154..108J](#))
- Petigura et al. (2017); *The California-Kepler Survey. I. High-resolution Spectroscopy of 1305 Stars Hosting Kepler Transiting Planets*, AJ, 154, 107 ([2017AJ....154..107P](#))
- Sinukoff, E., et al. (2017); *K2-66b and K2-106b: Two Extremely Hot Sub-Neptune-size Planets with High Densities*, AJ, 153, 271 ([2017AJ....153..271S](#))
- Weiss, L., et al. (2017); *New Insights on Planet Formation in WASP-47 from a Simultaneous Analysis of Radial Velocities and Transit Timing Variations*, AJ, 153, 265 ([2017AJ....153..265W](#))
- McLeod, K., et al. (2017); *KELT-18b: Puffy Planet, Hot Host, Probably Perturbed*, AJ, 153, 263 ([2017AJ....153..263M](#))
- Crossfield, I., et al. (2017); *Two Small Transiting Planets and a Possible Third Body Orbiting HD 106315*, AJ, 153, 255 ([2017AJ....153..255C](#))

- Rappaport, S., et al. (2017); *EPIC 220204960: A Quadruple Star System Containing Two Strongly Interacting Eclipsing Binaries*, MNRAS, 467, 2 ([2017MNRAS.467.2160R](#))
- Zheng, W., et al. (2017); *Discovery and Follow-up Observations of the Young Type Ia Supernova 2016coj*, ApJ, 841, 64Z ([2017ApJ...841...64Z](#))
- Pepper, J., et al. (2017); *KELT-11b: A Highly Inflated Sub-Saturn Exoplanet Transiting the V = 8 Subgiant HD 93396*, AJ, 153, 215 ([2017AJ....153..215P](#))
- Zhou, G., et al. (2017); *HAT-P-67b: An Extremely Low Density Saturn Transiting an F-subgiant Confirmed via Doppler Tomography*, AJ, 153, 211 ([2017AJ....153..211Z](#))
- Stevens, D., et al. (2017); *KELT-12b: A P~5 day, Highly Inflated Hot Jupiter Transiting a Mildly Evolved Hot Star*, AJ, 153, 178 ([2017AJ....153..178S](#))
- Petigura, E., et al. (2017); *Four Sub-Saturns with Dissimilar Densities: Windows into Planetary Cores and Envelopes*, AJ, 153, 142 ([2017AJ....153..142P](#))
- Oberst, T., et al. (2017); *KELT-16b: A Highly Irradiated, Ultra-short Period Hot Jupiter Nearing Tidal Disruption*, AJ, 153, 97 ([2017AJ....153...97O](#))
- De Wit, J., et al. (2017); *Planet-induced Stellar Pulsations in HAT-P-2's Eccentric System*, ApJ, 836, 17 ([2017ApJ...836L..17D](#))
- David, T., et al. (2017); *A Transient Transit Signature Associated with the Young Star RIK-210*, ApJ, 835, 168 ([2017ApJ...835..168D](#))
- Sinukoff, E., et al. (2017); *Mass Constraints of the WASP-47 Planetary System from Radial Velocities*, AJ, 153, 70 ([2017AJ....153...70S](#))
- Rappaport, S., et al. (2017); *EPIC 220204960: A Quadruple Star System Containing Two Strongly Interacting Eclipsing Binaries*, MNRAS ([2017MNRAS.tmp..145R](#))
- Bayliss, D., et al. (2017); *EPIC 201702477b: A Transiting Brown Dwarf from K2 in a 41 day Orbit*, AJ, 153, 15 ([2017AJ....153...15B](#))
- Samuel, K., et al. (2016); *K2-97b: A (Re-)Inflated Planet Orbiting a Red Giant Star*, AJ, 152, 185 ([2016AJ....152..185G](#))
- Hartman, J., et al. (2016); *HAT-P-65b and HAT-P-66b: Two Transiting Inflated Hot Jupiters and Observational Evidence for the Re-inflation of Close-in Giant Planets*, AJ, 152, 182 ([2016AJ....152..182H](#))
- Zhou, G., et al. (2016); *KELT-17b: A Hot-Jupiter Transiting an A-star in a Misaligned Orbit Detected with Doppler Tomography*, AJ, 152, 136 ([2016AJ....152..136Z](#))
- Crossfield, I. J., et al. (2016); *197 Candidates and 104 Validated Planets in K2's First Five Fields*, ApJS, 226, 7 ([2016ApJS..226....7C](#))
- Sinukoff, E. et al. (2016); *Eleven Multiplanet Systems from K2 Campaigns 1 and 2 and the Masses of Two Hot Super-Earths*, ApJ, 827, 78 ([2016ApJ...827...78S](#))
- Ciceri, S. et al. (2016); *HATS-15b and HATS-16b: Two Massive Planets Transiting Old G Dwarf Stars*, PASP, 128, 4401 ([2016PASP..128q4401C](#))
- Wong, I. et al. (2016); *3.6 and 4.5 μ m Spitzer Phase Curves of the Highly Irradiated Hot Jupiters WASP-19b and HAT-P-7b*, ApJ, 823, 122 ([2016ApJ...823..122W](#))
- Bryan, M. L. et al. (2016); *Statistics of Long Period Gas Giant Planets in Known Planetary Systems*, ApJ, 821, 89 ([2016ApJ...821...89B](#))
- Buhler, P. B. et al. (2016); *Dynamical Constraints on the Core Mass of Hot Jupiter HAT-P-13b*, ApJ, 821, 26 ([2016ApJ...821...26B](#))
- Weiss, L. et al. (2016); *Revised Masses and Densities of the Planets around Kepler-10*, ApJ, 819, 83 ([2016ApJ...819...83W](#))
- Kirk, B. et al. (2016); *Kepler Eclipsing Binary Stars. VII. The Catalog of Eclipsing Binaries Found in the Entire Kepler Data Set*, AJ, 151, 68 ([2016AJ....151...68K](#))
- Schlieder, J. E. et al. (2016); *Two Small Temperate Planets Transiting Nearby M Dwarfs in K2 Campaigns 0 and 1*, ApJ, 818, 87 ([2016ApJ...818...87S](#))
- Petigura, E. A. et al. (2016); *Two Transiting Low Density Sub-Saturns from K2*, ApJ, 818, 36 ([2016ApJ...818...36P](#))
- Eastman, J. D. et al. (2016); *KELT-4Ab: An Inflated Hot Jupiter Transiting the Bright (V ~ 10) Component of a Hierarchical Triple*, AJ, 151, 45 ([2016AJ....151...45E](#))
- Hartman, J. D. et al. (2015); *HAT-P-50b, HAT-P-51b, HAT-P-52b, and HAT-P-53b: Three Transiting Hot Jupiters and a Transiting Hot Saturn From the HATNet Survey*, AJ, 150, 168 ([2015AJ....150..168H](#))
- Zhou, G. et al. (2015); *A High Obliquity Orbit for the Hot-Jupiter HATS-14b Transiting a 5400K Star*, ApJ, 814, 16 ([2015ApJ...814L..16Z](#))
- Bakos, G. A. et al. (2015); *HATS-7b: A Hot Super Neptune Transiting a Quiet K Dwarf Star*, ApJ, 813, 111 ([2015ApJ...813..111B](#))
- Wong, I. et al. (2015); *3.6 and 4.5 μ m Phase Curves of the Highly Irradiated Eccentric Hot Jupiter WASP-14b*, ApJ, 811, 122 ([2015ApJ...811..122W](#))
- Kammer, J. A. et al. (2015); *Spitzer Secondary Eclipse Observations of Five Cool Gas Giant Planets and Empirical Trends in Cool Planet Emission Spectra*, ApJ, 810, 118 ([2015ApJ...810..118K](#))
- Bayliss, D. et al. (2015); *HATS-8b: A Low-density Transiting Super-Neptune*, AJ, 150, 49 ([2015AJ....150...49B](#))

- Bieryla, A. et al. (2015); *KELT-7b: A Hot Jupiter Transiting a Bright $V = 8.54$ Rapidly Rotating F-star*, AJ, 150, 12 ([2015AJ....150...12B](#))
- Demming, D. et al. (2015); *Spitzer Secondary Eclipses of the Dense, Modestly-irradiated, Giant Exoplanet HAT-P-20b Using Pixel-level Decorrelation*, ApJ, 805, 132 ([2015ApJ...805..132D](#))
- Ruprecht, J. D. et al. (2015); *29 November 2011 stellar occultation by 2060 Chiron: Symmetric jet-like features*, Icarus, 252, 271 ([2015Icar..252..271R](#))
- Crossfield, I. J. M. et al. (2015); *A Nearby M Star with Three Transiting Super-Earths Discovered by K2*, ApJ, 804, 10 ([2015ApJ...804...10C](#))
- Graham, M. L. et al. (2015); *Time-Varying Potassium in High-Resolution Spectra of the Type Ia Supernova 2014j*, ApJ, 801, 136 ([2015ApJ...801..136G](#))
- Zhao, Ming et al. (2014); *Characterization of the Atmosphere of the Hot Jupiter HAT-P-32Ab and the M-dwarf Companion HAT-P-32B*, ApJ, 796, 115 ([2014ApJ...796..115Z](#))
- Wong, Ian et al. (2014); *Constraints on the Atmospheric Circulation and Variability of the Eccentric Hot Jupiter XO-3b*, ApJ, 794, 134 ([2014ApJ...794..134W](#))
- Biddle, Lauren I. et al. (2014); *Warm ice giant GJ 3470b - II. Revised planetary and stellar parameters from optical to near-infrared transit photometry*, MNRAS, 443, 1810 ([2014MNRAS.443.1810B](#))
- Hartman, J. D. et al. (2014); *HAT-P-44b, HAT-P-45b, and HAT-P-46b: Three Transiting Hot Jupiters in Possible Multi-planet Systems*, ApJ, 791, 89 ([2014AJ....147..128H](#))
- Gaidos, E. et al. (2014); *Trawling for transits in a sea of noise: a search for exoplanets by analysis of WASP optical light curves and follow-up (SEAWOLF)*, MNRAS, 437, 3133 ([2014MNRAS.437.3133G](#))
- Bryan, Marta L. et al. (2014); *Erratum: "Qatar-2: A K Dwarf Orbiting by a Transiting Hot Jupiter and a More Massive Companion in an Outer Orbit"*, ApJ, 782, 121, ([2014ApJ...782..121B](#))
- Collins, Karen A. et al. (2014); *KELT-6b: A $P \sim 7.9$ Day Hot Saturn Transiting a Metal-poor Star with a Long-period Companion*, AJ, 147, 39 ([2014AJ....147...39C](#))
- Brown, T. M. et al. (2013); *Las Cumbres Observatory Global Telescope Network*, PASP, 125, 931 ([2013PASP..125.1031B](#))
- Hartman, J. D. et al. (2013); *HAT-P-44b, HAT-P-45b, and HAT-P-46b: Three Transiting Hot Jupiters in Possible Multi-Planet Systems*, arXiv1308.2937 ([2013arXiv1308.2937H](#), submitted to AJ)
- Collins, K. A. et al. (2013); *KELT-6b: A $P \sim 7.9$ d Hot Saturn Transiting a Metal-Poor Star with a Long-Period Companion*, arXiv1308.2296 ([2013arXiv1308.2296C](#), submitted to AJ)
- Quintana, E. V. et al. (2013); *Confirmation of Hot Jupiter Kepler-41b via Phase Curve Analysis*, arXiv1303.0858 ([2013arXiv1303.0858Q](#), Accepted to ApJ)
- Steinfadt, J. D. et al. (2012); *A Search for Pulsations in Helium White Dwarfs*, 2012 PASP, 124, 911 ([2012PASP..124....1S](#))
- Boisse, I. et al. (2012); *HAT-P-42b and HAT-P-43b. Two Inflated Transiting Hot Jupiters from the HATNet Survey*, A&A 558, A86 ([2013A&A...558A..86B](#))
- Siverd, R., et al. (2012); *KELT-1b: A Strongly Irradiated, Highly Inflated, Short Period, 27 Jupiter-mass Companion Transiting a Mid-F Star*, ApJ, 761, 123 ([2012ApJ...761..123S](#))
- Barclay, T. et al. (2012); *Photometrically Derived Masses and Radii of the Planet and Star in the TrES-2 System*, ApJ, 761, 53 ([2012ApJ...761...53B](#))
- Maguire, K. et al. (2012); *Hubble Space Telescope studies of low-redshift Type Ia supernovae: evolution with redshift and ultraviolet spectral trends*, MNRAS, 426, 2359 ([2012MNRAS.426.2359M](#))
- Pepper, J. et al. (2012); *KELT-3b: A Hot Jupiter Transiting a $V=9.8$ Late-F Star*, ApJ, 773, 64, ([2013ApJ...773...64P](#))
- Hartman, J.D., et al. (2012); *HAT-P-39b-HAT-P-41b: Three Highly Inflated Transiting Hot Jupiters*, AJ, 144, 139 ([2012AJ....144..139H](#))
- Law, N. et al. (2012); *Three New Eclipsing White-dwarf-M-dwarf Binaries Discovered in a Search for Transiting Planets around M-dwarfs*, ApJL, 757, 133 ([2012ApJ...757..133L](#))
- Beatty, T. et al. (2012); *KELT-2Ab: A Hot Jupiter Transiting the Bright ($V = 8.77$) Primary Star of a Binary System*, ApJ, 756, 39 ([2012ApJ...756L..39B](#))
- van Eyken, J. et al. 2012; *The PTF Orion Project: A Possible Planet Transiting a T-Tauri Star*, ApJ, 755, 42 ([2012ApJ...755...42V](#))
- Bryan, M. et al. (2011); *Qatar-2: A K Dwarf Orbiting by a Transiting Hot Jupiter and a More Massive Companion in an Outer Orbit*, ApJ, 750, 84 ([2012ApJ...750...84B](#))
- Arcavi, I. et al. (2011); *SN 2011dh: Discovery of a Type IIb Supernova from a Compact Progenitor in the Nearby Galaxy M51*, ApJL, 742, L18 ([2011ApJ...742L..18A](#))
- Levitan, D. et al. (2011); *PTF1 J071912.13+485834.0: An Outbursting AM CVn System Discovered by a Synoptic Survey*, ApJ, 739, 68 ([2011ApJ...739...68L](#))
- Shporer, A. et al. (2010); *Ground-based Multisite Observations of Two Transits of HD 80606b*, ApJ, 722, 880 ([2010ApJ...722..880S](#))

Work History

Texaco Postdoctoral Fellow	California Institute of Technology	August 2017 – present
National Science Foundation Graduate Research Fellow	Institute for Astronomy, University of Hawaii	August 2014 – August 2017
Graduate Research Assistant	Institute for Astronomy, University of Hawaii	August 2012 – August 2014
Research Associate (Astronomy)	LCOGT, Goleta, CA	March 2009 - August 2012

Hobbies and Interests

- Auto racing – SCCA Hawaii Region Solo class champion 2016
- Digital photography, including astrophotography (Astronomy Picture of the Day, 2011/08/26 <http://apod.nasa.gov/apod/ap110826.html>)
- Amateur astronomy