Brian A. Keeney – Curriculum Vitae

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Education

Ph.D.	Astrophysics	University of Colorado	December 2006
M.S.	Astrophysics	University of Colorado	December 2003
B.A.	Honors in Astronomy-Physics Minor in Computer Science	University of Virginia (High Distinction)	May 2001

Skills and Tools

Data Analysis:	Remote Sensing	Multi-spectral Imaging	Data Visualization
Statistical Analysis:	Bayesian Inference	Monte Carlo/MCMC	Experimental Design
Operating Systems:	Mac OS X	Linux/UNIX	Windows
Programming Languages:	IDL HTML/CSS	Python R	C/C++ SQL
Scripting:	Shell (tcsh/bash)	Perl	KML

Research Experience

Southwest Research Institute Oct. 2023 – Present
Principal Analyst

- Provided mission support for NASA's *Lucy* mission, with responsibilities ranging from science sequence development to stellar occultation campaign organization
- Created data archives for NASA's *New Horizons* mission

Southwest Research Institute Jan. 2021 – Sep. 2023
Lead Analyst

- Provided mission support for NASA's *Lucy* mission, with responsibilities ranging from science sequence development to stellar occultation campaign organization
- Created data archives for NASA's *New Horizons* mission

Southwest Research Institute Nov. 2020 – Jan. 2021
Lucy Science Sequencer

- Developed science sequences for the *Lucy* Science Operations Center Uplink Team based on input from the Science Team to ensure that science objectives are met in the command loads
- Participated in regular project meetings with stakeholders for sequence planning, validation, and verification

Southwest Research Institute Feb. 2020 – Jan. 2021
PDS Archive Creator

- Prepared *New Horizons* Kuiper Belt Extended Mission datasets for delivery to the NASA Planetary Data System (PDS) Small Bodies Node
- Participated in the PDS archive review and resolved liens to enable dataset release

Southwest Research Institute Oct. 2019 – Jan. 2021
New Horizons Data Analyst

- Performed the first measurement of the far-ultraviolet surface reflectance of Pluto's moon Charon, resulting in a refereed publication
- Analyzed the dimensions and brightness fluctuations in the neck of Arrokoth, the *New Horizons* Kuiper Belt Extended Mission flyby target
- Measured the size, shape, and photometric and spectroscopic properties of large pits in Pluto's Sputnik Planitia and analogous dark regions in Burney Basin
- Searched for the presence of high-energy electrons penetrating the Alice ultraviolet spectrograph

Southwest Research Institute May 2017 – Jan. 2021
Stellar Occultation Logistics Specialist

- Planned and executed mission-critical observations to support NASA's *New Horizons* mission, as well as projects funded by the National Science Foundation
- Developed flexible strategies for occultation campaigns in response to the global COVID pandemic
- Appointed second-in-command of large campaigns in Senegal in August 2018 (NYT write-up), Australia in 2019, and the U.S. in 2018-2019
- Coordinated travel, lodging, transportation, security, and public-outreach logistics with representatives of NASA Headquarters, the US Embassy in Dakar, the Senegalese Ministry of Higher Education (MESRI), and the French National Center for Space Studies (CNES)
- Trained, coordinated, and led teams of 2-3 observers in the assembly and operation of portable 16-inch telescopes to record stellar occultations
- Traveled with large multidisciplinary teams in the U.S., Senegal, Australia, and Argentina
- Collaborated and built rapport with professional and amateur astronomers in the U.S. and abroad; essential for engaging traditionally under-represented communities
- Processed ground-based images of *Lucy* mission targets to refine predictions for future occultation events

Southwest Research Institute Jan. 2015 – May 2019
Consultant for Rosetta-Alice Science Team

- Analyzed data from the Alice far-ultraviolet spectrograph, which acquired roughly 70,000 spectral images while orbiting comet 67P/Churyumov-Gerasimenko as part of the European Space Agency's *Rosetta* mission
- Confirmed pervasive absorption from water and oxygen molecules near the comet, using Monte Carlo simulations to constrain their abundances, resulting in two refereed publications
- Collaborated with colleagues to develop robust, flexible IDL software to measure the strengths of emission lines detected in *Rosetta*-Alice spectra and quantify their spatial and temporal evolution
- Designed, tested, and implemented IDL software to remove known emissions from *Rosetta*-Alice spectra and search the residuals for weak, otherwise undetectable features, resulting in a refereed publication

University of Colorado at Boulder Jan. 2007 – May 2017
Research Associate, Center for Astrophysics and Space Astronomy

- Measured redshifts of ~9,000 foreground galaxies (doi:10.17909/T9XH52) near 39 QSOs targeted by the Cosmic Origins Spectrograph Guaranteed Observing Time team to connect gas detected in the far-UV QSO spectra with nearby galaxies in the Cosmic Web
- Developed initial reduction and analysis algorithms for Servicing Mission Orbital Verification data and Early Release Observations from the Cosmic Origins Spectrograph as part of the Instrument Development Team
- Awarded external funding as the Principal Investigator of successful National Science Foundation, *Galaxy Evolution Explorer* (Cycle 4) Guest Investigator and *Swift* (Cycle 7) Guest Investigator proposals
- Awarded observing time as Principal Investigator at Apache Point Observatory, Kitt Peak National Observatory, Cerro Tololo Inter-American Observatory, and Gemini Observatory

NASA Graduate Student Researchers Program Sep. 2003 – Dec. 2006
Fellow

- Completed Ph.D. thesis entitled "Do starburst winds escape? Insights from QSO absorption lines" under the supervision of Dr. John Stocke
- Analyzed optical and H I 21-cm images and spectra of low-z galaxies in conjunction with far-UV QSO absorption line data to determine if the galaxies produce unbound winds that transport metals and energy into the surrounding intergalactic medium
- Awarded observing time as Principal Investigator at Apache Point Observatory
- One of 8 fellowships awarded at Goddard Space Flight Center out of 98 applicants in 2003

University of Colorado at Boulder Jan. 2002 – Aug. 2003
Research Assistant, Center for Astrophysics and Space Astronomy

- Assessed feasibility of prototype scattering LCD array for use in next generation multi-object spectrograph at ground-based optical telescopes
- Designed and built an optical bench test bed and custom mount to study the light scattering properties of a prototype liquid crystal device
- Awarded observing time as Principal Investigator at Kitt Peak National Observatory and Cerro Tololo Inter-American Observatory

University of Virginia Aug. 2000 – May 2001
Research Assistant

- Analyzed *Hubble Space Telescope* images and 50 year old photographic plates to measure the absolute proper motion of the Fornax dwarf spheroidal galaxy

Lowell Observatory – Flagstaff, AZ June –Aug. 2000
Research Experience for Undergraduates

- Designed and integrated a CCD-user interface for Lowell Observatory's 31-inch telescope as part of a larger program to fully automate telescope operations
- Developed a Linux device driver for a filter wheel that is currently used at the 31-inch telescope

Teaching Experience

University of Colorado at Boulder Fall 2012
Lecturer

- Co-taught the department's undergraduate observing course for majors
- Responsible for lecturing and leading weekly lab sessions

University of Colorado at Boulder Spring 2004 – Spring 2005, Fall 2006
Teaching Assistant

- Developed and implemented a hands-on laboratory curriculum to introduce undergraduate astronomy majors to the Unix operating system, astronomical imaging and spectroscopic data reduction techniques, and the IRAF software package for data analysis
- Trained students to independently operate the Sommers-Bausch 24-inch telescope and its associated instrumentation (CCD imager and long-slit spectrograph)
- Received an average instructor rating of "A" in Faculty Course Questionnaires

University of Colorado at Boulder Fall 2001
Teaching Assistant

- Supported a 350-student introductory course

University of Virginia Fall 2000 – Spring 2001
Teaching Assistant
- Taught four 25-student sections of introductory physics lab for premedical students

University of Virginia Fall 1998 – Spring 1999
Teaching Assistant
- Supervised introductory computer science labs as one of 4 teaching assistants for 40 students

Selected Publications (*h*-index = 24)

(1) Stern, S. A., **Keeney, B.**, Hoover, R., et al., 2021, "Further Investigations of the Dark Pits In Pluto's Sputnik Planitia", *Astronomical Journal*, Vol. 162, Article 207

(2) Buie, M. W., **Keeney, B. A.**, Strauss, R. H., et al., 2021, "Size and shape of (11351) Leucus from five occultations", *Planetary Science Journal*, Vol. 2, Article 202

(3) **Keeney, B. A.**, Parker, J. Wm., Cunningham, N., et al., 2021, "On Charon's Far-Ultraviolet Surface Reflectance", *Planetary Science Journal*, Vol. 2, Article 164

(4) Stern, S. A., **Keeney, B.**, Singer, K., et al., 2021, "Some New Results and Perspectives Regarding the Kuiper Belt Object Arrokoth's Remarkable, Bright Neck", *Planetary Science Journal*, Vol. 2, Article 87

(5) **Keeney, B. A.**, Versteeg, M., Parker, J. Wm., et al., 2020, "The Search for MeV Electrons 2-45 au from the Sun with the Alice Instrument Microchannel Plate Detector on board *New Horizons*", *Research Notes of the AAS*, Vol. 4, Issue 5, id. 61

(6) **Keeney, B. A.**, Stern, S. A., Vervack, R. J., Jr. et al. 2019, "Upper Limits for Emissions in the Coma of Comet 67P/Churyumov-Gerasimenko Near Perihelion as Measured by *Rosetta*'s Alice Far-UV Spectrograph", *Astronomical Journal*, Vol. 158, Article 252

(7) **Keeney, B. A.**, Stern, S. A., Feldman, P. D., et al. 2019, "Stellar Occultation by Comet 67P/Churyumov-Gerasimenko Observed with *Rosetta*'s Alice Far-Ultraviolet Spectrograph", *Astronomical Journal*, Vol. 157, Article 173

(8) **Keeney, B. A.**, Stocke, J. T., Pratt, C. T., et al. 2018, "A Galaxy Redshift Survey near HST/COS AGN Sight Lines", *Astrophysical Journal Supplement Series*, Vol. 237, Article 11

(9) **Keeney, B. A.**, Stern, S. A., A'Hearn, M. F., et al. 2017, "H_2O and O_2 Absorption in the Coma of Comet 67P/Churyumov-Gerasimenko Measured by the Alice Far-Ultraviolet Spectrograph on *Rosetta*", *Monthly Notices of the Royal Astronomical Society*, Vol 469, pp. S158-S177

(10) **Keeney, B. A.**, Stocke, J. T., Danforth, C. W., et al. 2017, "Characterizing the Circumgalactic Medium of Nearby Galaxies with *HST*/COS and *HST*/STIS Absorption-Line Spectroscopy: II. Methods and Models", *Astrophysical Journal Supplement Series*, Vol. 230, Article 6

Selected Oral Presentations

(1) **Keeney, B. A.**, on behalf of the *Lucy* Occultations Team, "Shape of Lucy Mission Targets Patroclus/Menoetius from Four Occultations in 2022", Oct. 2022, *AAS Division of Planetary Sciences Meeting #54*, #512.04

(2) **Keeney, B. A.**, on behalf of the *Lucy* Occultations Team, "Occultation Studies of Three *Lucy* Mission Targets", Dec. 2021, *AGU Fall Meeting 2021*, #P32B-03

(3) **Keeney, B. A.**, on behalf of the *New Horizons* Team, "Pluto's Dark Heart? Albedos of Large Pits in Sputnik Planitia", Oct. 2020, *AAS Division of Planetary Sciences Meeting #52*, #509.08

(4) **Keeney, B. A.**, on behalf of the *Rosetta*-Alice Science Team, "Upper Limits for Emission in the Coma of Comet 67P/Churyumov-Gerasimenko Near Perihelion as Measured by *Rosetta*'s Alice Ultraviolet Spectrograph", Apr. 2018, *European Geosciences Union General Assembly*, EGU2018-19732

(5) **Keeney, B. A.**, on behalf of the *Rosetta*-Alice Science Team, "Stellar Occultation by Comet 67P/Churyumov-Gerasimenko Observed with the R-Alice Ultraviolet Spectrograph", Oct. 2017, *AAS Division of Planetary Sciences Meeting #49*, #509.08

(6) **Keeney, B. A.**, on behalf of the *Rosetta*-Alice Science Team, "H_2O and O_2 Absorption in the Coma of Comet 67P/Churyumov-Gerasimenko Measured by the Alice Far-Ultraviolet Spectrograph on *Rosetta*", Mar. 2017, *48th Lunar and Planetary Science Conference*, #1275

(7) **Keeney, B. A.**, on behalf of the *Rosetta*-Alice Science Team, "H_2O and O_2 Absorption-Line Abundances in the Coma of Comet 67P/Churyumov-Gerasimenko Measured by the R-Alice Ultraviolet Spectrograph", Oct. 2016, *AAS Division of Planetary Sciences Meeting #48*, #201.07

(8) **Keeney, B. A.**, "Do Starburst Winds Escape Their Parent Galaxies?", Jan. 2006, *American Astronomical Society Meeting #207*, Dissertation Talk (#43.04)

Professional Development

American Astronomical Society Meeting #212 May 31 – June 1, 2008
NASA Center for Astronomy Education Workshop

- This workshop focused on using "lecture tutorials" to engage students in active classroom learning

Academic Service

National Aeronautics and Space Administration 2019
Member of Research Opportunities in Space and Earth Science Review Panel

- Critical review and ranking of proposals

National Science Foundation 2017
Member of NSF Review Panel

- Critical review and ranking of proposals

Space Telescope Science Institute July, 2014 – December, 2015
External Member of Hubble's Spectroscopic Legacy Data Products Working Group

- Group tasked with identifying key science areas and archival data sets that would benefit from spectroscopic high-level science products in the *Hubble Space Telescope* archive, and developing and testing algorithms to create these products

Space Telescope Science Institute 2011, 2013, 2015, 2017
Member of Hubble Space Telescope Review Panel

- Critical review and ranking of proposals

University of Colorado at Boulder 2010 – 2012
Member of Time Allocation Commitee for ARC 3.5-m Telescope at Apache Point Observatory

- Critical review and ranking of departmental observing proposals, submitted quarterly

Educational Outreach

Boulder Valley Regional Science Fair – Boulder, CO 2011 – 2014
Volunteer Judge

- Volunteer judge for middle school and high school projects in the physical sciences

Sommers-Bausch Observatory – Boulder, CO 2001 – 2004

Volunteer Host for Friday Night Open Houses

- Operated 16-, 18-, and 24-inch telescopes, led tours of the night sky, and introduced astronomical concepts to the community

Professional Societies

- American Geophysical Union 2021 – Present
- International Astronomical Union 2012 – Present
- American Astronomical Society (Division for Planetary Sciences since 2016) 2004 – Present
- Phi Beta Kappa, University of Virginia Chapter 2001 – Present
- Asia Oceania Geosciences Society 2018 – 2019
- European Geosciences Union 2018 – 2019