Kirk Long

391 UCB
2000 Colorado Ave, Boulder, CO 80309 kirk.long@colorado.edu
Duane Physics Building, Rm. E226 kirklong.space

Research Interests

I am broadly excited about employing advances in modern computing to analyze large datasets and to simulate interesting systems numerically, techniques I am currently using to better understand the true nature of the broad-line region in AGN.

Education

08/2020 –	**University of Colorado Boulder**, Dept. of Astrophysical and Planetary Sciences M.S. awarded December 2022, Ph.D. expected May 2026.
08/2017 – 05/2020	**Boise State University**, Honors College Bachelors of Science in Physics, Astrophysics emphasis Minors in Music and Applied Mathematics Graduated Magna Cum Laude with recognition as a Graduating Student Leader
08/2015 – 05/2017	**Idaho State University** (transferred prior to completing degree)

Research Experience

08/2020 – **Modelling the broad-line region in quasar 3C273**

Mentored by Prof. Jason Dexter at CU Boulder.

We are investigating how thin disk-wind launching models can explain the observed properties of broad-line emission in quasars. We compare our models with observations of quasars using the unparalleled resolution of the interferometric GRAVITY instrument on the VLTI as well as the high-cadence reverberation mapping data taken by Hubble as part of the AGN-STORM program, with potential implications for accepted black hole mass and size measurements, in addition to the physical implications to the geometry and physics of the broad-line region.

04/2019 – 07/2020 **Identifying accreting x-ray binaries**,

Mentored by Prof. Daryl Macomb at Boise State University.

Analyzed archival data from CHANDRA and XMM-Newton (with the help of HEASoft and SAS) to attempt to find both new pulsars that may not have been previously detected (through pairings that increased statistial significance) and of pulsars whose periods had changed substantially (indicating potential accretion from a binary companion).

Selected Teaching and Outreach Experience

01/2023 – 05/2023 **Graduate Part-Time Instructor**
CU Boulder Dept. of Astrophysical and Planetary Sciences

Instructor of record for ASTR 2030 Black Holes with enrollment of 109 students. Responsible for all course content and managing TA, grader.

08/2020 – 12/2023 **Graduate Teaching Assistant**
CU Boulder Dept. of Astrophysical and Planetary Sciences

Taught recitations/labs for both lower-division and upper-division courses, assisted with grading assignments/exams, and occasionally assisted in the development of class materials (like Jupyter notebook labs).
Courses TA'd: ASTR 3730 (Astrophysics I), ASTR 1040 (Accelerated Intro to Astronomy II), ASTR 2030 (Black Holes)

08/2020 – **Graduate mentor**, CU Boulder

Mentored both undergraduate and incoming first-year graduate students.

12/2019 – **@ThreeBodyBot**, #scicomm

Built automated Twitter/Mastodon/Tumblr/YouTube account that posts random three-body simulations ∼1/day. Source code available at https://github.com/kirklong/ThreeBodyBot.

01/2019 – **Volunteer Instructor**, Idaho and Colorado Departments of Corrections

Inspired by *Just Mercy* to start program for inmates to learn STEM skills. Taught introductory programming classes from custom built curriculum (code samples available at: https://github.com/kirklong/PrisonOutreach), gave physics and astronomy demonstrations/lectures, and tutored individual students working towards their GEDs.

Press: Featured on Boise State University website (08/2019), on local news channel KIVI (11/2019), and in the Boise State University alumni magazine, *Focus*, (05/2020).

06/2017 – 08/2020 **Astronomer**, Bruneau Sand Dunes State Park Observatory
Former volunteer of >300 hours before being hired in March of 2017.

Operated large telescopes to show visitors celestial objects and gave ∼45 minute public talks/presentations on astronomy. Average crowd of ≈150 with >20,000 total visitors during employment.

08/2018 – 08/2020	**Physics Lab Instructor**, Boise State University Dept. of Physics Instructor of record for undergraduate physics and astronomy lab courses up to physics II, for both majors and non-majors.
08/2018 – 08/2020	**Physics Tutor**, Boise State University Department of Physics
01/2020 – 05/2020	**TA/Grader**, Boise State University Department of Physics

Skills (rated basic – expert)

- **Programming Languages:**
  - Advanced: Python, Julia
  - Competent: Matlab, Bash, C
  - Basic: Fortran, JavaScript, CUDA
- **Software:**
  - Expert: Microsoft Office Suite
  - Advanced: Jupyter Lab/Notebook, Anaconda, terminal/command line, FFmpeg
  - Competent: LaTeX, MPI, Git, Slurm/HPC applications
  - Beginner: HEASoft, SAS, HTML, CSS
- **Operating Systems:**
  - Advanced: Windows 10, Linux (Mint)
  - Competent: macOS

Posters and Publications

"Confronting a Thin Disk-Wind Launching Mechanism of Broad-Line Emission in AGN with GRAVITY Observations of Quasar 3C 273," **Long, K.**, Dexter, J., et al. 2023, ApJ, 953, 184

"To the Moon and Back —Simulating the Trajectory of a Multi-Stage Rocket Similar to Saturn V in an Apollo 8 Mission Analogue," **Long, K.**, 2018, Research Computing Days, Boise State University

Barkley, K., Belnap, K., Keller, M., Larson, J., **Long, K.**, McCarthy, K., Myers, M., & Withers, J. (2017). *Idaho State University (a campus history).* Charleston, SC: Arcadia.

Scholarships and Awards

2021 – 2022	Astrophysics Graduate Fellowship (APS department prize)	$1,000
2015 – 2020	All undergraduate scholarship awards	$22,000
2016 – 2020	Dean's List (undergraduate)	

Extracurricular Activities

I enjoy spending time outdoors (particularly hiking and skiing), tinkering with amateur science projects (I've built cloud chambers, homemade rockets and fireworks, DIY telescopes, a brick kiln for metallurgical experimentation, and more), leading a very chill pick-up soccer team, and making and teaching music (I play the piano, and my favorite work to play is Rachmaninoff's *Prelude in G Minor*).