DILLON BROUT PH.D.

Einstein Fellow @ Harvard-Smithsonian Center for Astrophysics

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Leading analyses of dark energy, dark matter, and the Hubble constant using Type Ia SNe for the Pantheon, SH0ES, DES, and DEBASS teams.

POSITIONS

NASA Einstein Postdoctoral Fellow, Harvard Smithsonian CfA	*Sep 2020 - Current*
NASA Einstein Postdoctoral Fellow, University of Pennsylvania	*Dec 2019 - Sep 2020*

EDUCATION

PhD, Physics and Astronomy, University of Pennsylvania	*2019*
MS, Physics and Astronomy, University of Pennsylvania	*2015*
BS, Physics, Johns Hopkins University	*2013*

AWARDS

NASA Einstein Fellowship ($225,000)	*2019*
Fermilab Universities Research Fellowship ($10,000)	*2016*
PennApps Hackathon 3rd Place Winner	*2016*
Provost Undergraduate Research Award	*2012*
Double Degree Abrams Scholar (Jazz Saxophone @ Peabody Institute)	*2009-2013*

LEADERSHIP

Dark Energy Survey Supernova Program 5-Year Cosmology Project Lead	*2021*
Pantheon+ SNIa Cosmology Analysis Lead	*2021*
SH0ES Hubble Constant Analysis (SNIa rungs) Lead	*2021*
PI - Dark Energy Bedrock All Sky Supernovae (DEBASS)	*2020*

PROPOSALS ACCEPTED

PI: NOAO Blanco/DECam telescope time - 29 Night Long Term Program (3 year) called Dark Energy Bedrock All Sky Supernovae (DEBASS) *2020-2024*

co-I: NOAO Blanco/DECam telescope time - 11.5 night imaging survey called Blanco Images of the Southern Sky (BLISS) *2016-2017*

DISCOVERIES

Its Dust: *Solving the Mysteries of Intrinsic Scatter and Host-galaxy Dependence of Standardized Type Ia Supernova Brightnesses.* I claim to have solved one of the mysteries of SN Ia cosmology that has persisted over the last 15 years. This has spurred an interesting discussion in the field and numerous papers have come out addressing and confirming my claim (e.g. Johansson et al. 2021)!

Binary Neutron Star Merger: Co-Discoverer of the very first ever BNS that was alerted by LIGO and Fermi and co-discovered optically by DECam. *Soares Santos, ..., Brout et al. 2017*

TEACHING

Introduction to Data Science and Machine Learning Bootcamp *2019*
    - Developed and taught intensive 1.5 week course of data mining and machine learning across for graduate students across all fields for a new UPenn MindCORE initiative on data science. [click here]

Teaching Assistant *2014-2019*
    - Taught classes: Cosmology (for physics majors). TA: Data Science and Machine Learning for Large Datasets, The Big Bang and Beyond, Intro Physics Lab 101.

Introduction to python for physics research *2018-2020*
    - Taught undergrads and incoming grad students each summer basic python and statistical fundamentals for physics research.

Machine Learning March Madness *2017-Current*
    - Guest lecturer each year at the Duke University Physics of Sports class where I speak on machine learning prediction of the NCAA College Basketball March Madness bracket.

ADVISING

    - **Sasha Brownsberger** is Christopher Stubbs' grad student at Harvard and we have just finished a paper together on cosmological parameter sensitivity to photometric calibration systematics (Brownsberger, Brout, et al. 2021).
    - **Brodie Popovic** is Dan Scolnic's grad student at Duke and we are in the process of writing a series of papers on my dust model that he is improving upon (Popovic, Brout et al. 2021 & Popovic, Brout et al. in prep). Brodie was just awarded an LBL grad fellowship.
    - **Georgie Taylor** is Chris Lidman's Ph.D. student. She has developed SALT2 retraining code and together we are writing a paper based on training with my recent survey cross-calibration (Brout, Taylor et al. in prep).
    - **Patrick Armstrong** is Chris Lidman's Ph.D student. I am on his thesis committee and I am his principle advisor on his current project of validating the BBC confidence interval (Armstrong, Brout et al. in prep) as well as on PIPPIN code development/maintenance.
    - **Noor Amer** is an undergrad at a university in Turkey and she is an Iraqi refugee. She has been helping me with the planning/observing for my DEBASS program as well as producing a plot for my upcoming paper. She was just accepted to a year long astrophysics study abroad program in Sweden!
    - **Cole Meldorf** is an undergrad at the Univ. of Chicago. Together with Dr. Antonella Palmese we have written an in depth analysis on dust in the host galaxies for the DES5YR sample to test my dust model. His paper is in DES working group review (Meldorf, Palmese, Brout et al. in prep).

OUTREACH

- Every year (including 2021 via zoom) I work with underprivileged youth through the Laboratory for Research on the Structure of Matter Penn Summer Science Initiative, including giving presentations and do interactive activities on the physics and data analysis in the motorsports industry (contact: Mark Licurse mlicurse@seas.upenn.edu).
- Working closely with an aspiring female undergrad astronomer living in Turkey, Noor Amer, who is an Iraqi refugee. Her goal is to go to graduate school for astrophysics and I am dedicated to helping her achieve this.
- 2015-2019 twice yearly talks at the Franklin Institute lecture series and "Science After Dark" astronomy program.
- Co-founder of UPenn Astronomy outreach group.
- Dark Energy Survey 'Early Career Scientist' Committee June 2019 - Present
- Referee of 10+ papers for journals.

RECENT AND PLANNED PROFESSIONAL TALKS

Nov 2021	Colloquium - University of Hawaii *Honolulu, HI*
Oct 2021	Symposium - NHFP NASA *Remote*
July 2021	MW Dust Seminar - LSST DESC Collaboration Meeting *Remote*
April 2021	Seminar - LSST DESC *Remote*
Jan 2021	Contributed Talk - AAS LSST Special Session *Remote*
Nov 2020	Contributed Talk - Royal Astronomical Society *Remote*
Sep 2020	Symposium - NHFP NASA *Remote*
May 2020	Colloquium - Stockholm University *Remote*
May 2020	DES Meeting Plenary - *Remote*
Mar 2020	Invited Speaker - World Summit *Guadeloupe Islands*:
	"The Hubble Constant Tension Problem: An Overview"
Feb 2020	Colloquium - Brandeis Univ. *Waltham, MA*
Oct 2019	Press Event - GOOGLE *New York, NY*
Oct 2019	Workshop - KICP UChicago *Chicago, IL*
July 2019	Invited Speaker - *Santa Barbara, CA*:
	"The Dark Energy Survey Contribution to H0"
Apr 2019	Colloquium - CMU/Pitt Physics Seminar *Pittsburgh, PA*
Mar 2019	Workshop - Universites Paris *Paris, France*
Mar 2019	Colloquium - Service de Physique Thorique @ ULB *Brussels, Belgium*
Feb 2019	Seminar - American Museum of Natural History *New York, NY*
Feb 2019	Colloquium - Johns Hopkins/STSCi *Baltimore, MD*
Dec 2018	Invited Speaker - *Sao Paulo, Brazil*:
	"SN Cosmology Results from the DES and implications for LSST"
	at South American Workshop on Cosmology in the LSST Era
May 2018	Invited Speaker (2 Talks) - *Tucson, AZ*: DECam Community Science Workshop
	Talk #1: "DES-SN Program, Cosmology Results, and Public Data Release."
	Talk #2: "DES-GW Program and The Future of GW Cosmology."
May 2018	DES Meeting Plenary - *College Station, TX*:
	"Preliminary Cosmology Results from the DES-SN3YR"
Apr 2018	APS - *Columbus, OH*: "Preliminary Cosmology Results from DES-SN3YR"
Feb 2018	Invited Speaker - *Fermilab*: "Preliminary Cosmology Results from DES-SN3YR"
	at FNAL Joint Experimental-Theoretical Physics Seminar ("Wine and Cheese")
Jan 2018	AAS #231 - *Washington, DC*: "Cosmology Results from DES-SN First 3 Years"
Nov 2017	DES Meeting Plenary - *Brisbane, AU*: "3YR Cosmology Update"
Dec 2016	DES Meeting Plenary - *Cambridge, UK*: "The SN Photometric Pipeline"

FUN

I love to play jazz saxophone! I was trained in the double degree program at Johns Hopkins and Peabody Conservatory. I have played at venues across the east coast with bands of the likes of the Monophonics, Black Masala, Swift Technique, Yomomanem, The Royal Noise, Hambone Relay and more.

I also love car racing. For several years during undergrad and the beginning of graduate school I was the race strategist for the Dyson Racing Team and Bentley North American Team. I wrote code to monitor the car and track conditions and to optimize the race strategy (some races as long as 12 hours!). Our team won the American Le Mans Series Championship in 2011.
wheels.blogs.nytimes.com/2011/11/02/johns-hopkins-student-applies-dark-energy-to-the-black-art-of-racing

Every year I make a machine learning bracket for the March Madness NCCA tournament. In the last 4 years I've come in the at least the 99th percentile on espn.com each year (sometimes in the 99.9th!) and I've out-performed FiveThirtyEight, Adobe Analytics, and SportsReference each year.