

# Carlos Blanco

ASSISTANT PROFESSOR, PENN STATE UNIVERSITY

✉ carlosblanco@psu.edu | 📧 GammaCascade/GCascade

## Personal Information

Ph.D. in 2020

Nationality: Colombia & USA

- INSPIREHEP: [C.BLANCO.2](#)
- GOOGLE SCHOLAR: [0000-0002-0175-247X \(ORCID\)](#)

Born 17 Dec. 1992

## Current Position

The Pennsylvania State University

State College, NJ, USA

ASSISTANT PROFESSOR

January 2025 – Present

- Department of Physics

## Postdoctoral Positions

Princeton University

Princeton, NJ, USA

ASSOCIATE RESEARCH SCHOLAR (VISITING SINCE 2025)

January 2021 – Dec. 2024

- Department of Physics

Stockholm University

Stockholm, Sweden

POSTDOCTORAL FELLOW (VISITING SINCE 2021)

June 2020 – January 2021

- Oskar Klein Centre - Dep. of Physics

## Education

University of Chicago

Chicago, IL, USA

NSF GRADUATE RESEARCH FELLOW: PH.D. IN PHYSICS & M.S. IN PHYSICS

Sept. 2015 – May 2020

- Thesis: Gamma-Cascade: A Simple Program To Compute Cosmological Gamma-Ray Propagation
- Doctoral advisor: Dan Hooper

Purdue University

West Lafayette, IN, USA

B.S. IN PHYSICS & B.C. IN CHEMISTRY (ACS CERT.)

Sept. 2011 – June 2015

## Fellowships and Awards

2024	<b>Research Corporation for Science Advancement Fellow</b>	RCSA, USA
2021 – 2023	<b>NASA Hubble Fellowship Einstein Postdoctoral Fellow</b>	NASA, USA
2017 – 2020	<b>NSF Graduate Research Fellowship Graduate Researcher</b>	NSF, USA

## Organization & Responsibilities

Seminar - Dark Cosmos

Princeton University

ORGANIZER

2021-2024

Workshop on Quantum Probes of Wave-like and Sub-GeV Dark Matter

Princeton University

ORGANIZER

Fall 2023

Workshop on Cosmological and Astrophysical Probes of New Physics

Princeton University

ORGANIZER

Spring 2022

Workshop on Molecular Crystal Dark Matter Detector

Northwestern University

SCIENCE COMMITTEE

Spring 2021

## Statistics

**31** Articles & Letters

(22 accepted, 4 in review, 5 whitepapers)

*inspire*: **944 citations**, h-index: **16**

**49** Conference, Seminar, & Workshop presentations

(9 invited, 22 seminars, 18 contributed)

## Reviewing Activities

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<b>Journal Referee</b> PHYSICAL REVIEW D, JOURNAL OF COSMOLOGICAL ASTROPHYSICS	2021 – Present
<b>FINNEST Grant Panel Reviewer</b> NASA	2023
<b>Starting Grant Remote Reviewer</b> EUROPEAN RESEARCH COUNCIL	2024 – Present

## Major Collaborations

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<b>The QUAntum dot Dark matter Recoil detection with Abalone photosensors (QUADRA) Collaboration</b> FOUNDATIONAL DESIGN, THEORY, AND PHENOMENOLOGY	2022 – Present Founding Member
<b>DarkDot Collaboration</b> FOUNDATIONAL DESIGN, THEORY, AND PHENOMENOLOGY	2022 – Present Founding Member
<b>DIANA Collaboration</b> FOUNDATIONAL DESIGN, THEORY, AND PHENOMENOLOGY	2023 – Present Founding Member
<b>The Windchime Project Collaboration</b> FOUNDATIONAL THEORY AND PHENOMENOLOGY	2020 – 2023 Member
<b>The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) Collaboration</b> THEORY AND PHENOMENOLOGY	2015 – 2017 Member

## Active Grants/Applications

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<b>Liverpool Impact Acceleration Exercise</b> MOLECULAR SCREENING WITH ML FOR DARK MATTER AND PROTEIN BINDING PI: Juri Smirnov, Co-I: Carlos Blanco	Awarded 2022 £2,050
<b>Office of Undergraduate Research (Hewlett Foundation)</b> TIME-DEPENDENT SIGNATURE OF BSM PHYSICS IN AGN PI: Carlos Blanco, Co-I: Matias Andia	Awarded 2024 \$6,300
<b>UK-RI (Medical Research Council) Future Leaders Fellowship</b> CLOSING IN ON DARK MATTER WITH SUPERFLUIDS AND QUANTUM TECHNOLOGY PI: Juri Smirnov, Co-I: Carlos Blanco & others	Awarded 2024 £197,205
<b>Research Corporation for Science Advancement</b> FELLOWS INITIATIVE PI: Carlos Blanco	Awarded 2024 Non-monetary
<b>Simons Foundation</b> SMALL-SCALE EXPERIMENTS FOR FUNDAMENTAL PHYSICS PIs: Jan Conrad, Val Zwiller, Co-I: Carlos Blanco & others	Applied, collab formed \$2,400,000, unsuccessful

## Publications

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### Deep learning optimal molecular scintillators for dark matter direct detection

Cameron Cook, Carlos Blanco, Juri Smirnov

(Dec. 2024). 2024, arXiv: 2501.00091 (hep-ph)

### Search for Dark Matter Induced Airglow in Planetary Atmospheres

Carlos Blanco, Rebecca K. Leane, Marianne Moore, Joshua Tong

(Aug. 2024). 2024, arXiv: 2408.15318 (hep-ph)

### $\gamma$ -Cascade V4: A semi-analytical code for modeling cosmological gamma-ray propagation

Antonio Capanema, Carlos Blanco

*Comput. Phys. Commun.* 307 (2025) p. 109408. 2025, arXiv: 2408.03995 (astro-ph.HE)

### Search for Dark Matter Ionization on the Night Side of Jupiter with Cassini

Carlos Blanco, Rebecca K. Leane

*Phys. Rev. Lett.* 132.26 (2024) p. 261002. 2024, arXiv: 2312.06758 (hep-ph)

### Sensitivity of JWST to eV-Scale Decaying Axion Dark Matter

Sandip Roy, Carlos Blanco, Christopher Dessert, Anirudh Prabhu, Tea Temim

(Nov. 2023). 2023, arXiv: 2311.04987 (hep-ph)

### Limits on dark matter annihilation in prompt cusps from the isotropic gamma-ray background

M. Sten Delos, Michael Korsmeier, Axel Widmark, Carlos Blanco, Tim Linden, Simon D. M. White

*Phys. Rev. D* 109.8 (2024) p. 083512. 2024, arXiv: 2307.13023 (astro-ph.HE)

### On the Neutrino and Gamma-Ray Emission from NGC 1068

Carlos Blanco, Dan Hooper, Tim Linden, Elena Pinetti

(July 2023). 2023, arXiv: 2307.03259 (astro-ph.HE)

### Where are the Cascades from Blazar Jets? An Emerging Tension in the $\gamma$ -ray sky

Carlos Blanco, Oindrila Ghosh, Sunniva Jacobsen, Tim Linden

(Mar. 2023). 2023, arXiv: 2303.01524 (astro-ph.HE)

### Particle Physics at the European Spallation Source

H Abele, A Alekou, A Algora, K Andersen, S Baessler, et al.

*Phys. Rept.* 1023 (Nov. 2022) pp. 1–84. 2022, arXiv: 2211.10396 (physics.ins-det)

### Constraints on dark matter-electron scattering from molecular cloud ionization

Anirudh Prabhu, Carlos Blanco

*Phys. Rev. D* 108.3 (Aug. 2023) p. 035035. 2023, arXiv: 2211.05787 (hep-ph)

### Molecular Migdal effect

Carlos Blanco, Ian Harris, Yonatan Kahn, Benjamin Lillard, Jesús Pérez-Ríos

*Phys. Rev. D* 106.11 (Dec. 2022) p. 115015. 2022, arXiv: 2208.09002 (hep-ph)

### Dark matter direct detection with quantum dots

Carlos Blanco, Rouven Essig, Marivi Fernandez-Serra, Harikrishnan Ramani, Oren Slone

*Phys. Rev. D* 107.9 (May 2023) p. 095035. 2023, arXiv: 2208.05967 (hep-ph)

### Snowmass2021 Cosmic Frontier: The landscape of low-threshold dark matter direct detection in the next decade

Rouven Essig, Graham K Giovanetti, Noah Kurinsky, Dan McKinsey, et al.

(Mar. 2022). 2022, arXiv: 2203.08297 (hep-ph)

### Snowmass 2021 White Paper: The Windchime Project

Alaina Attanasio, Sunil A Bhave, Carlos Blanco, Daniel Carney, et al.

(Mar. 2022). 2022, arXiv: 2203.07242 (hep-ex)

### Snowmass2021 Cosmic Frontier White Paper: Ultraheavy particle dark matter

Daniel Carney, Nirmal Raj, Yang Bai, Joshua Berger, Carlos Blanco, et al.

(Mar. 2022). 2022, arXiv: 2203.06508 (hep-ph)

### Snowmass2021-LOI Direct Detection of Spin-independent and Spin-dependent Nuclear Scattering of Sub-GeV Dark Matter Using Molecular Excitations and Superconducting Nanowire Single-Photon Detectors

Carlos Blanco, Ranny Budnik, Rouven Essig, Eden Figueroa, et al.

(Mar. 2022). 2022

### A next-generation liquid xenon observatory for dark matter and neutrino physics

J Aalbers, SS AbdusSalam, K Abe, V Aerne, et al.

*J. Phys. G* 50.1 (Mar. 2022) p. 013001. 2022, arXiv: 2203.02309 (physics.ins-det)

### Models of ultraheavy dark matter visible to macroscopic mechanical sensing arrays

Carlos Blanco, Bahaa Elshimy, Rafael F. Lang, Robert Orlando

*Phys. Rev. D* 105.11 (June 2022) p. 115031. 2022, arXiv: 2112.14784 (hep-ph)

## Dark Matter Daily Modulation With Anisotropic Organic Crystals

Carlos Blanco, Yonatan Kahn, Benjamin Lillard, Samuel D. McDermott

*Phys. Rev. D* 104 (Aug. 2021) p. 036011. 2021, arXiv: 2103.08601 (hep-ph)

## Star-forming galaxies provide a larger contribution to the isotropic gamma-ray background than misaligned active galactic nuclei

Carlos Blanco, Tim Linden

*JCAP* 02 (Feb. 2023) p. 003. 2023, arXiv: 2104.03315 (astro-ph.HE)

## Dark Matter-Electron Scattering from Aromatic Organic Targets

Carlos Blanco, J. I. Collar, Yonatan Kahn, Benjamin Lillard

*Phys. Rev. D* 101.5 (2020) p. 056001. 2020, arXiv: 1912.02822 (hep-ph)

## Z' mediated WIMPs: dead, dying, or soon to be detected?

Carlos Blanco, Miguel Escudero, Dan Hooper, Samuel J. Witte

*JCAP* 11 (2019) p. 024. 2019, arXiv: 1907.05893 (hep-ph)

## Annihilation Signatures of Hidden Sector Dark Matter Within Early-Forming Microhalos

Carlos Blanco, M. Sten Delos, Adrienne L. Erickcek, Dan Hooper

*Phys. Rev. D* 100.10 (2019) p. 103010. 2019, arXiv: 1906.00010 (astro-ph.CO)

## Constraining Sterile Neutrino Interpretations of the LSND and MiniBooNE Anomalies with Coherent Neutrino Scattering Experiments

Carlos Blanco, Dan Hooper, Pedro Machado

*Phys. Rev. D* 101.7 (2020) p. 075051. 2020, arXiv: 1901.08094 (hep-ph)

## Constraints on Decaying Dark Matter from the Isotropic Gamma-Ray Background

Carlos Blanco, Dan Hooper

*JCAP* 03 (2019) p. 019. 2019, arXiv: 1811.05988 (astro-ph.HE)

## $\gamma$ -cascade: a simple program to compute cosmological gamma-ray propagation

Carlos Blanco

*JCAP* 01 (2019) p. 013. 2019, arXiv: 1804.00005 (astro-ph.HE)

## Novel Gamma-Ray Signatures of PeV-Scale Dark Matter

Carlos Blanco, J. Patrick Harding, Dan Hooper

*JCAP* 04 (2018) p. 060. 2018, arXiv: 1712.02805 (hep-ph)

## High-Energy Gamma Rays and Neutrinos from Nearby Radio Galaxies

Carlos Blanco, Dan Hooper

*JCAP* 12 (2017) p. 017. 2017, arXiv: 1706.07047 (astro-ph.HE)

## Letter of Intent: The Accelerator Neutrino Neutron Interaction Experiment (ANNIE)

I Anghel, JF Beacom, M Bergevin, C Blanco, et al.

*arXiv preprint arXiv:1504.01480* (2015). 2015

## Novel synthetic methodology for controlling the orientation of zinc oxide nanowires grown on silicon oxide substrates

Jinhyun Cho, Najah Salleh, Carlos Blanco, Sungwoo Yang, Chul-Jin Lee, Young-Woo Kim, Jungsang Kim, Jie Liu

*Nanoscale* 6.7 (2014) pp. 3861–3867. Royal Society of Chemistry, 2014

## Modeling HIF relevant longitudinal dynamics in UMER

BL Beaudoin, S Bernal, C Blanco, I Haber, RA Kishek, T Koeth, Y Mo

*Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 733 (2014) pp. 178–181. Elsevier, 2014

## Teaching and Lecturing

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### High School Student Outreach (ZAPP)

GUEST TEACHER

Burnside HS, Burnside, New Zealand.

2022–Present

### Physics, Chemistry, Biology, Environmental Science

GUEST TEACHER

Holy Ghost school, Chicago, IL

2018–2019

## Research with Students and Mentorship

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### Antonio Capanema

GRADUATE STUDENT, RIO DE JANEIRO, PONT. U. CATOL.

Mentee and Coauthor

Faculty Advisor: Arman Esmaili

2023 — Present

### Karla Alejandra Cutiva Alvarez

GRADUATE STUDENT, UNIVERSITY OF GUANAJUATO-MEXICO

Mentee

STSci AMP program

2023 — Present

### Sunniva Jacobsen

GRADUATE STUDENT, STOCKHOLM UNIVERSITY

Coauthor

Faculty Advisor: Tim Linden

2021 — 2022

### Dylan Folsom

GRADUATE STUDENT, PRINCETON UNIVERSITY

Coauthor

Faculty Advisor: Mariangela Lisanti

2021 — Present

### Robert Orlando

GRADUATE STUDENT, PURDUE UNIVERSITY

Coauthor

Faculty Advisor: Rafael Lang

2020 — 2021

### Bahaa Elshimy

UNDERGRADUATE STUDENT, PURDUE UNIVERSITY

Mentee and Coauthor

Faculty Advisor: Rafael Lang

2020 — 2022

## Software Development

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### $\gamma$ -Cascade: A Simple Program to Compute Cosmological Gamma-Ray Propagation

2018 - Present

[github.com/GammaCascade/GCascade](https://github.com/GammaCascade/GCascade)

A publicly available Mathematica package that semi-analytically computes the effects of electromagnetic interactions during astrophysical gamma-ray transport.

## Membership Of Scientific Societies

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### American Physical Society (APS)

2023 – Present

## Summer Schools & Programs

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### ICTP School on Particle Physics

2019

### Theoretical Advanced Study Institute in Elementary Particle Physics (TASI)

2018

## Service and Outreach

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### $\Psi$ -dea: Project Condor

2016 – Present

CO-FOUNDER

Research is conducted to develop novel water quality sensors to be used as teaching and environmental monitoring tools in high school classrooms across the amazon region in Colombia.

### Society of Physics Students

2012 – 2015

PRESIDENT AND VICE-PRESIDENT

Purdue Univ.

General supervision of all society research projects and outreach activities.

### Engineers Without Borders

2011 – 2012

PRESIDENT

Purdue Univ.

Supervision, development, implementation of a water distribution system for a community of 135 families in Papachacra, Bolivia.