

Christopher B. Mendillo Ph.D.

Curriculum Vitae

UMASS Lowell
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CURRENT & PAST POSITIONS

Associate Professor , Electrical and Computer Engineering, UMASS Lowell	9/24-
Assistant Research Professor , Physics Department, UMASS Lowell	6/20-8/24
Research Scientist , Physics Department, UMASS Lowell	1/18-5/20
Post-Doctoral Research Fellow , Physics Department, UMASS Lowell	5/13-12/17

EDUCATION

Boston University , Boston, MA USA	9/05-5/13
Ph.D., Astronomy, May 2013 Dissertation title: "Scattering Properties of Dust in Orion and the Epsilon Eridani Exoplanetary System" Advisor: Supriya Chakrabarti	
Brown University , Providence, RI USA	9/01-5/05
ScB, Physics, May 2005	

RESEARCH INTERESTS

Direct imaging of exoplanets and their environments

Experience: PI of NASA PICTURE-D Mission (2022 - 2027) Development and launch (September, 2019 & 2022) of the PICTURE-C high-altitude balloon, an exoplanetary direct imaging mission targeting multiple nearby stars.
Development and launch (October, 2011 & 2015) of the PICTURE sounding rocket, a mission to directly image exozodiacal dust in the ϵ Eridani system.

Optical design & wavefront sensing and control

Experience: Full optical design for the PICTURE-C telescope and coronagraph.
Polarization aberration analysis for PICTURE-C.
Design of high and low-order wavefront control systems using multiple deformable mirrors for PICTURE-C.
Development of a fine pointing system that achieved 5 milliarcsecond stability on board the PICTURE rocket.

Interstellar dust

Experience: Determining the far-ultraviolet scattering properties of dust in Orion using the SPINR sounding rocket.

TECHNICAL SKILLS

Software Development

Experience: Real-time embedded computer systems.
Flight software development.
Real-time telemetry monitoring, visualization and command software.
High-speed optical servo control.
Deformable Mirror & PZT control for adaptive optics.
CCD readout sequencing.

Languages: C, C++, IDL, Python, HTML, PHP, SQL

Hardware & Optics

Experience: Optical design and tolerancing for space and balloon missions.
Physical optics simulation for exoplanet coronagraphs.
High-speed, low-order wavefront control systems.
Wavefront sensing and electric field conjugation for coronagraphs.
Interferometric optical alignment.
Thermal control systems.
Ultra-high vacuum systems.
Environmental testing of spaceflight hardware.

TEACHING EXPERIENCE

Teaching Assistant , Introduction to Astronomy, Boston University	2005-2006
Grading Assistant , Core Natural Science I, Boston University	Fall 2010

PUBLICATIONS

- [1] Christopher B. Mendillo, Kuravi Hewawasam, Jason Martel, Thaddeus Potter, Timothy A. Cook, and Supriya Chakrabarti. Balloon flight demonstration of coronagraph focal plane wavefront correction with PICTURE-C. *Journal of Astronomical Telescopes, Instruments, and Systems*, 9(02), May 2023.
- [2] Christopher B. Mendillo, Jaren N. Ashcraft, Kevin Zhang Derby, Ewan Douglas, Dae-wook Kim, and Jared R. Males. Reflective lyot stop low-order wavefront control for future large space telescope coronagraphs. In Garreth J. Ruane, editor, *Techniques and Instrumentation for Detection of Exoplanets XI*. SPIE.
- [3] Christopher B. Mendillo, Kuravi Hewawasam, Jason Martel, Thaddeus Potter, Sunip K. Mukherjee, Timothy A. Cook, Supriya Chakrabarti, Frans Snik, David S. Doelman, Dan Sirbu, Ruslan Belikov, Eduardo Bendek, Karl Stapelfeldt, and Schuyler G. Wolff. The picture-c exoplanetary imaging balloon mission: second flight results and the transition to a new mission, picture-d. In Garreth J. Ruane, editor, *Techniques and Instrumentation for Detection of Exoplanets XI*. SPIE.
- [4] Christopher B. Mendillo, Kuravi Hewawasam, Jason Martel, Thaddeus Potter, Timothy A. Cook, and Supriya Chakrabarti. The PICTURE-C exoplanetary imaging balloon

- mission: laboratory coronagraph demonstrations of high-contrast imaging and low-order wavefront control. In Laura E. Coyle, Shuji Matsuura, and Marshall D. Perrin, editors, *Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave*, volume 12180, page 1218022. International Society for Optics and Photonics, SPIE, 2022.
- [5] Christopher B. Mendillo, Kuravi Hewawasam, Jason Martel, Thaddeus Potter, Timothy A. Cook, and Supriya Chakrabarti. The picture-c exoplanetary imaging balloon mission: First flight results and second flight preparation. In Stuart B. Shaklan and Garreth J. Ruane, editors, *Techniques and Instrumentation for Detection of Exoplanets X*. SPIE, aug 2021.
- [6] Christopher B. Mendillo, Kuravi Hewawasam, Jason Martel, Timothy A. Cook, Supriya Chakrabarti, Frans Snik, and David Doelman. Dual-polarization electric field conjugation and applications for vector vortex coronagraphs. In Stuart B. Shaklan and Garreth J. Ruane, editors, *Techniques and Instrumentation for Detection of Exoplanets X*. SPIE, jul 2021.
- [7] C. B. Mendillo, G. A. Howe, K. Hewawasam, J. Martel, T. A. Cook, and S. Chakrabarti. Polarization aberration analysis for the picture-c exoplanetary coronagraph. *Journal of Astronomical Telescopes, Instruments, and Systems*, 5(2):025003, April 2019.
- [8] Christopher B. Mendillo, Kuravi Hewawasam, Glenn A. Howe, Jason Martel, Timothy A. Cook, and Supriya Chakrabarti. The PICTURE-C exoplanetary direct imaging balloon mission: first flight preparation. In Stuart B. Shaklan, editor, *Techniques and Instrumentation for Detection of Exoplanets IX*, volume 11117, pages 101 – 111. International Society for Optics and Photonics, SPIE, 2019.
- [9] Christopher B. Mendillo, Kuravi Hewawasam, Glenn A. Howe, Jason Martel, Timothy A. Cook, and Supriya Chakrabarti. Decoupling the image-plane and low-order wavefront sensors for the PICTURE-C coronagraph. In Stuart B. Shaklan, editor, *Techniques and Instrumentation for Detection of Exoplanets IX*, volume 11117, pages 559 – 565. International Society for Optics and Photonics, SPIE, 2019.
- [10] C. B. Mendillo, G. A. Howe, K. Hewawasam, J. Martel, S. C. Finn, T. A. Cook, and S. Chakrabarti. Optical tolerances for the picture-c mission: error budget for electric field conjugation, beam walk, surface scatter, and polarization aberration. volume 10400 of *Proc. SPIE*, page 17, 2017.
- [11] C. B. Mendillo, J. Brown, J. Martel, G. A. Howe, K. Hewawasam, S. C. Finn, T. A. Cook, S. Chakrabarti, E. S. Douglas, D. Mawet, O. Guyon, G. Singh, J. Lozi, K. L. Cahoy, and A. D. Marinan. The low-order wavefront sensor for the picture-c mission. In *Techniques and Instrumentation for Detection of Exoplanets VII*, volume 9605 of *Proc. SPIE*, page 19, September 2015.
- [12] Christopher B. Mendillo, Supriya Chakrabarti, Timothy A. Cook, Brian A. Hicks, and Benjamin F. Lane. Flight demonstration of a milliarcsecond pointing system for direct exoplanet imaging. *Appl. Opt.*, 51(29):7069–7079, Oct 2012.

- [13] C. B. Mendillo, B. A. Hicks, T. A. Cook, T. G. Bifano, D. A. Content, B. F. Lane, B. M. Levine, D. Rabin, S. R. Rao, R. Samuele, E. Schmidtlin, M. Shao, J. K. Wallace, and S. Chakrabarti. Picture: a sounding rocket experiment for direct imaging of an extrasolar planetary environment. *Proc. SPIE*, 8442, September 2012.
- [14] Thaddeus Potter, Christopher Mendillo, Kuravi Hewawasam, Jason Martel, Timothy Cook, and Supriya Chakrabarti. The picture-c exoplanetary imaging balloon mission: a refactored thermal model and framework for an end-to-end model for balloon borne coronagraphs. In H. Philip Stahl, Allison A. Barto, and Fanny Keller, editors, *UV/Optical/IR Space Telescopes and Instruments: Innovative Technologies and Concepts XI*. SPIE.
- [15] Thaddeus Potter, Christopher B. Mendillo, Kuravi Hewawasam, Jason F. Martel, Timothy A. Cook, and Supriya Chakrabarti. STOP model implementation for the PICTURE-c exoplanetary imaging balloon mission, progress report i: thermal modeling and comparison with flight data. In Laura E. Coyle, Marshall D. Perrin, and Shuji Matsuura, editors, *Space Telescopes and Instrumentation 2022: Optical, Infrared, and Millimeter Wave*. SPIE.
- [16] Sunip K. Mukherjee, Jeffrey Baumgardner, Jason F. Martel, Christopher Mendillo, Timothy A. Cook, and Supriya Chakrabarti. Compact multichannel imaging camera for wide-field imaging of diffused sources. 61(03).
- [17] Noah J. Swimmer, Benjamin A. Mazin, Clinton Bockstiegel, John I. Bailey, Gregoire Coiffard, Miguel Daal, Kristina Davis, Neelay Fruitwala, Isabel Lipartito, Jennifer Smith, Sarah Steiger, Nicholas Zobrist, Timothy Cook, Supriya Chakrabarti, Christopher Mendillo, Jason Martel, and Kuravi Hewawasam. The PICTURE-c MKID camera. In Christopher J. Evans, Julia J. Bryant, and Kentaro Motohara, editors, *Ground-based and Airborne Instrumentation for Astronomy VIII*. SPIE.
- [18] Eduardo A. Bendek, Garreth J. Ruane, Camilo Mejia Prada, Christopher B. Mendillo, A.J. Eldorado Riggs, and Eugene Serabyn. Microelectromechanical deformable mirror development for high-contrast imaging, part 1: miniaturized, flight-capable control electronics. *Journal of Astronomical Telescopes, Instruments, and Systems*, 6(4):1 – 20, 2020.
- [19] Kuravi Hewawasam, Christopher B. Mendillo, Glenn A. Howe, Jason Martel, Susanna C. Finn, Timothy A. Cook, Julien Charton, Pierre Mahiou, and Supriya Chakrabarti. The low-order wavefront control system for the PICTURE-C mission: deformable mirror anti-aliasing through temporal dithering. In Stuart B. Shaklan, editor, *Techniques and Instrumentation for Detection of Exoplanets IX*, volume 11117, pages 549 – 558. International Society for Optics and Photonics, SPIE, 2019.
- [20] E. S. Douglas, C. B. Mendillo, T. A. Cook, K. L. Cahoy, and S. Chakrabarti. Wavefront sensing in space: flight demonstration ii of the picture sounding rocket payload. *Journal of Astronomical Telescopes, Instruments, and Systems*, 4(1):019003, January 2018.

- [21] G. A. Howe, C. B. Mendillo, K. Hewawasam, J. Martel, S. C. Finn, T. A. Cook, and S. Chakrabarti. The low-order wavefront control system for the picture-c mission: preliminary testbed results from the shack-hartmann sensor. volume 10400 of *Proc. SPIE*, pages 10400 – 10400 – 9, 2017.
- [22] K. Hewawasam, G. A. Howe, C. B. Mendillo, J. Martel, S. C. Finn, T. A. Cook, and S. Chakrabarti. The low-order wavefront control system for the picture-c mission: high-speed image acquisition and processing. volume 10400 of *Proc. SPIE*, pages 10400 – 10400 – 9, 2017.
- [23] E. S. Douglas, C. B. Mendillo, T. A. Cook, and S. Chakrabarti. Wavefront sensing in space from the picture-b sounding rocket. In *Space Telescopes and Instrumentation 2016: Optical, Infrared, and Millimeter Wave*, volume 9904 of *Proc. SPIE*, page 99046A, July 2016.
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- [29] B. A. Hicks, T. A. Cook, B. F. Lane, C. B. Mendillo, P. Jung, and S. Chakrabarti. The monolithic achromatic nulling interference coronagraph (manic) testbed. In *Techniques*

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