Casey T. DeRoo

Curriculum Vitae as of Oct. 1st, 2021

EDUCATION AND PROFESSIONAL HISTORY

Higher Education

2016 **PhD**, Physics, University of Iowa
Thesis: Fabrication & Testing of Off-Plane Gratings for Future X-ray Spectroscopy Missions

Professional and Academic Positions

2018 – Present **Assistant Professor,** University of Iowa
2017 - 2018 **Astrophysicist**, High Energy Astrophysics, Smithsonian Astrophysical Observatory
2016 - 2017 **Leon Van Speybroeck Postdoctoral Fellow in X-ray Optics**, High Energy Astrophysics, Smithsonian Astrophysical Observatory
2011 - 2016 **Presidential Graduate Fellow**, Dept. of Physics & Astronomy, University of Iowa

Honors and Awards

2021 - Present **Nancy Grace Roman Technology Fellow**, NASA Astrophysics Division (early career award designed to foster future leaders in astrophysics instrumentation)

Professional Memberships

2018 - Present American Astronomical Society (AAS)
2018 - Present The International Society for Optics and Photonics (SPIE)
2021 – Present American Physical Society (APS)

SELECTED TEACHING

Academic Courses Taught at the University of Iowa

Term	Course#	Title	Total Enrollment
Fall 2021	HONR:1100	Honors Primetime	22
Spring 2021	ASTR:1772	Introductory Astronomy II	18
Fall 2020	ASTR:1771	Intro Astronomy I: Basic Astrophysics	29
Spring 2020	ASTR:6880	High Energy Astrophysics	12
Spring 2019	ASTR:1070	Stars, Galaxies, and the Universe	243
Fall 2018	ASTR:1070	Stars, Galaxies, and the Universe	282

Research Courses Taught at the University of Iowa

Term	Course#	Title	Lifetime Enrollment
Various	URES:3994	Undergraduate Research/Creative Projects	1
Various	ASTR:7991	Research: Astronomy	3
Various	PHYS:4999	Undergraduate Research	1
Various	ASTR:2991	Reading in Astronomy	1
Various	PHYS:7992	Individual Critical Study	1
Various	PHYS:7990	Research: Physics	2

SELECTED SCHOLARSHIP – ORCID ID

CLAS * SYSTEM:
* = SENIOR AUTHOR/MAJOR CONTRIBUTION, ** = SECONDARY CONTRIBUTION,
*** = EQUAL CONTRIBUTION, **** = MINOR CONTRIBUTION

Refereed Articles

** Roth et al. (under review). Characterization of gamma-ray induced TID radiation effects on a commercial CMOS sensor for x-ray small satellites. *Journal of Astronomical Telescopes, Instruments, and Systems*

** Zhang et al. (2021). Metrology for Measuring Custom Periodicities on Diffraction Gratings. *Journal of Astronomical Instrumentation*, 10(2), 2150005 https://doi.org/10.1142/S2251171721500057

** Tammes et al. (2020). Soft x-ray detection for small satellites with a commercial CMOS sensor at room

temperature. *Journal of Astronomical Telescopes, Instruments, and Systems*, 6(4), 046004 https://doi.org/10.1117/1.jatis.6.4.046004

* DeRoo, C. T. et al. (2020). Limiting Spectral Resolution of a Reflection Grating Made via Electron-beam Lithography. *The Astrophysical Journal*, 904(2), 142 https://doi.org/10.3847/1538-4357/abbe15

** Donovan, B. D. et al. (2020). Performance Testing of a Large-Format X-ray Reflection Grating Prototype for a Suborbital Rocket Payload. *Journal of Astronomical Instrumentation*, 9(4), 2050017 https://doi.org/10.1142/S2251171720500178

* DeRoo, C. T. et al. (2020). Large-format X-Ray Reflection Grating Operated in an Echelle-like Mounting. The Astrophysical Journal, 897(1), 92 https://doi.org/10.3847/1538-4357/ab9a41

* Bishop, N. et al. (2019). Thickness Distribution of Sputtered Films on Curved Substrates for Adjustable X-ray Optics. *Journal of Astronomical Telescopes, Instruments, and Systems*, *5*(2), 021005.

*** Miles, D. M. et al. (2018). Fabrication and Diffraction Efficiency of a Large-format, Replicated X-Ray Reflection Grating. *The Astrophysical Journal*, *869*(2), 95.

* DeRoo, C. T. et al. (2018). Deterministic figure correction of piezoelectrically adjustable slumped glass optics. *Journal of Astronomical Telescopes, Instruments, and Systems*, *4*(01), 1.

** Donovan, B. D. et al. (2018). X-ray verification of an optically aligned off-plane grating module. *Applied Optics*, *57*(3), 454. http://dx.doi.org/10.1364/ao.57.000454

*** Tutt, J. H. et al. (2016). Diffraction Efficiency Testing of Sinusoidal and Blazed Off-Plane Reflection Gratings. *Journal of Astronomical Instrumentation*, *05*(03), 1650009. http://dx.doi.org/10.1142/s2251171716500094

*** Marlowe, H. et al. (2015). Performance testing of an off-plane reflection grating and silicon pore optic spectrograph at PANTER. *Journal of Astronomical Telescopes, Instruments, and Systems*, *1*(4), 045004. http://dx.doi.org/10.1117/1.jatis.1.4.045004

*** Roper, Q. et al. (2015). X-ray Spectroscopy of Potential Small Magellanic Cloud Type Ia Supernova Remnants and their Environments. *The Astrophysical Journal*, *803*(2), 106.

** McEntaffer, R. et al. (2013). First results from a next-generation off-plane X-ray diffraction grating. *Experimental Astronomy, 36*(1-2), 389-405. http://dx.doi.org/10.1007/s10686-013-9338-1

*** McEntaffer, R. L. et al. (2013). A New X-ray View of the Supernova Remnant G272.2-3.2 and its Environment. *The Astrophysical Journal*, *774*(2), 120. http://dx.doi.org/10.1088/0004-637x/774/2/120

*** Witt, A. N. et al. (2010). On the Origins of the High-Latitude Hα Background. *The Astrophysical Journal*, *724*(2), 1551-1560. http://dx.doi.org/10.1088/0004-637x/724/2/1551

Conference Proceedings

**** Hohl et al. (2021). Development for a metrology system for the Arcus MIDEX mission. *SPIE Conference Proceedings*, 1182107, https://doi.org/10.1117/12.2594671

*** Tendulkar et al. (2021). Process development for adjustable X-ray mirrors. *SPIE Conference Proceedings*, 1182213, https://doi.org/10.1117/12.2595316

*** Smith et al. (2019). Arcus: the soft x-ray grating explorer. *SPIE Conference Proceedings*, 111180W. *https://doi.org/10.1117/12.2529499*

* DeRoo, C. T., Swarm, D. K., Smith, R. K. (2019). arcusTrace: Modular Raytracing Software for the Arcus X-ray Spectrometer. *SPIE Conference Proceedings*, 11161F. https://doi.org/10.1117/12.2528497

* DeRoo, C. T. et al. (2019). Curved Diffractive X-ray Optics for Astronomy. *SPIE Conference Proceedings*, 11161F. https://doi.org/10.1117/12.2528817

**** Burwitz et al. (2019). X-ray testing at PANTER of optics for the ATHENA and Arcus Missions. *SPIE Conference Proceedings*, 1118024. https://doi.org/10.1117/12.2535995

*** Cotroneo, V. et al. (2018). Progress in development of adjustable optics for X-ray astronomy. *SPIE Conference Proceedings, 1076109*. https://doi.org/10.1117/12.2323283

**** Civitani, M. et al. (2018). Progress in ion beam figuring of very thin slumped glass plates for lightweight X-ray telescopes. *SPIE Conference Proceedings, 106690T*. https://doi.org/10.1117/12.2313599

*** Ptak, A. et al. (2018). Arcus: the X-ray Grating Spectrometer Explorer. *SPIE Conference Proceedings, 1069926*. https://doi.org/10.1117/12.2313965

*** Heilmann, R. et al. (2018). Blazed Transmission Grating Technology Development for the Arcus X-ray Spectrometer Explorer. *SPIE Conference Proceedings, 106996D*. https://doi.org/10.1117/12.2314180

*** Ptak, A. et al. (2018). Arcus: the X-ray Grating Spectrometer Explorer. *SPIE Conference Proceedings, 1069926*. https://doi.org/10.1117/12.2313965

*** Günther, M. et al. (2018). Ray-tracing Arcus in Phase A. *SPIE Conference Proceedings, 106996F*. https://doi.org/10.1117/12.2312678

*** Cotroneo, V. et al. (2017). Thermal forming of glass substrates for adjustable optics. *SPIE Conference Proceedings, 103990Y*. https://doi.org/10.1117/12.2275738

**** Civitani, M. et al. (2017). Advancements in ion beam figuring of very thin glass plates. *SPIE Conference Proceedings, 103991E*, https://doi.org/10.1117/12.2275555.

** Miles, D. M. et al. (2017). Diffraction Efficiency of a Replicated, Large-Format, X-ray Reflection Grating. *SPIE Conference Proceedings, 1039913*. https://doi.org/10.1117/12.2272605

*** Gaskin, J. A. et al. (2017). Lynx Mission Concept Status. *SPIE Conference Proceedings, 103970S*. https://doi.org/10.1117/12.2273911

*** Smith, R. K. et al. (2017). Arcus: exploring the formation and evolution of clusters, galaxies, and stars. *SPIE Conference Proceedings, 103970Q*. https://doi.org/10.1117/12.2272818

** Walker, J. et al. (2017). Design and fabrication of adjustable X-ray optics using piezoelectric thin films. *SPIE Conference Proceedings, 103991K*. https://doi.org/10.1117/12.2275351

* DeRoo, C. T. et al. (2017). Deterministic Figure Correction of Piezoelectrically Adjustable Slumped Glass Optics. *SPIE Conference Proceedings, 103991M*. https://doi.org/10.1117/12.2275210

*** Cotroneo, V. et al. (2016). Thermal Forming of Substrates for the X-ray Surveyor Telescope. *SPIE Conference Proceedings, 99650C*. https://doi.org/10.1117/12.2239223

*** Smith, R. K. et al. (2016). Arcus: the X-ray grating spectrometer explorer. *SPIE Conference Proceedings, 99054M*. https://doi.org/10.1117/12.2231778

*** Lewis, R. F. M. et al. (2016). Development of the X-ray camera for the OGRE sub-orbital rocket. *SPIE Conference Proceedings, 991506*. https://doi.org/10.1117/12.2232812

*** Brenneman, L. et al. (2016). The evolution of structure and feedback with Arcus. *SPIE Conference Proceedings, 99054P*. https://doi.org/10.1117/12.2231193

** McCoy, J. A., McEntaffer, R. L. & DeRoo, C. T. (2016). New lithographic techniques for X-ray spectroscopy. *SPIE Conference Proceedings, 990524*. https://doi.org/10.1117/12.2232072

** Miles, D. M. et al. (2015). Diffraction efficiency of radially-profiled off-plane reflection gratings. *SPIE Conference Proceedings, 960316*. https://doi.org/10.1117/12.2186842

** Allured, R. et al. (2015). Optical and X-ray alignment approaches for off-plane reflection gratings. *SPIE Conference Proceedings, 960315*. https://doi.org/10.1117/12.2186412

*** Marlowe, H. et al. (2015). Polarization sensitivity testing of off-plane reflection gratings. *SPIE Conference Proceedings, 960318*. https://doi.org/10.1117/12.2186344

* Peterson, T. J. et al. (2015). Off-plane X-ray reflection grating fabrication. *SPIE Conference Proceedings, 960317*. https://doi.org/10.1117/12.2188302

*** Tutt, J. H. et al. (2015). Technological developments of the OGRE focal plane array. *SPIE Conference Proceedings, 960105*. https://doi.org/10.1117/12.2186630

*** Tutt, J. H. et al. (2014). Development in the EM-CCD camera for OGRE. *SPIE Conference Proceedings, 91540E*. https://doi.org/10.1117/12.2054872

* DeRoo, C. T. et al (2013). Pushing the boundaries of X-ray grating spectroscopy in a suborbital rocket. *SPIE Conference Proceedings, 88611B*. https://doi.org/10.1117/12.2022244

Book Chapters

* McEntaffer & DeRoo (2021). Off-Plane X-ray Gratings. In *The WSPC Handbook of Astronomical Instrumentation*¸ Vol. 4 (X-ray Astronomical Instrumentation). World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ.

Grants and Contracts

Funded

Oct. 2021 – Present — *Curved Customized Gratings for High Energy Spectroscopy*
Funded by NASA Science Mission Directorate (APRA). Award amount: ($599,333) Number of Months: 24. Investigator/s Casey DeRoo (Principal Investigator).

Oct. 2021 – Present — *High efficiency, high-dynamic range UV blazed gratings for NASA's Next Generation Space Observatories*
Funded by NASA Science Mission Directorate (APRA). Award amount: ($882,491)

Number of Months: 36. Investigator/s Keri Hoadley (Principal Investigator), Casey DeRoo (Co-I).

Sept. 2021 – Present *Quantifying the Spectral Resolution of Next-Generation Diffraction Gratings for Ultraviolet Astronomy*
Funded by NASA Science Mission Directorate (FINESST). Award amount: ($135,000) Number of Months: 36. Investigator/s Casey DeRoo (Principal Investigator), Cecilia Fasano (Student Investigator).

Feb 2020 – Present *X-ray Reflection Gratings: Limitations and Improvements S000314-NASA*
Funded by NASA Science Mission Directorate (APRA). Award amount: ($119,248) Number of Months: 23. Investigator/s Randall McEntaffer (Principal Investigator), Casey DeRoo (Site-PI).

Sept. 2020 – Aug. 2021 *Investigating Unique X-ray Sources Identified Via Machine Learning*
Funded by Iowa Space Grant Consortium. Award amount: ($2,500). Investigator Dustin Swarm

Sept. 2019 – Aug. 2020 *Employing Machine Learning Algorithms to Search for Unique X-ray Sources*
Funded by Iowa Space Grant Consortium. Award amount: ($2,500). Investigator Dustin Swarm

July 2020 *Old Gold Summer Fellowship*
Funded by University of Iowa. Award amount: ($6,000). Investigator/s Casey DeRoo (Principal Investigator).

Oct 2019 – May 2020 *Automated Searches of X-ray Data for the Earliest Black Holes*
Funded by University of Iowa. Award amount: ($8,500). Investigator/s Casey T. DeRoo (Principal Investigator).

Aug 2019 *Measuring Gratings Made with Electron-Beam Lithography*
Funded by Iowa Space Grant Consortium. Award amount: ($9,000). Investigator/s Casey T DeRoo (Principal Investigator), Jared Termini (Co-Investigator).

Oct. 2018 – June 2019 *X-ray Diffraction Gratings on Curved Substrates 4222051C*
Funded by Iowa Space Grant Consortium. Award amount: ($7,000) Investigator/s Casey T DeRoo (Principal Investigator).

Currently Under Review

Sept. 2020 *Precision Nanosculpted Gratings for Space-Based Spectroscopy*
Funding Org.: NASA Space Technology Mission Directorate. Requested Award amount: ($174,950).

Declined

Dec. 2020 *Adjustable X-ray Optics with Polymer Actuators*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Manel Errando (Principal Investigator), Casey DeRoo (Site-PI). Requested Award amount: ($270,984).

Dec. 2020 *CMOS Sensors for Soft X-ray Detection*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Phil Kaaret (Principal Investigator), Casey DeRoo (Co-I).Requested Award amount: ($1,044,827).

Dec. 2020 *Technology Maturation for Adjustable X-ray Mirrors*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Susan Trolier-McKinstry (Principal Investigator), Casey DeRoo (Site-PI). Requested Award amount: ($151,470).

Dec. 2020 *Technology Maturation for Adjustable X-ray Mirrors*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Susan Trolier-McKinstry (Principal Investigator), Casey DeRoo (Site-PI). Requested Award amount: ($151,470).

Dec. 2020 *Collimating X-ray Zone Plates for Ground Calibration*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Fabien Grisé (Principal Investigator), Casey DeRoo (Site-PI). Requested Award amount: ($111,135).

Oct. 2020 *StokeSat – A Small Satellite for Soft X-ray Polarimetry*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Philip Kaaret (Principal Investigator), Casey DeRoo (Co-I). Requested Award amount: ($15,260,425).

Sept. 2020 *Enabling New Spectroscopy Missions with Custom Diffractive Optics*
Funding Org.: NASA Space Technology Mission Directorate. Investigator/s Casey DeRoo (Principal Investigator). Requested Award amount: ($124,812).

Sept. 2020 *Using Machine Learning Techniques to Identify Unusual X-ray Sources*
Funding Org.: NASA Office of STEM Engagement. Investigator/s Casey DeRoo (Principal Investigator). Requested Award amount: ($99,792).

Mar. 2020 *Identifying Unusual Sources in the Chandra Source Catalog*
Funding Org.: Chandra X-ray Center. Investigator/s Casey DeRoo (Principal Investigator). Requested Award amount: ($85,000).

Sept. 2019 *Two-Element X-ray Spectrometers for Astronomy*
Funding Org.: NASA Space Technology Mission Directorate. Investigator/s Casey DeRoo (Principal Investigator). Requested Award amount: ($125,000).

Mar. 2019 *Curved Diffractive X-ray Optics for Two Element Spectrometers*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Casey DeRoo (Principal Investigator). Requested Award amount: ($1,848,124).

Dec. 2016 *Arcus: Exploring the Formation and Evolution of Clusters, Galaxies, and Stars*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Randall Smith (Principal Investigator), Casey DeRoo (Co-I). Requested Award amount: ($0).

Dec. 2014 *Arcus: Exploring the Formation and Evolution of Clusters, Galaxies, and Stars*
Funding Org.: NASA Science Mission Directorate (APRA). Investigator/s Randall Smith (Principal Investigator), Casey DeRoo (Co-I). Requested Award amount: ($0).

SELECTED PRESENTATIONS

PRESENTATION * SYSTEM:
* = INVITED TALK, *** = CONTRIBUTED TALK,

Colloquia / Seminars

Sept. 2021 *International Centre for Radio Astronomy Research (ICRAR) – Colloquium Series
Baryon Reservoirs and Mechanisms of Feedback: What Can Future Soft X-ray Spectrometers Tell Us? Presenter: Casey DeRoo

June 2021 *American Physical Society Prairie Section – Research Colloquia
The Physics of X-ray Instruments for Astronomy; Presenter: Casey DeRoo

Sept. 2020 **University of Iowa – Departmental Colloquium
Astronomy Research at the University of Iowa: Exploring How Galaxies Evolve; Presenter: Casey DeRoo

Aug. 2020 **Cedar Amateur Astronomers – Public Presentation
Exploring Beyond Our Galaxy with X-ray Astronomy; Presenter: Casey DeRoo

June 2020 **University of Iowa – Public Observing Night
Exploring Beyond Our Galaxy with X-ray Astronomy; Presenter: Casey DeRoo

Nov. 2019 *Grinnell College – Departmental Colloquium
Revealing the Invisible, Energetic Universe Using X-ray Astronomy; Presenter: Casey DeRoo

Sept. 2019 **University of Iowa – Departmental Colloquium (Graduate Recruitment)
Developing X-ray Technologies for Astrophysics; Presenter: Casey DeRoo

Sept. 2018 **University of Iowa – Departmental Colloquium
Developing X-ray Technologies for Astrophysics; Presenter: Casey DeRoo

Sept. 2018 **University of Iowa – Astronomy & Space Physics Seminar
Grating Technologies for X-ray Spectroscopy; Presenter: Casey DeRoo

Conference Presentations

Aug. 2021 **SPIE Optics + Photonics
Optical Metrology of an Adjustable X-ray Mirror Prototype; Presenter: Casey DeRoo

Aug. 2021 **SPIE Optics + Photonics
Assessing the Spectral Resolution of High Energy Diffraction Gratings Made with Electron-Beam Lithography; Presenter: Casey DeRoo

Aug. 2019 **SPIE Optics + Photonics
Curved Diffractive X-ray Optics for Astronomy; Presenter: Casey DeRoo

Mar. 2019 **High Energy Astrophysics Division (HEAD) of the American Astronomical Society
Curved Diffractive X-ray Optics for Two Element Spectrometers; Presenter: Casey DeRoo

SELECTED SERVICE

Service to the Field

2021	University Space Research Association Distinguished Undergraduate Scholarship, Reviewer
2021	Applied Sciences, Journal Reviewer
2020	Journal of Astronomical Telescopes, Instruments, and Systems, Journal Reviewer
2020	NASA Future Investigators in Earth and Space Science and Technology (FINESST), Reviewer
2019	Iowa Space Grant Consortium, Undergraduate Merit Scholarship Program, Reviewer
2019	Iowa Space Grant Consortium, Undergraduate Research Fellowship, Reviewer
2018	National Academies of Sciences, Engineering, and Medicine, Early Career Focus Session for the Astro2020 Decadal Survey, Attendee

Service to the Department

2021 – Present	Diversity, Equity, and Inclusion Faculty Committee Member
2019 – Present	Graduate Recruitment & Admissions Committee Member
2020 – Present	University Space Research Association, Institutional Representative
2019 – Present	American Astronomical Society, Departmental Agent
2019 – 2021	Astronomy & Space Physics Seminar Coordinator

MENTORSHIP

Ph. D. Examination Committees:
Member: Daniel LaRocca

M.S. Examination Committees:
Chair: Hunter Reaves (slated Oct. 2021)
Member: Jacob Richardson

Comprehensive Examination Committees:
Chair: Dustin Swarm (slated Oct. 2021)
Member: Josh Steffan, Arran Gross, Jesse Bluem, Riley Troyer

Undergraduate Honors Theses:
Advisor: Jared Termini, Tyler Roth (co-advisor)

Graduate Student Researchers:
Advisor: Dustin Swarm, Kristie Nault, Cecilia Fasano, Hunter Reaves

Undergraduate Student Researchers:
Advisor: Jared Termini, Samantha Watkins, Jeff Leiberton, Tyler Roth (co-advisor), Steve Tammes (co-advisor), Cole Dorman, Eric Jones, Shea Hartzler