

Drew M. Miles

Curriculum Vitae

Postdoctoral Research Associate
Division of Physics, Mathematics, and Astronomy, Caltech
1200 E California Blvd, Pasadena, CA 91125
drewmmiles@gmail.com +1 641-691-7091

EDUCATION

Ph.D. in Astronomy & Astrophysics Penn State University, University Park, PA, USA	Dec. 2021
M.S in Astronomy & Astrophysics Penn State University, University Park, PA, USA	Dec. 2018
B.S. in Astronomy and B.S. in Physics University of Iowa, Iowa City, IA, USA	Dec. 2015
B.B.A. in Accounting University of Iowa, Iowa City, IA, USA	Dec. 2011

POSITIONS HELD

Postdoctoral Scholar Research Associate , California Institute of Technology	Jan. 2022 -
NASA Space Technology Research Fellow, Penn State University	2017 – 2021
Graduate Research Assistant, Penn State University	2016 – 2017
Undergraduate Research Assistant, University of Iowa	2013 – 2016

TEACHING EXPERIENCE

Penn State University	
Astronomy Communication (ASTRO 297), Instructor <i>SRTE Instructor Effectiveness: Mean = 6.9/7</i> <i>SRTE Course Effectiveness: Mean = 6.6/7</i>	Fall 2020
Certificate in Online Teaching	Summer 2020
Astronomical Universe (ASTRO 001), Guest Lecturer	2018-2019
Observational Astronomy (ASTRO 320), TA & Lab Lead	Fall 2016

PENDING SUPPORT

X-ray Reflection Gratings: Key Developments for the Next Decade

- Duration: 10/01/2022 - 12/31/2025
- Agency: NASA – Strategic Astrophysics Technology SAT21
- Total Amount: ≈\$1,600,000
- Role: Co-I

Ultraviolet Spectroscopy for the Next Decade Enabled Through Nanofabrication Techniques

- Duration: 10/01/2022 - 12/31/2025
- Agency: NASA – Strategic Astrophysics Technology SAT21
- Total Amount: ≈\$2,500,000
- Role: Co-I

CURRENT AND PAST SUPPORT

Rockets for Extended-source Soft-X-ray Spectroscopy

- Duration: 01/01/2018 - 12/31/2022
- Agency: NASA – Grant No. 80NSSC18K0282 (APRA)
- Total Amount: \$4,117,663
- Role: Co-I

Calibration of Soft X-ray Components for Flights Missions I, II & III

- Duration: 08/01/2017 - 12/31/2023
- Agency: Lawrence Berkeley National Lab - Advanced Light Source
- Total Amount: Beam time valued at \$180,000
- Role: Lead Experimenter

Development of Grating Technology for High-Resolution Spectrometers Using Nanofabrication Techniques

- Duration: 08/01/2017 - 07/31/2021
- Agency: NASA – Grant No. 80NSSC17K0183 (NSTRF)
- Total Amount: \$296,000
- Role: Fellow

TECHNICAL PRESENTATIONS

Oral Presentations

1. *An update on the Rockets for Extended-source X-ray Spectroscopy*
SPIE Optics & Photonics, San Diego, CA 2021
2. *The Rockets for Extended-source X-ray Spectroscopy*
Joint Astrophysics/Space Physics Seminar, The University of Iowa - *Invited* 2021
3. *Potential UV/X-ray SETI Applications*
The Penn State Extraterrestrial Intelligence Center - *Invited* 2020
4. *The Rocket for Extended-source X-ray Spectroscopy*
SPIE Optics & Photonics, San Diego, CA 2019
5. *Blazed x-ray reflection gratings using electron-beam lithography and ion milling*
SPIE Advanced Lithography, San Jose, CA; Substitute Speaker: Fabien Grisé 2019
6. *The Lynx X-ray reflection grating spectrometer*
AAS 233rd Meeting, Seattle, WA; Substitute for R. L. McEntaffer 2019
7. *An update on X-ray reflection gratings*
AAS 231st Meeting, Washington D.C. 2018
8. *An introduction to the Water Recovery X-ray Rocket*
SPIE Optics & Photonics, San Diego, CA 2018
9. *Diffraction efficiency of a large-scale, replicated X-ray reflection grating*
Penn State University Astrophysics Seminar - *Invited* 2017
10. *Suborbital rockets for X-ray astronomy*
Penn State University Black Holes Workshop - *Invited* 2017
11. *Penn State's sounding rocket program*
Penn State University Astronomy Board of Visitors Annual Meeting - *Invited* 2017
12. *X-ray astronomy and Penn State's sounding rocket program*
Central Pennsylvania Observers Amateur Astronomy Club - *Invited* 2017
13. *Diffraction efficiency of a replicated, flight-like off-plane reflection grating baselined for future X-ray missions*
AAS 229th Meeting, Grapevine, TX 2017
14. *Low-cost, spaceborne soft X-ray astronomy missions*
The Open University, United Kingdom - *Invited* 2016
15. *Diffraction efficiency of radially-profiled off-plane reflection gratings*
SPIE Optics & Photonics, San Diego, CA 2015

Poster Presentations

1. *Astronomical X-ray reflection gratings and the Rockets for Extended-source X-ray Spectroscopy*
AAS 235th Meeting, Honolulu, HI 2020
2. *Nanofabrication of Astronomical Reflection Gratings*
Cornell NanoScale Facility 2019 Annual Meeting, Ithaca, NY 2019
3. *Progress in X-ray reflection grating development*
AAS 233rd Meeting, Seattle, WA 2019

4. *A diffuse soft X-ray spectrometer for sounding rocket*
Astronomical X-ray Optics Workshop, Prague, Czech Republic 2018
5. *The Water Recovery X-ray Rocket*
SPIE Astronomical Telescopes & Instrumentation, Austin, TX 2018
6. *The Water Recovery X-ray Rocket*
AAS HEAD 16th Meeting, Sun Valley, ID 2017
7. *HaloSat: a CubeSat to map the distribution of baryonic matter in the Galactic halo*
AAS HEAD 15th Meeting, Naples, FL 2016
8. *Off-plane X-ray diffraction grating performance and applications*
Iowa Undergraduate Research Festival, Iowa City, IA 2015

FELLOWSHIPS AND AWARDS

NASA Space Technology Research Fellowship, NASA	2017 – 2021
Downsbrough Graduate Fellowship for outstanding success, Penn State University	2019 – 2020
NASA Pennsylvania Space Grant Graduate Fellowship, Penn State University	2017 – 2018
NASA Earth and Space Science Fellowship, NASA	2017 (declined)
Zaccheus Daniel Award, Penn State University	2017
Newport Award for Outstanding Achievement, SPIE	2017
Braddock/Roberts Fellowship, Penn State University	2016
Iowa Center for Research by Undergraduates Fellow, University of Iowa	2015
Charles A. Wert Scholarship in Physics, University of Iowa	2014 – 2015
Student Travel Grant, University of Iowa	2015
Strayer-Rairden Scholarship in Physics, University of Iowa	2012 – 2015
Van Allen Summer Research Grant, University of Iowa	2014

MENTORING & ADVISING

Undergraduate Students

Natalie Zinski, <i>Instrument Modeling</i>	2020 – Present
Logan Baker, <i>tREXS Sounding Rocket Instrument</i>	2019 – 2021
Outcome: Graduate school in Aerospace Engineering	
Joseph Weston, <i>tREXS Sounding Rocket Instrument</i>	2018 – 2020
Outcome: Systems Engineer at Lockheed Martin	
Christopher Hillman, <i>WRX Sounding Rocket Instrument</i>	2017 – 2018
Outcome: Research Technologist at Penn State University	
Tyler Steiner, <i>Nanofabrication and Data Analysis</i>	2016 – 2017
Outcome: PhD Candidate at the University of Tennessee	

OUTREACH & SERVICE

Mentor, Rockets for Inclusive Science Education	2020 – 2021
Treasurer, Astronomy on Tap State College	2017 – 2021
Tour Guide, X-ray Rocket Laboratory	2016 – 2021
Graduate Student Service, <i>Dept. of Astronomy, Penn State University</i>	
Representative for the Graduate Student Body	2020 – 2021

Co-Chair of Graduate Student Recruitment	2018 – 2020
Co-Representative to Graduate Program	2018 – 2020
Representative on Facilities & Safety Committee	2016 – 2018
Co-Organizer and Moderator, Graduate School Information Panel	2020
Volunteer, Penn State University Astrofest	2016 – 2018, 2020
AAS Chambliss Poster Judge	2019
AAS Abstract Sorter	2018 – 2019
Research Symposium Reviewer, <i>College of Engineering, Penn State University</i>	2018
Organizer, Science Leadership Camp Instrumentation Lab Research Snapshot	2017

PROFESSIONAL MEMBERSHIPS

Member, Lynx Instrument Working Group	2017 – Present
Junior Member, American Astronomical Society	2016 – Present
Member, SPIE	2015 – Present

PUBLICATIONS - [\[ORCID\]](#)

In-progress publications:

1. **D. M. Miles** et al., “Design of the Rockets for Extended-source X-ray Spectroscopy”, *J. Astron. Telesc. Instrum. Syst.*, 2022 (expected).
2. **D. M. Miles** et al., “X-ray reflection grating fabrication via electron-beam lithography and directional ion-beam etching”, *The Astrophysical Journal*, 2022 (expected).
3. K. France et al. (inc. **D. M. Miles**), “The Extreme-ultraviolet Stellar Characterization for Atmospheric Physics and Evolution (ESCAPE) Mission: Motivation and Overview”, *J. Astron. Telesc. Instrum. Syst.*, 2022 (expected).
4. R. C. McCurdy, **D. M. Miles**, et al., “Characterizing electron-beam fogging for large-format, high-density, X-ray reflection gratings”, *The Astrophysical Journal*, 2022 (expected).

Refereed Publications: 16; 2 first author, 5 with significant contribution, 9 with contribution

16. M. Urban, et al. (inc. **D. M. Miles**), “[REX: X-ray experiment on the water recovery rocket](#)”, *Acta Astronautica* 184, 1-10 (2021).
15. J. A. McCoy, M. A. Verschuuren, **D. M. Miles**, & R. L. McEntaffer, “[X-ray verification of sol-gel resist shrinkage in substrate-conformal imprint lithography for a replicated blazed reflection grating](#)”, *OSA Continuum* 3(11), 3141-3156 (2020).
14. R. C. McCurdy, **D. M. Miles**, J. A. McCoy, F. Grise, & R. L. McEntaffer, “[Diffraction efficiency of a small-period astronomical X-ray reflection grating fabricated using thermally-activated selective topography equilibration](#)”, *J. Astron. Telesc. Instrum. Syst.* 6(4), 045003 (2020).
13. J. A. McCoy, R. L. McEntaffer, & **D. M. Miles**, “[Extreme Ultraviolet and Soft X-ray Diffraction Efficiency of a Blazed Reflection Grating Fabricated by Thermally Activated Selective Topography Equilibration](#)”, *The Astrophysical Journal* 891 (2), 13 pp (2020).

12. D. LaRocca, et al. (inc. **D. M. Miles**), “[Design and construction of the X-ray instrumentation onboard the HaloSat CubeSat](#)”, *J. Astron. Telesc. Instrum. Syst.* 6 (1), 014003 (2020).
11. T. Rogers, et al. (inc. **D. M. Miles**), “[Induced X-ray fluorescence background for high-voltage space based detectors](#)”, *Experimental Astronomy* 49, 20pp (2020).
10. **D. M. Miles**, et al., “[Water Recovery X-ray Rocket grating spectrometer](#)”, *J. Astron. Telesc. Instrum. Syst.* 5(4), 044006 (2019).
9. P. Kaaret, et al. (inc. **D. M. Miles**), “[HaloSat - A CubeSat to Study the Hot Galactic Halo](#)”, *The Astrophysical Journal* 884 (2), 11 pp (2019).
8. J. H. Tutt, R. L. McEntaffer, **D. M. Miles**, B. D. Donovan, & C. Hillman, “[Grating alignment for the Water Recovery X-ray Rocket \(WRXR\)](#)”, *Journal of Astronomical Instrumentation* 08 (2), 1950009 (2019).
7. **D. M. Miles**, et al., “[Fabrication and Diffraction Efficiency of a Large-Format, Replicated X-ray Reflection Grating](#)”, *The Astrophysical Journal* 869 (2), 12 pp (2018).
6. T. Rogers, et al. (inc. **D. M. Miles**), “[Gaseous electron multiplier gain characteristics using low-pressure Ar/CO₂](#)”, *Experimental Astronomy* 43 (2), 201-210 (2017).
5. J. H. Tutt, et al. (inc. **D. M. Miles**), “[Diffraction Efficiency Testing of Sinusoidal and Blazed Off-Plane Reflection Gratings](#)”, *Journal of Astronomical Instrumentation* 05 (3), 1650009 (2016).
4. H. Marlowe, et al. (inc. **D. M. Miles**), “[Modeling and empirical characterization of the polarization response of off-plane reflection gratings](#)”, *Applied Optics* 55 (21), pp. 5548-5553 (2016).
3. C. T. DeRoo, R. L. McEntaffer, **D. M. Miles**, et al., “[Line Spread Functions of Blazed Off-Plane Gratings Operated in the Littrow Mounting](#)”, *Journal of Astronomical Telescopes, Instruments, and Systems* 2 (2), 025001 (2016).
2. J.A. McCoy, et al. (inc. **D. M. Miles**), “[A Primer for Telemetry Interfacing in Accordance with NASA Standards Using Low Cost FPGAs](#)”, *Journal of Astronomical Instrumentation* 05 (01), 1640002 (2016).
1. H. Marlowe, et al. (inc. **D. M. Miles**), “[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 (2015).

Conference Proceedings: 22; 5 first author, 4 with significant contribution, 13 with contribution

22. **D. M. Miles et al.**, “[An update on the rockets for extended-source X-ray spectroscopy](#)”, *Proc. SPIE 11821 UV, X-ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, 118210K (2021).
21. J. H. Tutt, **D. M. Miles**, et al., “[Developments of the focal plane camera for tREXS](#)”, *Proc. SPIE 11821 UV, X-ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, 118210V (2021).
20. N. Kruczek, F. Gris , **D. M. Miles**, et al., “[Performance of anisotropically-etched gratings in the extreme and far ultraviolet bandpasses](#)”, *Proc. SPIE 11821 UV, X-ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, 118210X (2021).

19. F. Gris , et al. (inc. **D. M. Miles**), “[Fabrication of custom astronomical gratings for the extreme and far ultraviolet bandpasses](#)”, *Proc. SPIE 11821* UV, X-ray, and Gamma-Ray Space Instrumentation for Astronomy XXII, 1182112 (2021).
18. B. Fleming, et al. (inc. **D. M. Miles**), “[Opto-mechanical design of the ESCAPE Small Explorer: an EUV spectrograph for exoplanet host star irradiance and CME activity](#)”, *Proc. SPIE 11821* UV, X-ray, and Gamma-Ray Space Instrumentation for Astronomy XXII, 1182104 (2021).
17. K. France, et al. (inc. **D. M. Miles**), “[The ESCAPE mission overview: exploring the stellar drivers of exoplanet habitability](#)”, *Proc. SPIE 11821* UV, X-ray, and Gamma-Ray Space Instrumentation for Astronomy XXII, 1182103 (2021).
16. K. France, et al. (inc. **D. M. Miles**), “[EUV spectroscopy with the ESCAPE mission: exploring the stellar drivers of exoplanet habitability](#)”, *Proc. SPIE 11444* Space Telescopes and Instrumentation 2020: Ultraviolet to Gamma Ray, 1144405 (2020).
15. **D. M. Miles**, et al., “[An introduction to the Rockets for Extended-source X-ray Spectroscopy](#)”, *Proc. SPIE 11118* UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI, 111180B (2019).
14. K. France, et al. (inc. **D. M. Miles**), “[The Extreme-ultraviolet Stellar Characterization for Atmospheric Physics and Evolution \(ESCAPE\) mission concept](#)”, *Proc. SPIE 11118* UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI, 1111808 (2019).
13. R. McCurdy, R. L. McEntaffer, J. McCoy, & **D. M. Miles**, “[Fabrication and diffraction efficiency of a 160-nm period X-ray reflection grating produced using thermally activated selective topography equilibration](#)”, *Proc. SPIE 11119* Optics for EUV, X-ray, and Gamma-Ray Astronomy IX, 111190Y (2019).
12. J. H. Tutt, **D. M. Miles**, et al., “[The Focal Plane Camera for tREXS](#)”, *Proc. SPIE 11118* UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI, 111180C (2019).
11. M. Wages, et al. (inc. **D. M. Miles**), “[Flight camera package design, calibration and performance for the Water Recovery X-ray Rocket mission](#)”, *Proc. SPIE 11118* UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI, 111180D (2019).
10. P. Kaaret, et al. (inc. **D. M. Miles**), “[First Results from HaloSat - A CubeSat to Study the Hot Galactic Halo](#)”, *Proc. of AIAA/USU Conference on Small Satellites, Upcoming Missions, Year in Review I*, SSC19-III-05 (2019).
9. **D. M. Miles**, et al., “[Grating design for the Water Recovery X-ray Rocket](#)”, *Proc. SPIE 10699* Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray, 106996K (2018).
8. A. Zajczyk, et al. (inc. **D. M. Miles**), “[HaloSat: a search for missing baryons with a CubeSat](#)”, *Proc. of AIAA/USU Conference on Small Satellites, Upcoming Missions, Year in Review*, SSC18-WKIX-01 (2018).
7. **D. M. Miles**, et al., “[An Introduction to the Water Recovery X-ray Rocket](#)”, *Proc. SPIE 10397* UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XX, 103970R (2017).
6. J. E. Hill, et al. (inc. **D. M. Miles**), “[The x-ray polarimeter instrument on board the Polarimeter for Relativistic Astrophysical X-ray Sources \(PRAXyS\) mission](#)”, *Proc. SPIE 9905* Space Telescopes and Instrumentation 2016: Ultraviolet to Gamma Ray, 99051B (2016).

5. **D. M. Miles**, et al., “[Diffraction efficiency of radially-profiled off-plane reflection gratings](#)”, *Proc. SPIE 9603* Optics for EUV, X-ray and Gamma-Ray Astronomy VII, 960316 (2015).
4. H. Marlowe, R. L. McEntaffer, C. DeRoo, **D. M. Miles**, et al., “[Polarization sensitivity testing of off-plane reflection gratings](#)”, *Proc. SPIE 9603* Optics for EUV, X-ray and Gamma-Ray Astronomy VII, 960318 (2015).
3. T. J. Peterson, et al. (inc. **D. M. Miles**), “[Off-plane x-ray reflection grating fabrication](#)”, *Proc. SPIE 9603* Optics for EUV, X-ray and Gamma-Ray Astronomy VII, 960317 (2015).
2. T. Rogers, T. Schultz, J. McCoy, **D. Miles**, et al., “[First results from the OGRESS sounding rocket payload](#)”, *Proc. SPIE 9601* UV, X-ray and Gamma-Ray Space Instrumentation for Astronomy XIX, 960104 (2015).
1. J. H. Tutt, et al. (inc. **D. M. Miles**), “[Developments in the EM-CCD camera for OGRE](#)”, *Proc. SPIE 9154* High Energy, Optical, and Infrared Detectors for Astronomy VI, 91540E (2014).