Drew M. Miles

Research Assistant Professor

dmiles.astro@gmail.com drewmiles@caltech.edu
https://drew-miles.github.io/

Education

2018 – 2021 **PhD Astronomy & Astrophysics,** Penn State University
2016 – 2018 **MS Astronomy & Astrophysics,** Penn State University
2012 – 2015 **BS Physics, Astronomy,** University of Iowa

Postitions Held

2024 – · · · · **Research Assistant Professor,** Caltech
2022 – 2024 **Postdoctoral Researcher,** Caltech
2017 – 2021 **NASA Space Technology Research Fellow,** Penn State University
2016 – 2017 **Graduate Research Assistant,** Penn State University
2013 – 2016 **Undergraduate Research Assistant,** University of Iowa

Select Current Projects

Techniques in blazed reflection gratings to enable next-generation spectroscopy
Period of Performance: 03/01/2025 – 02/28/2027
Project Funding: $1.9M; NASA SAT
Role: PI

The Faint Intergalactic-medium Redshifted Emission Balloon (FIREBall-2)
Period of Performance: 10/01/2022 – 09/30/2026
Project Funding: $4.9M; NASA APRA
Role: Project manager and technical lead for balloon-borne multiobject UV spectrograph.

Ultraviolet Spectroscopy ... Enabled Through Nanofabrication Techniques
Period of Performance: 03/01/2023 - 02/28/2026
Project Funding: $200k Co-I funding; NASA SAT
Role: Co-I and proposal writer for UV reflection gratings development to enable future missions. Serve as calibration lead and am responsible for fabricating UV echelle gratings.

X-ray Reflection Gratings: Key Developments for the Next Decade
Period of Performance: 10/01/2023 – 09/30/2026
Project Funding: $114k Co-I funding; NASA APRA
Role: Co-I and calibration lead, responsible for beamline measurements.

Observation Programs: 2023 – Present
Keck: 8 total nights (4 as PI)

Select Pending Projects

tREXS-2: The Rockets for Extended-source X-ray Spectroscopy
Period of Performance: 10/01/2024 – 09/30/2028
Project Funding: ≈$3.9M
Role: PI
Status: To be submitted to 2024 NASA APRA solicitation

Teaching

Live Instruction

2020 — Instructor, Astronomy Communication (ASTRO 297), Penn State University
SRTE Instructor Effectiveness: Mean = 6.9/7
SRTE Course Effectiveness: Mean = 6.6/7

2019 — Guest Lecturer, Astronomical Universe (ASTRO 001), Penn State University

2016 — TA and Lab Lead, Observational Astronomy (ASTRO 320), Penn State University

Workshops and Certifications

2024 — Workshop: How Learning Works

Workshop: How to Increase Student Engagement and Promote Academic Integrity

2023 — Workshop: The Effects of Stereotypes and Deficit Mindset on Learning

Workshop: Flipped Classrooms: Effective Active Learning in Large Classes

Workshop: Creating Dynamic and Engaging Lectures

2022 — Workshop: Setting Intentions for Student Learning

Workshop: Assessment as a Learning Tool

Workshop: Increasing Student Engagement and Motivation

2020 — Certificate in Online Teaching

Advising

Postdoctoral Researchers

2024 – — Vincent Picouet, FIREBall balloon project

Graduate Students

2024 – ... — Yasmine Meziani, FIREBall balloon project

2020 – 2024 — Ross McCurdy, tREXS sounding rocket project
Outcome: PhD, Postdoctoral position

Undergraduate Students

2022 – 2023 — Vincent Smedile, Thesis: *"Soft X-ray Source Modeling of the Cygnus Loop..."*
Outcome: Honor's thesis, graduate school in Astronomy

2020 – 2021 — Natalie Zinski, *tREXS instrument modeling*
Outcome: Position in industry

2019 – 2021 — Logan Baker, *tREXS opto-mechanical design*
Outcome: Graduate school in Aerospace Engineering

2018 – 2020 — Joseph Weston, *tREXS mechanical design*
Outcome: Position in industry

2017 – 2018 — Christopher Hillman, *Sounding rocket telemetry systems*
Outcome: Position in industry

2016 – 2017 — Tyler Steiner, *Nanofabrication and data analysis*
Outcome: Graduate school in Nuclear Engineering

Select Outreach & Service

2024 - ...	Co-Chair, HWO Community Sub WG
	Co-Organizer, AAS HEAD Frontier Seminar Series
2023 - ...	Deputy Secretary, AAS HEAD
	Member, NASA Astrophysics with Equity SAG
2022 - ...	Reviewer, JATIS
	Reviewer, NASA APRA
2024	Co-lead, HWO UV Tech Grating Focus Group
2023 - 2024	Co-Chair, Astrophysics with Equity SAG Student Training Programs WG
	Member, HWO UV Tech WG
2022 - 2024	Mentor, Caltech Future Ignited
2022 - 2023	Divisional Representative, Caltech Postdoctoral Association
2020 - 2021	Mentor, Rockets for Inclusive Science Education
	Co-Organizer & Moderator, Graduate Student Info Panel & Town Halls
	Department Representative, Penn State Graduate Students
2017 - 2021	Treasurer, Astronomy on Tap State College
2018 - 2020	Co-Chair, Graduate Student Recruitment for PSU Astronomy
	Co-Chair, Graduate Program for PSU Astronomy
2017	Organizer, PSU Science Leadership Camp Research Snapshot

Select Awards

2024	Roman Technology Fellow, NASA
2022 - 2023	Presidential Management Fellow, U.S. Office of Personnel Management
2017 - 2021	NASA Space Technology Research Fellow, NASA
2021	Rising Star in Aerospace, MIT/Stanford/CU-Boulder Rising Stars Program
2019 - 2020	Downsbrough Graduate Fellowship for Outstanding Success, Penn State University
2017 - 2018	PA Space Grant Graduate Fellowship, NASA
2017	Newport Award for Outstanding Achievement, SPIE

Invited Seminars

2025	Invited - AAS PhysPAG Session, *Grating Development and the Rockets for Extended-source X-ray Spectroscopy*
2024	Invited - HWO IGM/CGM Science Working Group, *The CGM in emission - state of the technology and path to HWO*
2023	Invited - Pasadena City College, *Diffraction grating nanofabrication for astronomy instruments*
	Invited - NASA UV Program Review, *The Faint Intergalactic-medium Redshifted Emission Balloon*
	Invited - Marshall Space Flight Center, *Grating spectrographs for extended-source X-ray astronomy*
2022	Invited - Astronomical Society of Long Island, *Observing diffuse astronomical sources of high-energy emission with suborbital instruments*

Invited Seminars (continued)

- Invited - Montana State University, *Enabling new observations of diffuse astrophysical emission with state-of-the-art grating technology*
- Invited - Jet Propulsion Laboratory, *Reflection grating fabrication for space-based astronomy*

2021
- Invited - The University of Iowa Astrophysics Seminar, *The Rockets for Extended-source X-ray Spectroscopy*

2020
- Invited - The Penn State Extraterrestrial Intelligence Center, *Potential UV/X-ray SETI Applications*

2017
- Invited - Penn State University Black Holes Workshop, *Suborbital rockets for X-ray astronomy*
- Invited - Penn State Unviversity Board of Visitors, *Penn State's sounding rocket program*
- Invited - Central Pennsylvania Observers, *X-ray astronomy and Penn State's sounding rocket program*

2016
- Invited - The Open University Astrophysics Seminar, *Low-cost, spaceborne soft X-ray astronomy missions*

Publications – [ORCID]

Journal Articles - 25; 5 first author, 9 with significant contribution

1. **D. Miles**, "Great Observatories Maturation: NASA astrophysics development through suborbital rockets and balloons," *Journal of Astronomical Telescopes, Instruments, and Systems*, 2025 (in review).
2. **D. M. Miles**, V. Picouet, Z. Lin, *et al.*, "The 2023 Flight of the Faint Intergalactic-medium Redshifted Emission Balloon," *The Astrophysical Journal Supplement Series*, 2025 (in review).
3. J. S. Li, N. I. Kerkeser, A. R. Khan, *et al.*, "FIREBall-2 UV balloon telescope in-flight calibration system," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 10, no. 3, p. 035 002, 2024. DOI: 10.1117/1.JATIS.10.3.035002.
4. **D. M. Miles**, R. L. McEntaffer, J. H. Tutt, *et al.*, "The Rockets for Extended-source X-ray Spectroscopy Instrument Design," *The Astrophysical Journal*, vol. 971, no. 2, 171, p. 171, Aug. 2024. DOI: 10.3847/1538-4357/ad58d4.
5. J. H. Tutt, K. Hunter, V. A. Smedile, *et al.*, "A Rail-Mounted Pumping System Developed for Suborbital Rockets," *Journal of Astronomical Instrumentation*, vol. 13, no. 2, 2450006-40, pp. 2 450 006–40, Jan. 2024. DOI: 10.1142/S2251171724500065.
6. S. Tuttle, M. Matsumura, D. R. Ardila, *et al.*, "Ultraviolet technology to prepare for the habitable worlds observatory," 2024. arXiv: 2408.07242 [astro-ph.IM].
7. T. Brendel, A. Khan, S. Agarwal, *et al.*, "Balloon-borne FIREBall-2 ultraviolet spectrograph stray light control based on nonsequential reverse modeling of on-sky data," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 8, 048001, p. 048 001, Oct. 2022. DOI: 10.1117/1.JATIS.8.4.048001.
8. K. France, B. Fleming, A. Youngblood, *et al.*, "Extreme-ultraviolet Stellar Characterization for Atmospheric Physics and Evolution mission: motivation and overview," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 8, 014006, p. 014 006, Jan. 2022. DOI: 10.1117/1.JATIS.8.1.014006.
9. N. Kruczek, **D. M. Miles**, B. Fleming, *et al.*, "High efficiency echelle gratings for the far ultraviolet," *Applied Optics*, vol. 61, no. 22, p. 6430, Aug. 2022. DOI: 10.1364/AO.461537.
10. M. Urban, O. Nentvich, T. Báča, *et al.*, "REX: X-ray experiment on the water recovery rocket," *Acta Astronautica*, vol. 184, pp. 1–10, Jul. 2021. DOI: 10.1016/j.actaastro.2021.03.019.

11. D. M. LaRocca, P. Kaaret, D. L. Kirchner, *et al.*, "Design and construction of the x-ray instrumentation onboard the HaloSat CubeSat," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 6, 014003, p. 014 003, Jan. 2020. DOI: 10.1117/1.JATIS.6.1.014003.

12. J. A. McCoy, R. L. McEntaffer, and **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*, vol. 891, no. 2, 114, p. 114, Mar. 2020. DOI: 10.3847/1538-4357/ab76d3.

13. J. A. McCoy, M. A. Verschuuren, **D. M. Miles**, and 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), pp. 3141–3156, Oct. 2020. DOI: 10.48550/arXiv.2011.14771.

14. R. C. McCurdy, **D. M. Miles**, J. A. McCoy, F. Grisé, and R. L. McEntaffer, "Diffraction efficiency of a small-period astronomical x-ray reflection grating fabricated using thermally activated selective topography equilibration," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 6, 045003, p. 045 003, Oct. 2020. DOI: 10.1117/1.JATIS.6.4.045003.

15. T. Rogers, R. McEntaffer, J. McCoy, **D. M. Miles**, T. Schultz, and J. Tutt, "Induced X-ray fluorescence background for high-voltage space based detectors," *Experimental Astronomy*, vol. 49, no. 1-2, pp. 1–20, Jan. 2020. DOI: 10.1007/s10686-019-09649-5.

16. P. Kaaret, A. Zajczyk, D. M. LaRocca, *et al.*, "HaloSat: A CubeSat to Study the Hot Galactic Halo," *The Astrophysical Journal*, vol. 884, no. 2, 162, p. 162, Oct. 2019. DOI: 10.3847/1538-4357/ab4193.

17. **D. M. Miles**, S. V. Hull, T. B. Schultz, *et al.*, "Water Recovery X-Ray Rocket grating spectrometer," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 5, 044006, p. 044 006, Oct. 2019. DOI: 10.1117/1.JATIS.5.4.044006.

18. J. H. Tutt, R. L. McEntaffer, **D. M. Miles**, B. D. Donovan, and C. Hillman, "Grating Alignment for the Water Recovery X-Ray Rocket (WRXR)," *Journal of Astronomical Instrumentation*, vol. 8, no. 3, 1950009, p. 1 950 009, Jan. 2019. DOI: 10.1142/S2251171719500090.

19. **D. M. Miles**, J. A. McCoy, R. L. McEntaffer, *et al.*, "Fabrication and Diffraction Efficiency of a Large-format, Replicated X-Ray Reflection Grating," *The Astrophysical Journal*, vol. 869, no. 2, 95, p. 95, Dec. 2018. DOI: 10.3847/1538-4357/aaec73.

20. T. Rogers, R. McEntaffer, T. Schultz, J. McCoy, **D. Miles**, and J. Tutt, "Gaseous electron multiplier gain characteristics using low-pressure Ar/CO_2," *Experimental Astronomy*, vol. 43, no. 2, pp. 201–210, Apr. 2017. DOI: 10.1007/s10686-017-9531-8.

21. 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*, vol. 2, 025001, p. 025 001, Apr. 2016. DOI: 10.1117/1.JATIS.2.2.025001.

22. H. Marlowe, R. L. McEntaffer, J. H. Tutt, *et al.*, "Modeling and empirical characterization of the polarization response of off-plane reflection gratings," *Applied Optics*, vol. 55, no. 21, p. 5548, Jul. 2016. DOI: 10.1364/AO.55.005548.

23. J. McCoy, T. Schultz, J. Tutt, T. Rogers, **D. Miles**, and R. McEntaffer, "A Primer for Telemetry Interfacing in Accordance with NASA Standards Using Low Cost FPGAs," *Journal of Astronomical Instrumentation*, vol. 5, no. 1, 1640002, p. 1 640 002, Dec. 2016. DOI: 10.1142/S225117171640002X.

24. J. H. Tutt, R. L. McEntaffer, H. Marlowe, *et al.*, "Diffraction Efficiency Testing of Sinusoidal and Blazed Off-Plane Reflection Gratings," *Journal of Astronomical Instrumentation*, vol. 5, no. 3, 1650009, p. 1 650 009, Sep. 2016. DOI: 10.1142/S2251171716500094.

25 H. Marlowe, R. L. McEntaffer, R. Allured, *et al.*, "Performance testing of an off-plane reflection grating and silicon pore optic spectrograph at PANTER," *Journal of Astronomical Telescopes, Instruments, and Systems*, vol. 1, 045004, p. 045 004, Oct. 2015. DOI: 10.1117/1.JATIS.1.4.045004.

Conference Proceedings - 28; 7 first author, 7 with significant contribution

1 S. Agarwal, A. R. Khan, H. Bradley, *et al.*, "Realignment and performance verification of two-mirror focal corrector optics for FIREBall-2 using computer generated hologram (CGH)," in *Space Telescopes and Instrumentation 2024: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., International Society for Optics and Photonics, vol. 13093, SPIE, 2024, p. 130932V. DOI: 10.1117/12.3020834.

2 I. Cevallos-Aleman, D. Schiminovich, M. Sitaram, *et al.*, "FIREBall-2 2023: fine guidance system performance for UV balloon telescope flight," in *Space Telescopes and Instrumentation 2024: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., International Society for Optics and Photonics, vol. 13093, SPIE, 2024, 130932U. DOI: 10.1117/12.3020671.

3 G. Davis, K. Hoadley, J. Termini, *et al.*, "FIREBall-2 2023: flight communications performance," in *Space Telescopes and Instrumentation 2024: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., International Society for Optics and Photonics, vol. 13093, SPIE, 2024, 130932S. DOI: 10.1117/12.3019120.

4 **D. M. Miles**, R. McCurdy, J. H. Tutt, *et al.*, "The Rockets for Extended-source X-ray Spectroscopy: instrument updates, results from the first flight, and future outlook," in *Space Telescopes and Instrumentation 2024: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., International Society for Optics and Photonics, vol. 13093, SPIE, 2024, p. 1 309 373. DOI: 10.1117/12.3020368.

5 **D. M. Miles**, R. L. McEntaffer, and F. Grisé, "Blazed reflection gratings with electron-beam lithography and ion-beam etching," in *Space Telescopes and Instrumentation 2022: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 12181, Aug. 2022, 1218153, p. 1 218 153. DOI: 10.1117/12.2637880.

6 V. Picouet, D. Valls-Gabaud, B. Milliard, *et al.*, "FIREBall-2: flight preparation of a proven balloon payload to image the intermediate redshift circumgalactic medium," Nov. 2022, 25th ESA PAC Symposium. DOI: 10.48550/arXiv.2211.15491.

7 B. T. Fleming, K. France, T. Hellickson, *et al.*, "Opto-mechanical design of the ESCAPE Small Explorer: an EUV spectrograph for exoplanet host star irradiance and CME activity," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11821, Aug. 2021, 1182104, p. 1 182 104. DOI: 10.1117/12.2593732.

8 K. France, B. Fleming, A. Youngblood, *et al.*, "The ESCAPE mission overview: exploring the stellar drivers of exoplanet habitability," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11821, Aug. 2021, 1182103, p. 1 182 103. DOI: 10.1117/12.2593814.

9 F. Grisé, N. Kruczek, B. Fleming, *et al.*, "Fabrication of custom astronomical gratings for the extreme and far ultraviolet bandpasses," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11821, Aug. 2021, 1182112, p. 1 182 112. DOI: 10.1117/12.2594796.

10 N. Kruczek, F. Grisé, **D. M. Miles**, *et al.*, "Performance of anisotropically-etched gratings in the extreme and far ultraviolet bandpasses," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for*

Astronomy XXII, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11821, Aug. 2021, 118210X, p. 118210X. DOI: 10.1117/12.2593609.

11 **D. M. Miles**, J. H. Tutt, R. McCurdy, *et al.*, "An update on the rockets for extended-source X-ray spectroscopy," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11821, Aug. 2021, 118210K, 118210K. DOI: 10.1117/12.2594291.

12 J. H. Tutt, **D. M. Miles**, R. McEntaffer, *et al.*, "Developments of the focal plane camera for tREXS," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXII*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11821, Aug. 2021, 118210V, p. 118210V. DOI: 10.1117/12.2594563.

13 K. France, B. Fleming, A. Youngblood, *et al.*, "EUV spectroscopy with the ESCAPE mission: exploring the stellar drivers of exoplanet habitability," in *Space Telescopes and Instrumentation 2020: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11444, Dec. 2020, 1144405, p. 1 144 405. DOI: 10.1117/12.2560292.

14 K. France, B. T. Fleming, J. J. Drake, *et al.*, "The extreme-ultraviolet stellar characterization for atmospheric physics and evolution (ESCAPE) mission concept," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11118, Sep. 2019, 1111808, p. 1 111 808. DOI: 10.1117/12.2526859.

15 P. Kaaret, A. Zajczyk, and e. a. LaRocca Daniel, "First Results from HaloSat - A CubeSat to Study the Hot Galactic Halo," in *Proc. of AIAA/USU*, ser. Conference on Small Satellites, Upcoming Missions, Year in Review I, vol. SSC19-III-05, 2019. URL: https://digitalcommons.usu.edu/smallsat/2019/all2019/277/.

16 R. C. McCurdy, R. L. McEntaffer, J. A. McCoy, and **D. M. Miles**, "Fabrication and diffraction efficiency of a 160-nm period x-ray reflection grating produced using thermally activated selective topography equilibration," in *Optics for EUV, X-Ray, and Gamma-Ray Astronomy IX*, S. L. O'Dell and G. Pareschi, Eds., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11119, Sep. 2019, 111190Y, 111190Y. DOI: 10.1117/12.2530052.

17 **D. M. Miles**, R. M. McEntaffer, J. H. Tutt, *et al.*, "An introduction to the Rockets for Extended-source X-ray Spectroscopy," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11118, Sep. 2019, 111180B, 111180B. DOI: 10.1117/12.2529567.

18 J. H. Tutt, **D. M. Miles**, R. M. McEntaffer, T. Anderson, M. Weiss, and B. C. O'Meara, "The focal plane camera for tREXS," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11118, Sep. 2019, 111180C, p. 111180C. DOI: 10.1117/12.2529555.

19 M. Wages, S. V. Hull, A. D. Falcone, *et al.*, "Flight camera package design, calibration, and performance for the Water Recovery X-ray Rocket mission," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XXI*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 11118, Sep. 2019, 111180D, p. 111180D. DOI: 10.1117/12.2529361.

20 **D. M. Miles**, R. L. McEntaffer, B. D. Donovan, *et al.*, "Grating design for the Water Recovery X-ray Rocket," in *Space Telescopes and Instrumentation 2018: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, S. Nikzad, and K. Nakazawa, Eds., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 10699, Jul. 2018, 106996K, 106996K. DOI: 10.1117/12.2312648.

21 **D. M. Miles**, R. L. McEntaffer, T. B. Schultz, *et al.*, "An introduction to the water recovery x-ray rocket," in *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, O. H. Siegmund, Ed.,

ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 10397, Aug. 2017, 103970R, 103970R. DOI: 10.1117/12.2274249.

22 J. E. Hill, J. K. Black, K. Jahoda, *et al.*, "The x-ray polarimeter instrument on board the Polarimeter for Relativistic Astrophysical X-ray Sources (PRAXyS) mission," in *Space Telescopes and Instrumentation 2016: Ultraviolet to Gamma Ray*, J.-W. A. den Herder, T. Takahashi, and M. Bautz, Eds., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9905, Jul. 2016, 99051B, 99051B. DOI: 10.1117/12.2233322.

23 H. Marlowe, R. L. McEntaffer, C. T. DeRoo, *et al.*, "Polarization sensitivity testing of off-plane reflection gratings," in *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9603, Sep. 2015, 960318, p. 960 318. DOI: 10.1117/12.2186344.

24 J. McCoy, T. Schultz, J. Tutt, T. Rogers, **D. Miles**, and R. McEntaffer, "A primer for telemetry interfacing in accordance with NASA standards using low cost FPGAs," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XIX*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9601, Aug. 2015, 960106, p. 960 106. DOI: 10.1117/12.2186455.

25 **D. M. Miles**, J. H. Tutt, C. T. DeRoo, *et al.*, "Diffraction efficiency of radially-profiled off-plane reflection gratings," in *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9603, Sep. 2015, 960316, p. 960 316. DOI: 10.1117/12.2186842.

26 T. J. Peterson, C. T. DeRoo, H. Marlowe, *et al.*, "Off-plane x-ray reflection grating fabrication," in *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9603, Sep. 2015, 960317, p. 960 317. DOI: 10.1117/12.2188302.

27 T. Rogers, T. Schultz, J. McCoy, **D. Miles**, J. Tutt, and R. McEntaffer, "First results from the OGRESS sounding rocket payload," in *UV, X-Ray, and Gamma-Ray Space Instrumentation for Astronomy XIX*, O. H. Siegmund, Ed., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9601, Sep. 2015, 960104, p. 960 104. DOI: 10.1117/12.2183237.

28 J. H. Tutt, R. L. McEntaffer, C. DeRoo, *et al.*, "Developments in the EM-CCD camera for OGRE," in *High Energy, Optical, and Infrared Detectors for Astronomy VI*, A. D. Holland and J. Beletic, Eds., ser. Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 9154, Jul. 2014, 91540E, 91540E. DOI: 10.1117/12.2054872.