

# Drew M. Miles

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## EDUCATION

<b>Ph.D. in Astronomy &amp; Astrophysics</b>	Dec. 2021
<b>M.S in Astronomy &amp; Astrophysics</b>	Dec. 2018
Penn State University, University Park, PA, USA	
 <b>B.S. in Astronomy and B.S. in Physics</b>	Dec. 2015
University of Iowa, Iowa City, IA, USA	

## POSITIONS HELD

<b>Research Assistant Professor, Caltech</b>	2024 – Present
Postdoctoral Research Associate, Caltech	2022 – 2024
NASA Space Technology Research Fellow, Penn State University	2017 – 2021
Graduate Research Assistant, Penn State University	2016 – 2017

## CURRENT PROJECTS

### **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: Acting PI for balloon-borne multiobject UV spectrograph.

### **Ultraviolet Spectroscopy ... Enabled Through Nanofabrication Techniques**

Period of Performance: 10/01/2022 – 09/30/2025  
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 verification of diffraction efficiency and spectral resolution.

### **Observation Programs**

1. Keck 2024A – 2 nights on KCWI (PI)
2. Keck 2024A – 4 nights on KCWI (Co-I)
3. Keck 2023A –  $2 \times 0.5$  nights on HIRES (PI)

## **PENDING SUPPORT**

### **tREXS-2: The Rockets for Extended-source X-ray Spectroscopy**

Period of Performance: 10/01/2024 – 09/30/2028

Project Funding: ≈\$3.8M

Role: PI

Status: To be submitted to 2023 NASA APRA solicitation

### **Techniques in blazed reflection gratings to enable next-generation spectroscopy**

Period of Performance: 10/01/2024 – 09/30/2027

Project Funding: ≈\$1.4M

Role: PI

Status: To be submitted to 2023 NASA SAT solicitation

### **Nox: the 12U CubeSat Mission Concept for Characterizing LUV/FUV Background**

Period of Performance: 10/01/2024 – 09/30/2026

Project Funding: ≈\$225k Co-I funding

Role: Co-I

Status: To be submitted to 2023 NASA APRA solicitation

## **SELECT PAST PROJECTS**

### **Rockets for Extended-source Soft-X-ray Spectroscopy**

Period of Performance: 01/01/2018 – 12/31/2023

Project Funding: \$4.1M

Role: Acting PI and instrument designer

### **Development of Grating Technology for High-resolution Spectrometers Using Nanofabrication Techniques**

Period of Performance 08/01/2017 – 07/31/2021

Project Funding: \$296k

Role: Fellow

## **TEACHING EXPERIENCE**

### **Live Instruction**

Astronomy Communication (ASTRO 297), Instructor

Fall 2020

*SRTE Instructor Effectiveness: Mean = 6.9/7*

*SRTE Course Effectiveness: Mean = 6.6/7*

Certificate in Online Teaching

Summer 2020

Astronomical Universe (ASTRO 001), Guest Lecturer

2018-2019

Observational Astronomy (ASTRO 320), TA & Lab Lead

Fall 2016

### **Teaching Workshops**

How to Design Courses to Increase Student Learning and Promote Academic Integrity 2024

How Learning Works 2024

The Effects of Stereotypes and Deficit Mindset on Learning 2023

Flipped Classroom: Effective Active Learning in Large Classes 2023

Creating Dynamic and Engaging Lectures 2023

Setting Intentions for Student Learning 2022

Assessment as a Learning Tool	2022
Increasing Student Engagement and Motivation	2022

## **SELECT FELLOWSHIPS AND AWARDS**

Presidential Management Fellow, U.S. Office of Personnel Management	2022 – 2023
NASA Space Technology Research Fellowship, NASA	2017 – 2021
Rising Star in Aerospace, MIT/Stanford/UC-Boulder Rising Stars Program	2021
Downsbrough Graduate Fellowship for Outstanding Success, Penn State University	2019 – 2020
NASA Pennsylvania Space Grant Graduate Fellowship, Penn State University	2017 – 2018
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

## **MENTORING & ADVISING**

### **Graduate Students**

Xihan Deng, <i>FIREBall Balloon Project</i>	2022 – Present
Ross McCurdy, <i>tREXS Sounding Rocket Project</i>	2018 – Present

### **Undergraduate Students**

Vincent Smedile, Thesis: “ <i>Soft X-ray Source Modeling of the Cygnus Loop...</i> ”	2022 – 2023
Outcome: Honor’s thesis, graduate school in Astronomy	
Natalie Zinski, <i>Instrument Modeling</i>	2020 – 2021
Outcome: Position in industry	
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: Position in industry	
Christopher Hillman, <i>WRX Sounding Rocket Instrument</i>	2017 – 2018
Outcome: Position in industry	
Tyler Steiner, <i>Nanofabrication and Data Analysis</i>	2016 – 2017
Outcome: Graduate school in Nuclear Engineering	

## **SELECT OUTREACH ACTIVITIES**

Co-Chair, Student Training Programs WG for Astrophysics With Equity	2023 – Present
Mentor, Caltech Future Ignited Program	2022 – Present
Mentor, Rockets for Inclusive Science Education	2020 – 2021
Co-Organizer and Moderator, Graduate School Information Panel and Town Halls	2020 – 2021
Treasurer, Astronomy on Tap State College	2017 – 2021
Organizer, Science Leadership Camp Instrumentation Lab Research Snapshot	2017

## **PROFESSIONAL SERVICE**

Deputy Secretary, AAS HEAD	2023 – Present
Member, Habitable Worlds Observatory UV Tech Working Group	2023 – Present
Member, New Great Observatories SAG	2023 – Present
Member, Science Analysis Group on Astrophysics With Equity	2023 – Present
Reviewer, Journal of Astronomical Telescopes, Instruments, and Systems	2022 – Present
Division representative, Caltech Postdoctoral Association	2022 – Present
Reviewer, AAS Prize Panel	2022 – Present
Member, LEM CGM and All-sky Survey Working Groups	2022 – Present
Member, AXIS Probe Instrument Working Group	2022 – Present
Review Panel, NASA APRA	2022
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
Member, Lynx Instrument Working Group	2017 – 2021
AAS Chambliss Poster Judge	2019
Research Symposium Reviewer, <i>College of Engineering, Penn State University</i>	2018
Member, American Astronomical Society and SPIE	2015 – Present

## **TECHNICAL PRESENTATIONS**

### **Oral Presentations**

1. *Diffraction grating nanofabrication for astronomy instruments*  
Pasadena City College - *Invited* 2023
2. *The Faint Intergalactic-medium Redshifted Emission Balloon*  
NASA UV Program Review - *Invited* 2023
3. *FIREBall-2: The Faint Intergalactic-medium Redshifted Emission Balloon*  
AAS 241st Meeting, Seattle, WA 2023
4. *Grating spectrographs for extended-source X-ray astronomy*  
Marshall Space Flight Center - *Invited* 2023
5. *An extended-source grating spectrograph for suborbital rockets and small satellite*  
Astronomical X-ray Optics Workshop 2022
6. *Observing diffuse astronomical sources of high-energy emission with suborbital instruments*  
Astronomical Society of Long Island - *Invited* 2022
7. *Enabling new observations of diffuse astrophysical emission with state-of-the-art grating technology*  
Montana State University Physics Colloquium - *Invited* 2022
8. *Reflection grating fabrication for space-based astronomy instruments*  
NASA JPL Microdevices Laboratory Seminar - *Invited* 2022
9. *The Rockets for Extended-source X-ray Spectroscopy*  
AAS HEAD 19, Pittsburgh, PA 2022

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

## Poster Presentations

1. *FIREBall-2: The Faint Intergalactic-medium Redshifted Emission Balloon*  
Scientific Ballooning Technologies Workshop 2023
2. *The Rockets for Extended-source X-ray Spectroscopy*  
NASA Sounding Rocket Symposium, Wallops Flight Facility, VA 2022
3. *Reflection grating fabrication via electron-beam lithography and ion-beam etching*  
SPIE Astronomical Telescopes and Instrumentation, Montreal, Canada 2022
4. *Astronomical X-ray reflection gratings and the Rockets for Extended-source X-ray Spectroscopy*  
AAS 235th Meeting, Honolulu, HI 2020

5. *Nanofabrication of Astronomical Reflection Gratings*  
Cornell NanoScale Facility 2019 Annual Meeting, Ithaca, NY 2019
6. *Progress in X-ray reflection grating development*  
AAS 233rd Meeting, Seattle, WA 2019
7. *A diffuse soft X-ray spectrometer for sounding rocket*  
Astronomical X-ray Optics Workshop, Prague, Czech Republic 2018
8. *The Water Recovery X-ray Rocket*  
SPIE Astronomical Telescopes & Instrumentation, Austin, TX 2018
9. *The Water Recovery X-ray Rocket*  
AAS HEAD 16th Meeting, Sun Valley, ID 2017
10. *HaloSat: a CubeSat to map the distribution of baryonic matter in the Galactic halo*  
AAS HEAD 15th Meeting, Naples, FL 2016
11. *Off-plane X-ray diffraction grating performance and applications*  
Iowa Undergraduate Research Festival, Iowa City, IA 2015

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

### ***In-progress first-author publications:***

1. **D. M. Miles** et al., “Design of the Rockets for Extended-source X-ray Spectroscopy”, *J. Astron. Telesc. Instrum. Syst.*, 2023 (in prep).
2. **D. M. Miles** et al., “FIREBall 2(2023): The 2023 flight of the Faint Intergalactic-medium Redshifted Emission Balloon”, *J. Astron. Telesc. Instrum. Syst.*, 2024 (in prep).
3. **D. M. Miles** et al., “The first flight of the Rockets for Extended-source X-ray Spectroscopy”, *Astrophysical Journal*, 2024 (in prep).

***Refereed Publications:*** 19; 2 first author, 7 with significant contribution, 10 with contribution

19. T. Brendel et al. (inc. **D. M. Miles**), “[Balloon-borne FIREBall-2 UV spectrograph stray light control based on non-sequential reverse modeling of on-sky data](#)”, *J. Astron. Telesc. Instrum. Syst.* 8(4), 048001 (2022).
18. N. Kruczek, **D. M. Miles**, et al., “[High-efficiency echelle gratings for the Far Ultraviolet](#)”, *Applied Optics* 61, 22 (2022).
17. K. France et al. (inc. **D. M. Miles**), “[Extreme-ultraviolet Stellar Characterization for Atmospheric Physics and Evolution \(ESCAPE\) mission: motivation and overview](#)”, *J. Astron. Telesc. Instrum. Syst.* 8(1), 014006 (2022).
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/CO<sub>2</sub>](#)”, *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:** 24; 6 first author, 5 with significant contribution, 13 with contribution

24. V. Picouet, et al. (inc. **D. M. Miles**), “[FIREBall-2: flight preparation of a proven balloon payload to image the intermediate redshift circumgalactic medium](#)”, *Proc. ESA Symposium on European Rocket and Balloon Programmes*, 25th ESA PAC Symposium, 2022.

23. **D. M. Miles**, R. L. McEntaffer, and F. Grisé, “[Blazed reflection gratings with electron-beam lithography and ion-beam etching](#)”, *Proc. SPIE 12181* Space Telescopes and Instrumentation 2022: UV to Gamma Ray, 1218153 (2022).
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. Grisé, **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. Grisé, 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).