

McDonald Observatory
University of Texas at Austin
Stop C1402
Austin, TX 78712-1206

Phone: 512-471-3465
Fax: 512-471-6016
Email:
cfroning@astro.as.utexas.edu
Citizenship: USA

Cynthia S. Froning

Statement

I am an astronomical observer and instrumentalist. I specialize in the development of ultraviolet, optical, and near-infrared cameras and spectrographs for ground- and space-based telescopes and enabling technologies for future instruments. I use multiwavelength observations to address a number of research questions, with a particular interest in the energetic properties and habitability of low mass exoplanet systems and the physics of accretion disks and outflows in X-ray binary systems.

Recent Employment History

Research Scientist

2018—present McDonald Observatory
University of Texas, Austin, TX

University Affiliate Research Fellow

2013–2018 Department of Astronomy
University of Texas, Austin, TX

Associate Director

2011–2013 Center for Astrophysics and Space Astronomy
University of Colorado. Boulder, CO

Assistant Research Professor

2009–2013 Department of Astrophysical and Planetary Sciences,
University of Colorado

Research Associate

2002–2013 Center for Astrophysics and Space Astronomy,
University of Colorado

Postdoctoral Fellow

1999–2002 Space Telescope Science Institute, Baltimore, MD

Ph.D Astronomy

1996–1999 University of Texas, Austin, TX

- Dissertation: *The Near-Infrared Properties of Compact Binary Systems*

MA Astronomy

1993–1996 University of Texas

BS Electrical Engineering, with High Honors

1989–1993 University of Texas

Selected Honors and Awards

- NASA RHG Exceptional Achievement Engineering-Teams award given to the HST Instrument Development for Servicing Mission 4 Team (2009)
- NASA Group Achievement Award to the HST SM4 Servicing Implementation Team (2009)
- University Co-Op Endowment Fellowship (1998–1999)
- David Alan Benfield Memorial Scholarship in Astronomy (1998–1999)
- William S. Livingstone Endowment Fund Fellowship (1997–1998)

- NASA/Texas Space Grant Consortium Fellowship (1997–1998)
- National Science Foundation Graduate Student Fellowship (1993–1996)

Research Highlights

- SDSS-V Architect (2021–)
- Science team, ESCAPE NASA Small Mission Explorer program, selected for Phase A
- PI, Mega-MUSCLES Treasury Survey, a large HST program to characterize the energetic radiation environment in cool stars and its effects on exoplanet atmospheres and habitability (2017–)
- Project Manager, SDSS-V Local Volume Mapper survey (2018–)
- Project Manager, conceptual design study for GMACS optical spectrograph for the Giant Magellan Telescope (2016–2020)
- Project Manager, HET Dark Energy Experiment VIRUS spectrograph development (2016–2018)
- Project Scientist, HST Cosmic Origins Spectrograph (2005–2014)
- PI, conceptual design study for the Gemini High-resolution Optical Spectrograph (2011–2012).
- PI, conceptual design study for a High Resolution Optical Spectrograph for the Thirty Meter Telescope (2005–2006).
- Co-I, development of the first NIR laser comb for ultra high precision calibration to support radial velocity exoplanet searches (2006–present).
- Program Director of the NIC-FPS NIR camera instrument team for the Apache Point Observatory 3.5-m telescope (2004).
- Member of the instrument development team for the CoolSpec NIR spectrograph and the instrument refit team for Rokcam, the NIR imager, both for McDonald Observatory (1996–1999).

Teaching Experience

- Undergraduate mentoring: Steven Herrera (2017–2019); Steve Anusie, TAURUS Scholars program (2018–2019)
- Taught AST 351/392J *Astronomical Instrumentation*, Spring 2016, UT Austin, a cross-listed upper level and graduate level lab instrumentation course
- Supervised graduate student J. Khargharia (Ph.D completion: Summer 2012).
- Taught ASTR 3520 *Observations and Instrumentation 2*, Spring 2011, CU Boulder, an undergraduate major lab course focusing on spectroscopy observations and data analysis.
- Teaching assistant at the University of Texas (1996–1997), including leading discussion sessions and instrument training at McDonald Observatory.

Membership and Service

- Project Manager, UT Austin Task Force for Fall 2020 planning (2020-2021)
- Executive Committee, Center for Planetary Systems Habitability (2020-)
- Gemini Observatory Board member (2019-)
- Space Telescope Science Institute User's Committee (STUC), 2016–2018.
- Mikulski Archive for Space Telescopes User's Group member, 2014–2016.
- Member, American Astronomical Society.
- Past CASA Associate Director and CASA Fellow. Current CASA Affiliated Fellow. CASA is a research center serving 11 rostered faculty, 25 research scientists, 39 undergraduate and graduate students, and 14 staff. CASA has a \$2.1M yearly budget.
- Member, McDonald Observatory and HET Telescope Allocation Committee

(2017–2020).

- Regular participation in refereeing manuscripts, serving on review and advisory panels for NASA and the NSF, etc.
- Far Ultraviolet Spectroscopic Explorer (FUSE) Observer's Advisory Committee (2003–2008) and various conference SOCs.
- Press activities: development of Cosmic Origins Spectrograph Early Release Observations and press release materials for the HST Servicing Mission 4 press conference; press interviews in support of press releases concerning observations of exoplanet atmospheres of WASP-12b and HD209458b.
- Community service: South by Southwest NASA education booth, Austin Astronomy on Tap, lecturing at University of Denver's Osher Lifelong Learning Institute and Ball Aerospace, participating in McDonald Observatory Board of Visitors meeting, CU Astronomy Day, star party support, interviews with high school students, etc.
- Invited participant in the Keck Institute for Space Studies workshop "Next Generation UV Instrument Technologies Enabling Missions in Astrophysics, Cosmology and Planetary Sciences."
- Data products: The MUSCLES Treasury Survey, FUSE Survey of Cataclysmic Variables (HST MAST High Level Science Products); Basic Galaxy Data for Spiral Rich Group Members, HST COS and STIS Absorption Line Spectroscopy (VizieR Online Catalogs).

Refereed Publications

- Gebherdt, K., et al. 2021, ApJ, submitted, *The Hobby-Eberly Telescope Dark Energy Experiment (HETDEX) Survey Design, Reductions, and Detections*
- Sneden et al. 2021, AJ, 161,128, *Chemical Compositions of Red Giant Stars from Habitable Zone Planet Finder Spectroscopy*
- Wilson et al. 2021, ApJ, 911, 18, *The Mega-MUSCLES Spectral Energy Distribution of Trappist-1*
- Duvvuri, G, et al. 2021, ApJ, 913, 40, *Reconstructing the Extreme Ultraviolet Emission of Cool Dwarfs*
- Linsky, J. et al. 2020, ApJ, 902, 3, *The Relative Emission from Chromospheres and Coronae: Dependence on Spectral Type and Age*
- France et al. 2020, AJ, 160, 237, *The High-energy Radiation Environment Around a 10 Gyr M dwarf: Habitable at Last?*
- Melbourne et al. 2020, AJ, 160,269, *Estimating the Ultraviolet Emission of M Dwarfs with Exoplanets from Ca II H&K*
- Froning et al. 2019, ApJL, 871, L26, *A Hot Ultraviolet Flare on the M Dwarf Star GJ 674*
- Hynes et al. 2018, MNRAS, 487, 60, *Optical and X-ray Correlations During the 2015 Outburst of the Black Hole V404 Cyg*
- Loyd et al. 2018, ApJ, 867, 71, *The MUSCLES Treasury Survey. V. FUV Flares on Active and Inactive M Dwarfs*
- Youngblood et al. 2017, ApJ, 843, 31, *The MUSCLES Treasury Survey. IV. Scaling Relations for Ultraviolet, Ca II H&K, and Energetic Particle Fluxes from M Dwarfs*
- Keeney, B., et al. 2017, ApJS, 230, 6, *Characterizing the Circumgalactic Medium of Nearby Galaxies with HST/COS and HST/STIS Absorption-Line Spectroscopy: II. Methods and Models*
- Robinson, E.L., Froning, C.S., et al. 2017, ApJ, 841, 79, *The Spectrum of SS 433 in the H and K Bands*
- Connors, R., et al. 2016, MNRAS, 466, 4121, *Mass Scaling as a Method to Constrain Outflows and Particle Acceleration from Low-Luminosity Accreting*

Black Holes

- Loyd, R.P. et al. 2016, ApJ, 824, 102, *The MUSCLES Treasury Survey III: X-ray to Infrared Spectra of 11 M and K Stars Hosting Planets*
- Youngblood, A. et al. 2016, ApJ, 824, 101, *The MUSCLES Treasury Survey II: Intrinsic Lyman Alpha and Extreme Ultraviolet Spectra of K and M Dwarfs with Exoplanets*
- France, K., et al. 2016 ApJ, 820, 89, *The MUSCLES Treasury Survey I: Motivation and Overview*
- Danforth, C. W., et al. 2016, ApJ, 817, 111, *An HST/COS Survey of the Low-Redshift Intergalactic Medium. I. Survey, Methodology, and Overall Results*
- Zhang, S., et al. 2015, MN, 447, 2671, *Modeling Warm Absorptions in the HST/COS Spectrum of Mrk 290 with XSTAR*
- Stocke, J., et al. 2014, ApJ, 791, 128, *Absorption-line Detections of the Intra-Group Medium in Spiral-Rich Groups of Galaxies*
- Hoard, D., et al. 2014, ApJ, 786, 68, *Nova-Like Cataclysmic Variables in the Infrared*
- Froning, C.S., et al. 2014 ApJ, 780, 48, *Multiwavelength Observations of Swift J1753.5-0127*
- France, K., Froning, C. S., et al. 2013, ApJ, 763, 149, *The Ultraviolet Radiation Environment Around M-Dwarf Exoplanet Host Stars*
- Stocke, J., et al. 2013, ApJ, 763, 148, *Characterizing the Circumgalactic Medium of Nearby Galaxies With HST/COS and /STIS Absorption-Line Spectroscopy*
- Khargharia, J., Froning, C. S., Robinson, E.L., & Gelino, D. 2012, AJ, 145, 21, *The Mass of the Black Hole in XTE J1118+480*
- Haswell, C., et al. 2012, ApJ, 760, 79, *Near-ultraviolet Absorption, Chromospheric Activity, and Star-Planet Interactions in the WASP-12 system*
- France, K., Linsky, J. L., Tian, F., Froning, C.S., & Roberge, A. 2012, ApJ, 750, L32, *Time-Resolved Spectroscopy of the M-dwarf GJ 876 Exoplanetary System*
- Froning, C. S., Long, K. S., Gänsicke., B., & Szkody, P. 2012, ApJS, 199, 7, *A Survey of Far Ultraviolet Spectroscopic Explorer Observations of Cataclysmic Variables*
- Khargharia, J., Stocke, J. T., Froning, C. S., Gopakumar, A. & Joshi, B. C. 2012, ApJ, 744, 183, *PSR J1903+0327: A Unique Milli-Second Pulsar with a Main-Sequence Companion Star*
- Green, J. C., Froning, C. S., et al. 2012, ApJ, 744, 60, *The Cosmic Origins Spectrograph*
- Froning, C.S., et al. 2011, ApJ, 743, 26, *Multiwavelength Observations of A0620-00 in Quiescence*
- Narayanan, A., et al. 2011, ApJ, 730, 14, *Cosmic Origins Spectrograph Detection of Ne VIII Tracing Warm-Hot Gas Towards PKS0405-123*
- Winter, L.M., Danforth, C., Vasudevan, R., Brandt, W.N, Scott, J., Froning, C., Keeney, B., Shull, J.M., Penton, S., Mushotzky, R., Schneider, D.P., & Arav, N. 2011, ApJ, 728, 28, *Ultraviolet and X-ray Variability of the Seyfert 1.5 Galaxy Markarian 817*
- Fossati, L., et al. 2010, ApJ, 720, 872, *A Detailed Spectropolarimetric Analysis of the Planet-hosting star WASP-12*
- Linsky, J.L., Yang, H., France, K., Froning, C.S., Green, J.C., Stocke, J.T., & Osterman, S.N, 2010, ApJ, 717, 1291, *Observations of Mass Loss from the Transiting Exoplanet HD209458b*
- Khargharia, J., Froning, C.S., & Robinson, E.L. 2010, ApJ, 716, 1105, *Near-*

Infrared Spectroscopy of Low Mass X-ray Binaries: Accretion Disk Contamination and Compact Object Mass Determination in V404 Cyg and Cen X-4

- France, K., Linsky, J.L., Brown, A., Froning, C.S., & Beland, S. 2010, ApJ, 715, 596, *Metal Depletion and Warm H₂ in the Brown Dwarf 2M1207 Accretion Disk*
- Fossati, L., Haswell, C.A., Froning, C.S., et al. 2010, ApJ, 714, 222, *Metals in the Exosphere of the Highly Irradiated Planet WASP-12b*
- France, K., Stocke, J., Yang, H., Linsky, J., Wolven, B.C., Froning, C.S., Green, J.C., & Osterman, S.N. 2009, ApJ, 712, 1277, *Searching for Far-Ultraviolet Auroral/Dayglow Emission from HD209458b with the Cosmic Origins Spectrograph*
- Cantrell, A.G., Baily, C.D., Orosz, J.A., McClintock, J.E., Remillard, R.A., Froning, C.S., Neilsen, J., & Gelino, D. 2009, ApJ, 710, 1127, *The Inclination of the Soft X-ray Transient A0620-00 and the Mass of its Black Hole*
- France, K., Beasley, M., Keeney, B.A., Danforth, C.W., Froning, C.S., Green, J.C., & Shull, J.M. 2009, ApJ, 707, 27, *Cosmic Origins Spectrograph Observations of the Chemical Composition of SNR LMC N132D*
- Long, K. S., Gansicke, B. T., Knigge, C., & Froning, C.S. 2009, ApJ, 697, 1512, *The Effect of the Superoutburst on the White Dwarf in VW Hydr as Observed with FUSE*
- Hoard, D.W., et al. 2009, ApJ, 693, 236, *Observations of V592 Cassiopeiae with the Spitzer Space Telescope — Dust in the Mid-Infrared*
- Reynolds, M.T., Callanan, P.J., Robinson, E.L., & Froning, C.S., 2008, MNRAS, 387, 788, *IR Contamination in Galactic X-Ray Novae*
- Froning, C.S., Robinson, E.L., & Bitner, M.A., 2007, ApJ, 663, 1215, *Near-Infrared Spectra of the Black Hole X-Ray Binary, A0620-00*
- Long, K.S., Brammer, G., & Froning, C.S. 2006, ApJ, 648, 541, *FUSE Spectroscopy of the White Dwarf in U Geminorum*
- Long, K.S., Froning, C.S., Knigge, C., Blair, W.P., Kallman, T.R., & Ko, Y.-K. 2005, ApJ, 630, 511, *FUV Spectroscopy of the Dwarf Novae SS Cygni and WX Hydr in Quiescence*
- Hartley, L.E., Long, K.S., Froning, C.S., & Drew, J.E. 2005, ApJ, 623, 425, *The Far Ultraviolet Spectrum of Z Cam in Quiescence and Standstill*
- Hoard, D.W., Szkody, P., Froning, C.S., Long, K.S., & Knigge, C. 2003, AJ, 126, 2473, *Observations of the SW Sextantis Star DW Ursae Majoris with the Far Ultraviolet Spectroscopic Explorer*
- Godon, P., Cheng, F., Sion, E.M., Szkody, P., Long, K.S., & Froning, C. S. 2004, ApJ, 612, 429, *Far Ultraviolet Observations of the Dwarf Nova VW Hyi in Quiescence*
- Froning, C.S., Long, K.S., & Baptista, R. 2003, AJ, 126, 964, *Hubble Space Telescope Observations of the Nova-Like Cataclysmic Variable V348 Puppis*
- Prinja, R.K., Long, K.S., Froning, C. S., Knigge, C., Witherick, D. K., Clark, J. S., & Ringwald, F. A. 2002, MNRAS, *FUSE and HST Ultraviolet Observations of the Disc Wind of RW Sextantis*
- Long, K.S., Froning, C.S., Gänsicke, B., Knigge, C., Sion, E. M., & Szkody, P. 2003, ApJ, 591, 1172, *WZ Sge: FUSE Spectroscopy of the 2001 Outburst*
- Froning, C.S., Long, K.S., & Knigge, C. 2002, ApJ, 584, 433, *Accretion and Outflow in Interacting Binary Systems: FUSE Observations of the Novalike Cataclysmic Variable, UX Ursae Majoris*
- Froning, C.S., Long, K.S., Drew, J.E., Knigge, C., & Proga, D. 2001, ApJ, 562, 963, *FUSE Observations of U Geminorum During Outburst and Decline*
- Froning, C. S. & Robinson, E. L. 2001, AJ, 121, 2212, *Near-Infrared Light*

Curves of the Black Hole Binary A0620—00

- Froning, C. S., Robinson, E. L., Welsh, W. F., & Wood, J. H. 1999, ApJ, 523, 399, *The Quiescent Accretion Disk in IP Peg at Near-Infrared Wavelengths*
- Barnes, T. G. III, Ivans, I. I., Martin, J., Froning, C. S., & Moffett, T. J., 1999, PASP, 111, 812, *V(RI)_c Photometry of Cepheids in the Magellanic Clouds*
- Lester, D. F., Hill, G. J., Doppmann, G., & Froning, C. S. 2000, PASP, 112, 384, *CoolSpec: A Near-Infrared Long-Slit Spectrometer for McDonald Observatory*

Books

- Froning, C.S. & Clemens, J. C. 2021, in Handbook of Astronomical Instrumentation, eds. D. Burrows & A. Moore (Singapore: World Scientific Publishing Corp.), *Dispersive Elements*

**Selected
Instrumentation
Papers**

- Hill, G., et al. 2021, AJ, submitted, *The HETDEX Instrumentation: Hobby-Eberly Telescope Wide Field Upgrade and VIRUS*
- France, K., et al. 2021, PASP, submitted, *The Extreme-ultraviolet Stellar Characterization for Atmospheric Physics and Evolution (ESCAPE) Mission: Motivation and Overview*
- Konidaris, N., et al. 2020, Proc. SPIE 11447, 8, *SDSS-V Local Volume Mapper Instrument: Overview and Status*
- Herbst, T., et al. 2020, Proc. SPIE, 11447, 0J, *Local Volume Mapper Telescope System*
- Feger, T., et al. 2020, Proc. SPIE 11447, 18, *SDSS-V Local Volume Mapper Fiber Cable System*
- France, K., et al. 2020, Proc. SPIE, 11444, 05, *EUV Spectroscopy with the ESCAPE Mission: exploring the stellar drivers of exoplanet habitability*
- Faes, D., et al. 2018, Proc. SPIE, 10705, 1AF, *Systems Engineering Applied to ELT Instrumentation: the GMACS Case*
- Cook E., et al. 2018, Proc. SPIE, 10702, 9ZC, *Electronics Prototypes for the Giant Magellan Telescope Multi-object astronomical and cosmological spectrograph (GMACS)*
- Prochaska, T., et al. 2018, Proc SPIE, 10702, 9YP, *The optomechanical design of the Giant Magellan telescope multi-object astronomical and cosmological spectrograph (GMACS)*
- Ribeiro, R., et al. 2018, Proc. SPIE, 10702, 9BR, *The optical design for the Giant Magellan Telescope Multi-object Astronomical and Cosmological Spectrograph (GMACS)*
- DePoy, D., et al. 2018, Proc. SPIE, 10702, 1XD, *GMACS: a wide-field, moderate-resolution spectrograph for the Giant Magellan Telescope*
- Indahl, B., et al. 2018, Proc. SPIE, 10702, 81I, *VIRUS: comparison of lab characterization with on-sky performance for multiple spectrograph units*
- Hill, G., et al. 2018, Proc. SPIE, 10702, 1KH, *VIRUS: status and performance of the massively replicated fiber integral field spectrograph for the upgraded Hobby-Eberly Telescope*
- Schmidt, L.M., et al. 2016, Proc. SPIE, 9908, 9908A4, *Optical design concept for the Giant Magellan Telescope Multi-object Astronomical and Cosmological Spectrograph (GMACS)*
- Prochaska, T., et al. 2016, Proc. SPIE, 9908, 9908A3, *Optomechanical design concept for the Giant Magellan Telescope Multi-object Astronomical and Cosmological Spectrograph (GMACS)*
- Froning, C.S., et al. 2013, Proc. SPIE, 8836, 88360Y *A Conceptual Design for a Cassegrain-mounted high resolution optical spectrograph for large aperture*

telescopes

- Froning, C. S. et al. 2012, *Conceptual Design Study for the Gemini High Resolution Optical Spectrograph*, Gemini Documents GHOSD-01 to GHOSD-06, University of Colorado study
- Froning, C. S. 2011, *Ap&SS*, 335, 267, *Early Science Results from the Cosmic Origins Spectrograph*
- Ghavmanian, P., Froning, C., Osterman, S., Keyes, C.D., & Sahnou, D. 2010, STScI Instrument Science Report COS 2010-09, *COS FUV External Spectroscopic Performance*
- Sahnou, D. J., et al. 2010, *SPIE*, 7731, 103, *Commissioning of the Cosmic Origins Spectrograph on the Hubble Space Telescope: an Overview of COS Servicing Mission Observatory Verification*
- Froning, C. S. & Green, J. C. 2009, *Ap&SS*, 320, 181, *The Cosmic Origins Spectrograph: Capabilities and Prelaunch Performance*
- Froning, C.S., Holtzmann, J., Beasley, M., & Burrows, C. 2009, white paper for the Astrophysical Research Consortium, *Apache Point Observatory 3.5-m Telescope Optical Camera Upgrade Options*
- Elias, et. Al. 2009, *Astro2010: The Astronomy and Astrophysics Decadal Survey*, Position Papers, no. 12, *Developing Future Generations of Instrument Builders*
- Osterman, S., Diddams, S., Beasley, M., Froning, C., et al. 2007, *SPIE*, 6693, 44, *A Proposed Laser Frequency Comb-Based Wavelength Reference for High-Resolution Spectroscopy*
- Froning, et al., 2006, *SPIE*, 6269, 61, *Conceptual Design for a High Resolution Optical Spectrograph on the Thirty Meter Telescope: a New Concept for a Ground-Based High-Resolution Optical Spectrograph*
- Osterman, et al., 2006, *SPIE*, 6269, 95, *A High Resolution Optical Spectrograph for the Thirty Meter Telescope: Design and Performance*
- Hearty, F., et al. 2004, *SPIE*, 5492, 1623, *Near-Infrared Camera and Fabry-Perot Spectrograph (NIC-FPS)*

Invited Talks

- Johns Hopkins University, April 2019, *The Mega-MUSCLES Treasury Survey*
- Texas Advanced Computing Center, TACCSTER Symposium for Texas Researchers, September 2018, *Using TACC Resources in the Advent of the Big Data Era of Observational Astronomy*
- Southwest Research Center, colloquium, September 2018, *Flexing our MUSCLES: the HST Mega-MUSCLES Treasury Survey*
- Space Telescope Science Institute, December 2016, *Science Enabled by Servicing the Hubble Space Telescope: a Symposium in Honor of Frank Cepollina, Spectroscopy with the Hubble Space Telescope*
- Thirty Meter Telescope Science Forum, Kyoto, May 2016, *High Resolution Optical Spectroscopy in the E-ELT Era*
- Anton Pannekoek Institute for Astronomy, University of Amsterdam, September 2015, *Probing Cosmic Origins: Ultraviolet Spectroscopy with the Cosmic Origins Spectrograph*
- Texas A&M University, October 2014
- Institute for Astronomy, University of Hawaii, January 2012
- University of Wisconsin-Madison, February 2011
- Princeton University, November 2010
- NOAO/Steward Observatory, October 2010
- Science With the Hubble Space Telescope III, Venice, October 2010

- UV Universe 2010, St. Petersburg, June 2010 (Froning 2011)
- Special session, "Science with the New HST," American Astronomical Society, Washington, D.C., January 2010
- University of Wyoming, April 2008
- Science with the New Hubble Space Telescope, Bologna, Italy, January 2008
- University of New Mexico, October 2007
- Space Astronomy: the UV Window to the Universe, El Escorial, Spain, May 2007 (Froning & Green 2009)
- Astrophysics in the Far Ultraviolet: Five Years of Discovery With FUSE, Victoria, B. C., August 2004
- The Astrophysics of Cataclysmic Variables, Strasbourg, France, July 2004
- San Diego State University, May 2004