

Professor Erika T. Hamden

University of Arizona
Steward Observatory
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RESEARCH INTERESTS

observational astronomy, UV optics and detector technology, Galactic molecular clouds, star formation, the interstellar, intergalactic and circumgalactic media, galactic outflows, integral field spectroscopy

APPOINTMENTS

Assistant Professor, University of Arizona, 2018 - Present

Postdoctoral Fellow, California Institute of Technology, 2014 - 2018

R.A. & G.B. Millikan Prize Postdoctoral Fellowship in Experimental Physics, 2017-2018

NSF Astronomy and Astrophysics Postdoctoral Fellowship, 2014-2017

Faculty Sponsor: D. Christopher Martin

EDUCATION

Columbia University, New York, NY

Ph.D., Astronomy, July 2014

Thesis: FIREBall, CH α S, and the diffuse universe

Advisor: David Schiminovich

M.Phil, Astronomy, 2010

M.A., Astronomy, 2009

Harvard College, Cambridge, MA

A.B., Astronomy & Astrophysics, June 2006

Cum Laude with High Honors

Thesis: A Radial Velocity Survey of the Orion Nebula Cluster using Hectochelle

Advisor: Andy Szentgyorgyi

AWARDS AND HONORS

Presidential Early Career Award for Scientists and Engineers (PECASE), 2019.

Nominated by NASA

2019 TED Fellow

Nancy Grace Roman Technology Fellowship in Astrophysics for Early Career Researchers-

Concept Study, 2016 & Development Phase, 2017

R.A. & G.B. Millikan Prize Postdoctoral Fellowship in Experimental Physics at Caltech 2017-2018

NASA Group Achievement Award to Advanced UV/Optical Detector Arrays & Systems Team- 2014

NSF Astronomy and Astrophysics Postdoctoral Fellowship 2014-2017

NASA Earth and Space Science Fellowship (NESSF), 2011-2014

RESEARCH GRANTS, as PI or Co-PI

NASA RTF 2015 (15-RTF15-0005): EMCCD technology for ultraviolet astronomy and high resolution spectroscopy (PI, **\$400K**)

NSF AAG 2016 (1716907): Protogalactic Disks: A New Window on Galaxy Formation (Co-PI with D. Christopher Martin, **\$716K**)

NSF AAPF 2014 (1402206): Understanding galaxy growth and history through innovative instruments (PI, **\$267K**)

RESEARCH GRANTS, with significant contribution as Co-I

NASA APRA 2015 (15-APRA15-0147): FIREBall-2: Trailblazing observations of the space UV circumgalactic medium. (PI: C. Martin, **\$1.9M**)

NASA APRA 2014 (14-APRA14-0150): FIREBall-2: Pioneering Space UV Baryon Mapping (Lead Institution). (PI: C. Martin, **\$650K**)

COMPETITIVELY OBTAINED TELESCOPE TIME, as PI

Keck II, 2018B: *KCWI Deep Field Pilot Study*, 1 night

Keck II, 2017B: *KCWI Deep Field Pilot Study*, 1 night

Palomar 200 inch, 2017B: *A systematic survey of giant Ly α blobs in over-dense fields*, 3 nights

Palomar 200 inch, 2017A: *A systematic survey of giant Ly α blobs in over-dense fields*, 3 nights

Palomar 200 inch, 2016B: *A systematic survey of giant Ly α blobs in over-dense fields*, 3 nights

Palomar 200 inch, 2016A: *Mapping MgII emission with the Cosmic Web Imager*, 5 nights

Palomar 200 inch, 2015B: *Mapping MgII emission with the Cosmic Web Imager*, 4 nights

RESEARCH EXPERIENCE

Assistant Professor, University of Arizona, 2018 - present

Hyperion, a mission concept to be proposed for a SMEX mission for a FUV long slit-spectrograph to observe molecular hydrogen at the boundaries of molecular clouds in nearby, galactic star forming regions. Prof. Hamden is the PI, working with Ball Aerospace and Ames Research Center.

Hamden UV/VIS Detector Lab (HUVVD), funded by a Nancy Grace Roman Technology Fellowship. The lab is working to flight test UV optimized EMCCDS for use on future space missions. This testing includes characterizing QE, noise, dark current, radiation hardness, as well as optimizing electronics for readout. The lab is also seeking to expand into using Skipper CCDs for astronomical purposes and technology development for UV applications. This lab is a continuation of the work started at Caltech.

Project Scientist for the Keck Cosmic Reionization Mapper (KCRM), the red channel for the Keck Cosmic Web Imager (KCWI). Lead of KCRM Scientific Oversight Committee.

Postdoctoral Fellow, California Institute of Technology, 2014 - 2018

Hamden UV/VIS Detector Lab (HUVVD), funded by a Nancy Grace Roman Technology Fellowship. The lab is working to flight test UV optimized EMCCDS for use on future space missions. This testing includes characterizing QE, noise, dark current, radiation hardness, as well as optimizing electronics for readout.

Project Scientist for the Faint Intergalactic Redshifted Emission Balloon (FIREBall-2). Successful launch Sept 2018 from CSBF facility in Fort Sumner, NM.

Project Scientist for the Keck Cosmic Reionization Mapper (KCRM), the red channel for the Keck Cosmic Web Imager (KCWI). Lead of KCRM Scientific Oversight Committee.

MgII observations of low-redshift galaxies and other observations with the Palomar Cosmic Web Imager (PCWI).

KCWI Deep Field in the Hubble Ultra Deep Field. Pilot survey in Fall 2018.

A systematic survey of giant Ly α blobs in extreme over-dense fields using PCWI and KCWI.

A study of the ISM of nearby resolved galaxies using PCWI, KCWI, and JWST.

Graduate Research Fellow, Columbia University, 2007 - 2014

Technology: Design, testing, and growth of high efficiency anti-reflection coatings for use on delta-doped CCDs at UV/VIS wavelengths

Observation: Diffuse Galactic FUV background and dusty Galactic clouds with GALEX; Observations of diffuse H α emission from galactic nebulae and nearby galaxies with proto-type Circumgalactic H- α spectrograph (CH α S).

Instrumentation: FIREBall- building and testing guider/mask system, developed UV anti-reflection coatings for detector and small optical surfaces; proto-type CH α S- built and commissioned narrow-band H α IFU for MDM telescopes at Kitt Peak; surface metrology and thermal contraction testing for proto-type LSST CCDs

Research Assistant, Harvard-Smithsonian Center for Astrophysics, 2005-2006

Advisor: Pat Slane. Compact object search using XMM-Newton data of supernova remnants

TEACHING, PUBLIC OUTREACH, PUBLIC SPEAKING

Panelist, Phoenix Fan Fusion, "Stars of AZ Science" Panel, May 2019

Storyteller, Story Collider LA, "The Falcon is a Metaphor", May 2019

Speaker, 2019 TED Conference, April 2019

Lecturer, Steward Observatory Public Evening Lecture Series, University of Arizona, 2019
Lecture: "The Ridiculous World of Scientific Ballooning"

Volunteer, Organizer, and Lecturer, Public Outreach, California Institute of Technology, 2016-2018

Telescope Coordinator for monthly outreach program. Program consists of 30 minute public lectures with 90 minutes of stargazing afterwards.

Lecture: "How to prepare for the Great American Eclipse of 2017", *California Institute of Technology*, Pasadena, CA, November 2016

Volunteer for Pasadena Astronomy on Tap lecture series. Program consists of 2 short 20 minute lectures in a casual, bar setting, with Q & A after.

Lecture: "An ode to a lost spacecraft: Cassini at Saturn", *Astronomy on Tap*, Pasadena, CA, October 2017.

Presenter, Caltech Reel Science Series & Science Saturdays, California Institute of Technology, 2015-2017

Presentation of *Planet Earth: Caves*, with scientific introduction and discussion afterward. Directed towards middle school aged students.

Presenter, Caltech Explorer's Club, California Institute of Technology, 2014

Presentation on light, the multi-wavelength universe, and how colors are perceived for after-school club meeting of elementary school aged students.

Mentor & Organizer, Rooftop Variables, Columbia University, 2008 - 2014

Mentored Anthony Finney, high school science teacher, and his class in astronomy education, telescope and CCD usage.

Helped design more general curriculum to teach public school science teachers the basics of observational astronomy and telescope/CCD use.

Volunteer & Lecturer, Public Outreach, Columbia University, 2007 - 2014

Telescope and lecture volunteer for twice monthly outreach program

Lecture: "Comet of the Century?", *Columbia University*, New York, NY, Dec 2013

Lecture: "Strange Shapes: Spirals, Polygons, and Fractals in the Universe" *Columbia University*, New York, NY, February 2008

Weston Science Scholars Program Mentor, Montclair State University, 2006-2012

Mentor for 4-8 high school students for a six week research project. Developed curriculum and research project. Topics included "The Physics of Baseball", "Astrophotography", and "Solar Observing".

Head Teaching Assistant, Columbia University, 2009-2010

Oversaw all undergraduate astronomy lab classes; organized graduate student teaching assistants; coordinated mid-term and final grading for all undergraduate astronomy classes; handled enrollment and final grades.

Lab Instructor, Columbia University, 2007 - 2010

Astronomy 1403: "Earth, Moon & Planets"

Astronomy 1404: "Beyond the Solar System"

PUBLICATIONS, refereed

1. "Multi-filament inflows in forming protogalaxies". D. C. Martin, D.O. Sullivan, M. Matuszewski, **E. T. Hamden**, A. Dekel, P. Morrissey1, J. D. Neill, S. Cantalupo, J. X. Prochaska, C. Steidel, R. Trainor, A. Moore. *Accepted by Nature*, 2019.
2. "Keck/Palomar Cosmic Web Imagers (KCWI/PCWI) Reveal an Enormous Ly Nebula in an Extremely Overdense QSO Pair Field at $z=2.45$ ". Z. Cai, **E. T. Hamden**, M. Matuszewski, J. X. Prochaska, Q. Li, S. Cantalupo, F. A. Battaia, C. Martin, J. D. Neill, D. O'Sullivan, R. Wang, A. Moore, P. Morrissey. *The Astrophysical Journal, Letters*, 861:L3, 2018.

3. “High-efficiency UV/optical/NIR detectors for large aperture telescopes and UV explorer missions: development of and field observations with delta-doped arrays”. S. Nikzad; A. D. Jewell; M. E. Hoenk; T. J. Jones; J. Hennessy; T. M. Goodsall; A. G. Carver; C. Shapiro; S. R. Cheng; **E. T. Hamden**; G. Kyne; D. C. Martin; D. Schiminovich; P. Scowen; K. France; S. McCandliss; & R. E. Lupu. *Journal of Astronomical Telescopes, Instruments, and Systems*, 3(3), 036002, Sept 2017.
4. “Discovery of an Enormous Ly α nebula in a massive galaxy overdensity at $z = 2.3$ ”, Z. Cai, Z. Fan, Y. Yang, F. Bian, J. X. Prochaska, A. Zabludoff, I. McGreer, Z. Zheng, R. Green, S. Cantalupo, B. Frye, **E. Hamden**, L. Jiang, N. Kashikawa, R. Wang. *Astrophysical Journal*, 837:71, Mar. 2017
5. “CCD detectors with high QE at UV wavelengths”. **E. T. Hamden**, A. D. Jewell, C. A. Shapiro, S. R. Cheng, T. M. Goodsall, J. Hennessy, M. E. Hoenk, T. J. Jones, S. Gordon, H. Ong, D. Schiminovich, D. C. Martin, S. Nikzad. *Journal of Astronomical Telescopes, Instruments, and Systems* 2(3), 036003, Sep. 2016.
6. “The Diffuse Galactic Far Ultraviolet Sky”. **E. T. Hamden**, D. Schiminovich, and M. Seibert. *Astrophysical Journal*, 799:180H, Dec. 2013
7. “Atomically precise surface engineering of silicon CCDs for enhanced UV quantum efficiency”. F. Greer, **E. T. Hamden**, B. C. Jacquot, M. E. Hoenk, T. J. Jones, M. R. Dickie, S. P. Monacos, and S. Nikzad. *Journal of Vacuum Science and Technology A*, 31:01A103, Sept. 2013 *Cover Article*
8. “The GALFA-H I Compact Cloud Catalog”. D. R. Saul, J. E. G. Peek, J. Grcevich, M. E. Putman, K. A. Douglas, E. J. Korpela, S. Stanimirović, C. Heiles, S. J. Gibson, M. Lee, A. Begum, A. R. H. Brown, B. Burkhart, **E. T. Hamden**, N. M. Pingel, and S. Tonnesen. *Astrophysical Journal*, 758:44, Oct. 2012.
9. “Ultraviolet anti-reflection coatings for use in silicon detector design”. **E. T. Hamden**, F. Greer, M. E. Hoenk, J. Blacksberg, M. R. Dickie, S. Nikzad, D. C. Martin, and D. Schiminovich. *Applied Optics*, 50:4180–4188, July 2011.
10. “Delta-doped electron-multiplied CCD with absolute quantum efficiency over 50% in the near to far ultraviolet range for single photon counting applications”. S. Nikzad, M. E. Hoenk, F. Greer, B. Jacquot, S. Monacos, T. J. Jones, J. Blacksberg, **E. T. Hamden**, D. Schiminovich, *Applied Optics*, 51:365, Jan. 2011.
11. “Measuring Transverse Motions for Nearby Galaxy Clusters”. **E. T. Hamden**, C. M. Simpson, K. V. Johnston, and D. M. Lee. *Astrophysical Journal, Letters*, 716:L205–L208, June 2010.
12. “Kinematic Structure of the Orion Nebula Cluster and its Surroundings”. G. Fűrész, L. W. Hartmann, S. T. Megeath, A. H. Szentgyorgyi, and **E. T. Hamden**. *Astrophysical Journal*, 676:1109–1122, Apr. 2008.

PUBLICATIONS, unrefereed

1. Erika T. Hamden, Keri Hoadley, D. Christopher Martin, David Schiminovich, Bruno Milliard, Shouleh Nikzad, Ramona Augustin, Philippe Balard, Patrick Blanchard, Nicolas Bray, Marty Crabill, Jean Evrard, Albert Gomes, Robert Grange, Julia Gross, April Jewell, Gillian Kyne, Michele Limon, Nicole Lingner, Mateusz Matuszewski, Nicole Melso, Frederi Mirc, Johan Montel, Hwei Ru Ong, Donal O’Sullivan, Sandrine Pascal, Etienne Perot, Vincent Picouet, Muriel Saccoccio, Brian Smiley, Xavier Soors, Pierre Tapie, Didier Vibert, Isabelle Zenone, Jose Zorrilla, “FIREBall-2: advancing TRL while doing proof-of-concept astrophysics on a suborbital platform”, Submitted to Proceedings of SPIE (2019)
2. Gillian Kyne, Erika T. Hamden, Nicole R. Lingner, Patrick Morrissey, Shouleh Nikzad, D. Christopher Martin, “The faint intergalactic-medium red-shifted emission balloon: future UV observations with EMCCDs”, Proceedings of SPIE Vol. 9915, 991507 (2016)
3. Robert Grange, Bruno Milliard, Gerard R. Lemaître, Samuel Quiret, Sandrine Pascal, Alain Orign, Erika T. Hamden, David Schiminovich, “Fireball multi object spectrograph: as-built optic performances”, Proceedings of SPIE Vol. 9905, 990531 (2016)
4. Erika T. Hamden, Nicole R. Lingner, Gillian Kyne, Patrick Morrissey, D. Christopher Martin, “Noise and dark performance for FIREBall-2 EMCCD delta-doped CCD detector”, Proceedings of SPIE Vol. 9601, 960100 (2015)

5. April D. Jewell, Erika T. Hamden, Hwei Ru Ong, John Hennessy, Timothy M. Goodsall, Charles A. Shapiro, Samuel R. Cheng, Todd J. Jones, Alexander G. Carver, Michael E. Hoenk, David Schiminovich, D. Christopher Martin, Shouleh Nikzad, “Detector performance for the FIREBall-2 UV experiment”, Proceedings of SPIE Vol. 9601, 96010N (2015)
6. Erika T. Hamden, April D. Jewell, Samuel Gordon, John Hennessy, Michael E. Hoenk, Shouleh Nikzad, David Schiminovich, D. Christopher Martin, “High efficiency CCD detectors at UV wavelengths”, Proceedings of SPIE Vol. 9144, 91442X (2014)
7. Erika T. Hamden, Frank Greer, David Schiminovich, Shouleh Nikzad, D. Christopher Martin, “UV photon-counting CCD detectors that enable the next generation of UV spectroscopy missions: AR coatings that can achieve 80-90% QE”, Proceedings of SPIE Vol. 8453, 845309 (2012)

ACADEMIC SERVICE & MEMBERSHIP

Grad Student Admissions Committee: University of Arizona, 2018-2019

Prize Postdoc hiring committee: University of Arizona, 2018-2019

Faculty Hiring committee: University of Arizona, 2018-2019

Review Panel Member: SPARCS CubeSat Systems Requirements Review, 2018 & Preliminary Design Review, 2019

Reviewer for JATIS, 2018- present

Local Organizing Committee: Image Sensors for Precision Astronomy, Dec 2018

Caltech Colloquium Committee: Postdoc Representative, 2017-2018

Time Allocation Committee: Caltech Optical Observatories, 2017A & 2017B

Review Panel: NASA APRA, 2016, 2018

Review Panel: NASA NESSF 2016-2019

Workshop Organizer, panel moderator, speaker: July 28, 2015

Astronomical Spectroscopy with Electron-Multiplied CCDs (EMCCDs)

Caltech and JPL one day workshop discussing applications, challenges, and future uses for EMCCDs in astronomical spectroscopy. Thirty participants.

Member: American Astronomical Society, 2008-present

Member: SPIE, 2008-present

Member: American Geophysical Union, 2018-present

SKILLS

Languages & Software: IDL, Lab View, TFCalc, Zemax, Solid Works, LaTeX, Altium

Machinery and Technology: JPL MDL class 1000 clean room certified (2008-present), atomic layer deposition (Beneq and Oxford), AJA dielectric sputtering, ellipsometry, thermal evaporation, reflectance/transmittance measurement, surface metrology

CONFERENCES and TALKS

Invited Seminar: Montclair State University College of Sciences, Montclair, NJ, May 2019

TED Talk: Technology, Entertainment, Design Conference, Vancouver, CA, April 2019

Colloquium: Northwestern University, Evanston, IL, March 2019

Technical Seminar: Arizona State University, Tempe, AZ, February 2019

Colloquium: Arizona State University, Tempe, AZ, February 2019

Colloquium: Laboratoire d’Astrophysique de Marseille, France, February 2019

Conference Talk: “The FIREBall-2 UV balloon telescope and 2018 flight”, AAS, Seattle, WA, January 2019

Conference Talk: “Advancing UV Spectroscopy and Technology through NASA’s Balloon Telescope Program”, AGU, Washington, DC, December 2018

Talk and LOC member: “EMCCDs for astrophysical use.” Image Sensors for Precision Astronomy, Pasadena, CA, December 2018

Invited participant: NASA's Pathways to Mission Leadership: Mission PI Diversity Workshop, Washington, DC, November 2018

Colloquium: University of Michigan Ann Arbor, Ann Arbor, MI, November 2018

Delegate: Early Career Focus Session for the Decadal Survey, Washington, DC, October 2018

Invited Panelist: New Directions in Optical/Near-IR Spectrographs and wide-field imagers workshop, Princeton, NJ, August 2018

Conference Talk: "Development and flight testing of UV optimized Photon Counting CCDs", AAS, Denver, Co, June 2018

Colloquium: Cal State Los Angeles, Los Angeles, CA, October 2017

Colloquium: University of California, Santa Cruz, CA, May 2017

Colloquium: Pomona College, Claremont, CA, March 2017

Colloquium: Carnegie Observatories, Pasadena, CA, March 2017

Colloquium: Columbia University, New York, NY, February 2017

Invited Seminar: University of Chicago, Chicago, IL, January 2017

Invited Seminar: University of Toronto, Toronto, Ontario, Canada, January 2017

Colloquium: University of Arizona, Tucson, AZ, January 2017

Colloquium: California Institute of Technology, Pasadena, CA, November 2016

Colloquium: University of California, San Diego, CA, October 2016

Colloquium: Montclair State University, Montclair, NJ, October 2016

Conference Talk: "FIREBall: future UV observations of the circumgalactic medium", *From Wall to Web*, Berlin, Germany, July 2016

Conference Talk: "The faint intergalactic medium redshifted emission balloon: FIREBall-2 ready for flight", *SPIE Astronomical Telescopes and Instrumentation*, Edinburgh, Scotland, June 2016

Conference Talk: "FIREBall: future UV observations of the circumgalactic medium", Carnegie Observatories Lunch Talk, Pasadena, CA, March 2016

Conference Talk: "Noise and dark performance for the FIREBall-2 EMCCD delta-doped UV optimized detector", AAS, Kissimmee, FL, January 2016

Conference Talk and Paper: "Noise and Dark Performance for the FIREBall-2 EMCCD detector", *SPIE Optics and Photonics*, San Diego, CA, August 2015

Conference Talk: "The Faint Intergalactic Redshifted Emission Balloon: future UV observations of the circumgalactic medium.", Dunlap Institute, University of Toronto, Toronto, Canada, August 2015

Conference Talk: "The Faint Intergalactic Redshifted Emission Balloon: future UV observations of the circumgalactic medium.", KNI/MDL Seminar, Pasadena, CA, May 2015

Lunch Talk: "FIREBall: UV observations of the circumgalactic medium at $z \sim 0.7$ ", NOAO Friday Scientific Lunch Talks, Tucson, AZ, March 2015

Poster and Paper: "High efficiency CCD detectors at UV wavelengths", *SPIE Astronomical Telescopes and Instrumentation*, Montreal, Canada, July 2014

Poster: "The circumgalactic H-alpha spectrograph", *SPIE Astronomical Telescopes and Instrumentation*, Montreal, Canada, July 2014

Dissertation Talk: "FIREBall, CHaS, and the diffuse Universe", AAS, Washington, DC, January 2014

Poster: "The Diffuse Galactic Far Ultraviolet Sky", *Phases of the ISM*, Heidelberg, Germany, July 2013

Conference Talk: "FUV Signatures of Diffuse Galactic Clouds", *GALEXFest*, Pasadena, CA, September 2012

Conference Talk and Paper: “UV photon-counting CCD detectors that enable the next generation of UV spectroscopy missions: AR coatings that can achieve 80-90% QE”, *SPIE Astronomical Telescopes and Instrumentation*, Amsterdam, The Netherlands, July 2012

Conference Talk: “FUV Signatures of Dusty Galactic Clouds”, *AAS*, Austin, TX, January 2012

Attendee: *KISS Closing Workshop*, Pasadena, CA, Dec 2011

Poster: “UV Anti-Reflection Coatings”, *KISS Workshop*, Pasadena, CA, August 2011

Conference Talk, Poster, and Paper: “Anti-Reflection Coatings for Silicon Ultraviolet Detectors” *Optical Interference Coatings*, Tucson, AZ, June 2010

Attendee: Single Photon Counting Detector Workshop, Pasadena, CA, January 25-29, 2010

Conference Talk and Poster: “The First Steps to a High Efficiency CCD Based UV Detector: Anti-Reflection Coatings for Increased Performance in the Space Ultraviolet” & “Rooftop Variables: Connecting New York City Astronomers with Public School Teachers” *AAS*, Washington, DC, January 2010

Attendee: *Canary Island Winter School on Local Group Cosmology*, Tenerife, Spain, November 2008

ADVISING

Graduate Students

Simran Agarwal, University of Arizona Optical Science, 2019-present

Aafaque Khan, University of Arizona Optical Science, 2019-present

Jessica Li, University of Arizona Physics, 2018-present

Zeren Lin, Caltech Physics, 2018-present

Donal O’Sullivan, Caltech Astronomy, 2014-present

Nicole Lingner, Caltech PhD, 2017

Prachi Parihar, Caltech Masters, 2017

Postdoctoral Scholars

Carlos Vargas, 2018-present

Keri Hoadley, 2017-present

Gillian Kyne, 2015-present

REFERENCES

Dr. Christopher Martin

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Dr. David Schiminovich

Associate Professor of Astronomy

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