

Kyle Kaplan  
Doctoral Candidate

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Department of Astronomy	kfkaplan@astro.as.utexas.edu
The University of Texas at Austin	<a href="http://www.as.utexas.edu/~kfkaplan/">http://www.as.utexas.edu/~kfkaplan/</a>
2515 Speedway, Stop C1400	(512) 471-3647
Austin, Texas 78712-1205, USA	001-512-471-364

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**Ph.D. Dissertation:**

- Title: “Probing the conditions within Photo-dissociation Regions with high resolution near-infrared spectroscopy of UV-excited molecular hydrogen”
  - Co-advisors: Harriet Dinerstein and Dan Jaffe
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**Education:**

- 2011 to present - University of Texas at Austin, (Ph.D. in Astronomy anticipated Spring 2017)
  - 2007 to 2010 - University of California, Santa Cruz, B.S. in Astrophysics
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**Interests:**

- The interstellar medium, photodissociation regions, planetary nebulae, molecular hydrogen, feedback from high mass star formation, elemental abundances in nebulae, H II regions, dust, infrared and optical spectroscopy
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**Fellowships, Grants, and Awards:**

- December 2016 - Office of Graduate Studies Professional Development Award - For travel to present my dissertation talk at the 229th Winter 2017 AAS meeting
  - February 2016 - McDonald Observatory Board of Visitors David Alan Benfield Memorial Fellowship - Recognizes outstanding research by a senior UT Astronomy graduate student
  - July 2015 - SOFIA travel grant to attend conference “30 Years of PhotoDissociation Regions”
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**Research Experience:**

- High resolution near-IR spectroscopy of H<sub>2</sub> in PDRs, exploring H<sub>2</sub> excitation physics, IGRINS instrument and observing support
  - Addressing the abundance discrepancy problem in PNe with optical IFU and infrared Herschel observations of recombination and collisionally excited lines
  - Measuring gas-phase metallicity gradients in nearby spiral galaxies with IFU data from the VENGA survey
  - Optical photometry, light-curves, and spectroscopy of Blazars to support the VERITAS gamma ray telescope collaboration
  - Absorption spectroscopy to measure abundances and dust content of metal strong damped Lyman- $\alpha$  systems
  - Photometry and light-curves of eclipsing binary stars
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**Computer Experience (GitHub account - kfkaplan):**

- Extensive experience in data reduction and analysis of slit spectroscopy, IFU data, imaging, and photometry
- Wrote code for processing, telluric correcting, flux calibrating, and analyzing 1D and 2D spectra, extracting emission line fluxes, and creating and analyzing data-cubes
- Experience using the plasma simulation code Cloudy to fit observed emission line data
- Experience with Python, DS9, and IDL

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**Observing Support:**

- Participated in the commissioning the IGRINS Near-IR spectrometer on the 2.7 m Harlan J. Smith Telescope at McDonald Observatory
- Observed for two IGRINS mini-queue runs in August 2015 and January 2016 where I was in charge of planning and observing the targets in the queue from night to night.
- Wrote code for creating real time finder charts in DS9

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**Observing Experience:**

- 2014 to 2016 - **126 nights**, McDonald Observatory, 2.7 m Harlan J. Smith Telescope, IGRINS near-IR spectrometer,  $\sim 40\%$  of time for my own projects and  $\sim 60\%$  on other people's projects
- 2013 to 2014 - **8 nights**, McDonald Observatory, 2.7 m Harlan J. Smith Telescope, Mitchell Spectrograph (VIRUS-P) IFU
- 2010 to 2011 - Worked with images taken nightly with the robotic SuperLOTIS robotic telescope at Kitt Peak Observatory
- 2008 to 2011 -  **$\sim 10$  nights**, Lick Observatory, 3 m Shane Telescope, KAST spectrometer

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**Research Positions:**

- Fall 2014 to Spring 2016 - Grad. Research Asst. - University of Texas at Austin - Topic: Near-IR spectroscopy of  $H_2$  in PDRs, IGRINS instrument and observing support - Advisors: Harriet Dinerstein and Dan Jaffe
  - Fall 2013 to Spring 2014 - Grad. Research Asst. - University of Texas at Austin - Topic: The abundance discrepancy problem in PNe - Advisor: Harriet Dinerstein
  - Summer 2012 to Summer 2013 - Grad. Research Asst. - University of Texas at Austin - Topic: Measuring gas-phase elemental abundance gradients in nearby spiral galaxies in the VENGA survey - Advisor: Shardha Jogee
  - 2010 to 2011 - Junior Researcher - University of California, Santa Cruz Institute of Particle Physics (SCIPP) - Topic: UCSC Blazar Monitoring program, optical photometry and spectroscopy of blazars - Advisor: David Williams.
  - 2008 to 2010 - Undergrad summer researcher - University of California, Santa Cruz - Topic: Metal strong Damped Lyman- $\alpha$  systems - Advisor: Jason X. Prochaska
  - Summer 2007 - REU - San Diego State University - Topic: Light-curves of the eclipsing binary star system UV Psc. - Advisor: Ronald Angione.
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### Teaching Positions:

- Spring 2015 - Extraterrestrial Life - Professor: Neal Evans - Teaching Assistant: Led discussion section and graded assignments for this writing intensive signature course for non-science majors.
- Spring 2012 to Spring 2013 - Introduction to Astronomy Lab - Primary instructor for this stand-alone lab course. Independently developed several new labs for the course.
- Fall 2011 - Introduction to Astronomy - Professor: Derek Wills - Teaching Assistant: Led review discussions and proctored and graded tests.

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### Public Outreach:

- August 2016 - Poster presentation, McDonald Observatory Board of Visitors meeting, *High Resolution Near-Infrared Spectroscopy of the Orion Bar with IGRINS*, Austin TX
- July 2014 - Invited graduate student talk, McDonald Observatory Board of Visitors meeting, *Observing the Evaporating Tears of a Dying Star with IGRINS*, Fort Davis TX
- March 8-10, 2013 - Volunteer, NASA JWST at SXSW exhibit, Austin TX
- Spring 2012 to Spring 2013 - Public star party host (Fridays and Saturdays) and operator for the 9 inch Painter Hall Telescope at UT Austin.
- December 2011 - Volunteer, Astronomy booth at the Texas Science and Engineering Festival, Austin TX

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### Talks:

- 2017 - Dissertation talk at the Winter AAS Meeting #229 - Grapevine, TX, USA - January 6, 2017 - *Probing the conditions within Photo-dissociation Regions with high resolution near-infrared spectroscopy of UV-excited molecular hydrogen*
- 2015 - Invited talk at the “High Resolution Spectroscopy with IGRINS” conference - Seoul, South Korea - November 13, 2015 - *Probing the physics of excited molecular hydrogen gas with IGRINS*
- 2015 - Contributed talk at the “High Resolution Spectroscopy with IGRINS” conference - Seoul, South Korea - November 12, 2015 - *2-D Analysis of Extended Objects with IGRINS: Constructing and Extracting Information from Position-Velocity Diagrams and Data Cubes*
- 2015 - Contributed talk at the “30 Years of PhotoDissociation Regions” conference - Asilomar, CA, USA - June 30, 2015 - *H<sub>2</sub> excitation and mapping in the Orion Bar with IGRINS*

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### List of Publications:

- **Kaplan, K. F.**, Dinerstein, H. L., Oh, H., et al. *Excitation of Molecular Hydrogen in the Orion Bar Photo-dissociation Region From a Deep Near-Infrared IGRINS Spectrum*, accepted for publication in ApJ
- Herczeg, G. J., Dong, S., Shappee, B. J. Chen, P., et al. *The Eruption of the Candidate Young Star ASASSN-15QI* 2016, ApJ, 831, 133
- **Kaplan, K. F.**, Jogee, S., Kewley, L., Blanc, G. A., et al. *The VIRUS-P Exploration of Nearby Galaxies (VENGA): spatially resolved gas-phase metallicity distributions in barred and unbarred spirals* 2016, MNRAS, 462, 1642
- Oh, H., Pyo, T., **Kaplan, K. F.**, Yuk, I., et al. *Three-dimensional Shock Structure of Orion KL Outflow with IGRINS* 2016, accepted to ApJ, arXiv:1610.09459
- Le, H. A. N., Pak, S., **Kaplan, K. F.**, Mace, G. N., et al. *Fluorescent H<sub>2</sub> Emission Lines from the Reflection Nebula NGC 7023 observed with IGRINS* 2016, submitted to ApJ, arXiv:1609.01818

- Sterling, N. C., Dinerstein, H. L., **Kaplan, K. F.**, Bautista, M. A. *Discovery of Rubidium, Cadmium, and Germanium Emission Lines in the Near-infrared Spectra of Planetary Nebulae* 2016, ApJL, 819, L9
- Afşar, M., Sneden, C., Frebel, A., Kim, H., et al. *The Chemical Compositions of Very Metal-poor Stars HD 122563 and HD 140283: A View from the Infrared* 2016, ApJ, 819, 103
- Mann, A. W., Gaidos, E., Mace, G. N., Johnson, M. C., et al. *Zodiacal Exoplanets in Time (ZEIT). I. A Neptune-sized Planet Orbiting an M4.5 Dwarf in the Hyades Star Cluster* 2016, ApJ, 818, 46
- Oh, H., Pyo, T., Yuk, I., Park, B., et al. *IGRINS Near-IR High-resolution Spectroscopy of Multiple Jets around LkH $\alpha$  234* 2016, ApJ, 817, 148
- Le, H. A. N., Pak, S., Jaffe, D. T., **Kaplan, K.**, et al. *Exposure time calculator for Immersion Grating Infrared Spectrograph: IGRINS* 2015, AdSpR, 55, 2509
- Park, C., Jaffe, D. T., Yuk, I., Chun, M., et al. *Design and early performance of IGRINS (Immersion Grating Infrared Spectrometer)* 2014, Proc. SPIE, 9147
- Blanc, G., Wenzl, T., Song, M., Heiderman, A., et al. *The VIRUS-P Exploration of Nearby Galaxies (VENGA): Survey Design, Data Processing, and Spectral Analysis Methods* 2013, AJ, 145, 138
- Aliu, E., Archambault, S., Arlen, T., Aune, T., et al. *VERITAS Observations of Six Bright, Hard-spectrum Fermi-LAT Blazars* 2012, ApJ, 759, 102
- Fumagalli, M., Dessauges-Zavadsky, M., Furniss, A., Prochaska, J. X., et al. *A search of CO emission lines in blazars: the low molecular gas content of BL Lac objects compared to quasars* 2012, MNRAS, 424, 227
- Aliu, E., Aune, T., Beilicke, M., Benbow, W., Btcher, M., et al. *Multiwavelength Observations of the Previously Unidentified Blazar RX J0648.7+1516* 2011, ApJ, 742, 127
- **Kaplan, K. F.**, Prochaska J. X. Herbert-Fort, S. Ellison, S., Dessauges-Zavadsky, M. *H I Column Densities, Metallicities, and Dust Extinction of Metal-Strong Damped Ly $\alpha$  Systems* 2010, PASP, 122, 619
- Fittingoff, A., Prochaska, J. X., Kalirai, J. S., Strader, et al. *A survey of ultraviolet-bright sources behind the halo of M31* 2009, MNRAS, 399, 728
- Hamann, F., **Kaplan, K. F.**, Rodriguez Hidalgo, P., Prochaska, J. X., & Herbert-Fort, S. *Emergence of a quasar outflow* 2008, MNRAS, 391, L39

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#### Conference Poster Presentations:

- 2016 - Cloudy: Emission Lines in Astrophysics, From Gaseous Nebulae to Quasars - Mexico City, Mexico - *New observational probes and constraints on the physical conditions and excitation mechanisms of molecular hydrogen in PDRs*
  - 2016 - Summer AAS Meeting #228 - San Diego, CA, USA - #219.06 *Resolving shocked and UV excited components of H<sub>2</sub> emission in planetary nebulae with high-resolution near-infrared spectroscopy*
  - 2010 - Winter AAS Meeting #215 - Washington DC, USA - #460.03 *H I Column Densities, Metallicities, and Dust Extinction of Metal-Strong Damped Lyman Alpha Systems*
  - 2008 - Winter AAS Meeting #211 - Austin, TX, USA - #03.29 *Photometric Analysis of UV Piscium. Light curves and analyses of the RS CVn eclipsing system*
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