

# Curriculum Vitae — Zachary P. Vanderbosch

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## Research Interests

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Time-domain astronomy ∙ Evolved planetary systems around white dwarf stars ∙ Data mining large surveys ∙ Pulsating white dwarf stars ∙ Asteroseismology ∙ Astronomical pipeline development ∙ Binary and single star evolution ∙ Laboratory astrophysics ∙ Type-Ia supernovae

## Education

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**The University of Texas at Austin**

August 2015 – present (expected September 2021)

Ph.D. Astronomy Candidate

Advisors: Don Winget & Mike Montgomery

*Thesis: Pulsations and Planetary Debris: Variable White Dwarfs in Time-Domain Surveys*

**The University of North Carolina at Chapel Hill**

2009–2013

B.S. Astrophysics, *cum laude*

## Publications

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As of 2021 July 21<sup>st</sup>, I have been involved in 13 peer-reviewed publications with 146 citations in high-impact journals, 4 of which are first and second author publications with 68 citations.

### First/Second Author Publications:

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\* indicates paper written with an undergraduate student I supervised

1. **Vanderbosch, Z.**, Rappaport, S., Guidry, J. A., et al., *Recurring Planetary Debris Transits and Circumstellar Gas around White Dwarf ZTF J0328–1219*, 2021, ApJ, in press, [arXiv:2106.02659](#)
2. \*Sanghi, A., **Vanderbosch, Z.**, & Montgomery, M. H., *Identifying Periodic Variable Stars and Eclipsing Binary Systems with Long-Term Las Cumbres Observatory Photometric Monitoring of ZTF J0139+5245*, 2021, AJ, submitted
3. **Vanderbosch, Z.**, Hermes, J. J., Dennihy, E., et al., *A White Dwarf with Transiting Circumstellar Material Far outside the Roche Limit*, 2020, ApJ, [897](#), [171](#), [Wikipedia](#)
4. \*Guidry, J., **Vanderbosch, Z.**, Hermes, J. J., et al., *I Spy Transits and Pulsations: Empirical Variability in White Dwarfs Using Gaia and the Zwicky Transient Facility*, 2021, ApJ, [912](#), [125](#)

### Co-Author Refereed Publications:

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5. Szkody, P., Godon, P., Gänsicke, B. T., ..., **Vanderbosch, Z.**, et al., *The Heating and Pulsations of V386 Serpentis after Its 2019 Dwarf Nova Outburst*, 2021, ApJ, [914](#), [40](#)
6. Kepler, S. O., Winget, D., **Vanderbosch, Z.**, et al., *The pulsating white dwarf G117–B15A: still the most stable optical clock known*, 2021, ApJ, [906](#), [7](#)

7. Casewell, S., Belardi, C., Parsons, S., ..., **Vanderbosch, Z.**, et al., *WD1032 + 011, an inflated brown dwarf in an old eclipsing binary with a white dwarf*, 2020, MNRAS, **497**, 3571
8. Reding, J., Hermes, J. J., **Vanderbosch, Z.**, et al., *An Isolated White Dwarf with 317 s Rotation and Magnetic Emission*, 2020, ApJ, **894**, 19
9. Kilic, M., Rolland, B., Bergeron, P., **Vanderbosch, Z.**, et al., *A magnetic white dwarf with five H  $\alpha$  components*, 2019, MNRAS, **489**, 3648
10. Bell, K., Pelisoli, I., Kepler, S. O., ..., **Vanderbosch, Z.**, et al., *The McDonald Observatory search for pulsating sdA stars. Asteroseismic support for multiple populations*, 2018, A&A, **617**, 6
11. Bell, K., Hermes, J. J., **Vanderbosch, Z.**, et al., *Destroying Aliases from the Ground and Space: Super-Nyquist ZZ Ceti in K2 Long Cadence Data*, 2017, ApJ, **851**, 24
12. Bell, K., Gianninas, A., Hermes, J. J., ..., **Vanderbosch, Z.**, et al., *Pruning The ELM Survey: Characterizing Candidate Low-mass White Dwarfs through Photometric Variability*, 2017, ApJ, **835**, 180
13. Greiss, S., Hermes, J. J., Gänsicke, B., ..., **Vanderbosch, Z.**, et al., *The search for ZZ Ceti stars in the original Kepler mission*, 2016, ApJ, **457**, 2855

## Professional Presentations

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### Talks:

1. *White Dwarfs with Transiting Planetary Debris In the Era of Large Time-Domain Surveys*, Online Meetings on Evolved Stars and Systems (O-MESS), 2021 July 14, [link to recording](#)
2. *The Zwicky Transient Facility as a Variable White Dwarf Discovery Tool*, UT Austin Department of Astronomy, 2020 November 11
3. *Planetary Debris around White Dwarfs in the Zwicky Transient Facility*, Celebrating ZTF-I & Soft Launch of ZTF-II, Caltech, USA, 2020 October 23, **invited talk**, [link to recording](#)
4. *A ground-based detection of a DBV outburst*, IAU Symposium 357: White Dwarfs as probes of fundamental physics and tracers of planetary, stellar, & galactic evolution, Hilo, Hawaii, USA, 2019 October 21–25
5. *Variable Stars in ZTF and a Second Case of Transiting Debris around a White Dwarf*, UT Austin Department of Astronomy, 2019 October 3
6. *Observing Outbursting White Dwarfs in the post-Kepler Era*, TASC5/KASC12 Workshop, MIT/Cambridge, USA, 2019 July 22–26
7. *A Ground-based Detection of an Outbursting White Dwarf*, UT Austin Department of Astronomy, 2019 April 17
8. *The Empirical Limits of the DB(A) Instability Strip*, 21<sup>st</sup> European White Dwarf Workshop, UT Austin, 2018 July 23–27, [link to recording](#)
9. *Redefining the Helium White Dwarf Pulsation Instability Strip with High-Speed Photometry, Uniform Spectroscopy, and Sandia Experiments*, UT Austin Department of Astronomy, 2018 March 21

## Posters:

10. ZTF J0139+5245: A Second Case of Transiting Circumstellar Debris around a White Dwarf, IAU Symposium 357: White Dwarfs as probes of fundamental physics and tracers of planetary, stellar, & galactic evolution, Hilo, Hawaii, USA, 2019 October 21–25, [PDF](#)
11. Empirical Constraints on the DB White Dwarf Instability Strip, Sandia National Labs: Z Fundamental Science Workshop, Albuquerque, New Mexico, USA, 2019 August 11–14, [PDF](#)
12. The First Ground-Based Detection of an Outburst in a K2 Pulsating Helium Atmosphere White Dwarf, Kepler and K2 SciCon V, Glendale, California, USA, 2019 March 4–8, [PDF](#)
13. Asteroseismology of Pulsating Helium Atmosphere White Dwarfs using K2, TASC4/KASC11 Workshop: First Light in a New Era of Astrophysics, Aarhus University, Denmark, 2018 July 8–13, [PDF](#)
14. V471 Tauri: Examining Eclipse Timing Variations with Two Independent Clocks, 20<sup>th</sup> European White Dwarf Workshop, University of Warwick, UK, 2016 July 25–29, [PDF](#)

## Awarded Telescope Time

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\* indicates time that includes currently active allocations

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| McDonald 2.1-m, ProEM Photometer       | *241/128 nights as PI/Co-PI — Observed 216 Nights |
| McDonald 2.7-m, Tull Spectrograph      | 23 nights as PI — Observed 21 Nights              |
| McDonald 2.7-m, Coude Guide Photometer | 4 nights as PI — Observed 4 Nights                |
| HET 10-m, LRS2 Spectrograph            | *79/10 hours as PI/Co-I — Used 49/6 hours         |
| LCOGT 1.0-m Network, Sinistro Imager   | *110 hours as PI — Used 91.6 hours                |
| LCOGT 0.4-m Network, SBIG Imager       | 5 hours as PI — Used 4.6 hours                    |
| Gemini North 8.1-m, GMOS Spectrograph  | *3.2 hours Fast Turnaround Time as PI             |

## Teaching and Advising

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| <b>Research Advisor:</b> <i>Joseph Guidry, UT Undergraduate</i><br>Co-advised an undergraduate student in two research projects, one leading to a poster presented at the TASC5/KASC12 workshop, and another leading to a recently submitted publication (Guidry et al. 2020). <i>UT Austin</i>  | <i>Spring 2019 – present</i> |
| <b>Research Mentor:</b> <i>Freshman Research Initiative</i><br>TA and mentor engaging undergraduate students in genuine research experiences. <i>UT Austin</i>   | <i>Spring 2018 – present</i> |
| <b>PDP Participant:</b> <i>ISEE Professional Development Program</i><br>Actively developed inquiry-based learning activities through the Institute for Scientist & Engineer Educators (ISEE) Professional Development Program, culminating in the design and execution of a 3-class inquiry activity for a 30-student undergraduate research methods course. <i>UT Austin, UC Santa Cruz</i> | <i>Spring – Fall 2018</i>    |
| <b>Teaching Assistant:</b> <i>AST-309N, Lives and Deaths of Stars</i><br>TA for an introductory Astronomy class for non-STEM majors. <i>UT Austin</i>  | <i>Fall 2017</i>             |
| <b>Teaching Assistant:</b> <i>AST-321, The Future of Humanity</i><br>TA for a discussion and writing intensive course for both STEM/non-STEM majors. <i>UT Austin</i>  | <i>Fall 2016</i>             |

**Undergraduate Teaching Assistant:** *ASTR-101L, Intro Astronomy Lab*  
Assistant to graduate TA in interactive Astronomy labs. *UNC Chapel Hill*

*Spring 2011, 2012, 2013*

## Instrumentation

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**ProEM Filter Wheel Upgrade:** Designed, assembled, and commissioned a new software-integrated filter wheel, allowing for multi-color photometry with the ProEM photometer on the McDonald 2.1-m telescope. *UT Austin*

*Spring 2016 – Fall 2017*

**Syzygy Optics VPH Gratings:** Lab assistant manufacturing and developing production methods for volume phase holographic (VPH) diffraction gratings, primarily for astronomical purposes. *UNC Chapel Hill*

*Summer 2014 - Spring 2015*

**Goodman Spectrograph Camera Shutter Upgrade:** Designed a new camera shutter incorporating a GPS-linked Hall-effect sensor to provide accurate shutter open and close times for astronomical imaging. Traveled to the SOAR telescope in Chile to install the new shutter on the Goodman Spectrograph. *UNC Chapel Hill*

*Fall 2011 – Fall 2012*

## Service and Outreach

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### **McDonald 2.1-m Telescope Tours**

Provide one-of-a-kind 2.1-m Telescope tours and demonstrations to McDonald Observatory visitors and distinguished guests. *Fort Davis, TX*

*Spring 2017 – present*

### **FRI Science Sprint**

Designed and facilitated a 1-day inquiry-based science sprint for 10–15 multidisciplinary undergraduate students in the Freshman Research Initiative (FRI) program. *UT Austin*

*October 2018*

### **Texas Lutheran University**

Presentation on observational astronomy and laboratory astrophysics for 25 undergraduates in the society of physics students at Texas Lutheran University. *Seguin, TX*

*April 2018*

### **Westminster Retirement Community**

Public presentation on white dwarfs and observational astronomy to 60+ members of an Austin retirement community. *Austin, TX*

*July 2017*

### **TAURUS Seminar**

Presentation on observational astronomy to students in the Texas Astronomy Undergraduate Research experience for Under-represented Students (TAURUS) program. *Austin, TX*

*July 2016*

### **Girl Day at UT**

Volunteered with the preparation of materials and activities for Girl Day, attended by over 8,000 elementary and middle school students. *Austin, TX*

*Spring 2016*

### **Astronomy on Tap ATX**

Volunteered at monthly Astronomy on Tap events which regularly host more than 200 attendees. *Austin, TX*

*Fall 2015 – Fall 2016*

## Skills

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**Computer Languages:** Python, JavaScript, SQL/ADQL, bash/shell,  $\text{\LaTeX}$ , C#, R, git, markdown, reStructuredText, HTML

**Software:** IRAF, TOPCAT, Periodo4, WQED, MOOG, iSpec, MS Office, Autodesk Inventor & Fusion 360, Zemax

**Instrumentation:** Precision mill and lathe operation, soldering, PCB design, ray tracing & optics manufacturing