Carl Andrew Ziegler

Dunlap Postdoctoral Fellow

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Research Interests

Characterization of exoplanets; formation and evolution of planetary systems in multiple star systems; large adaptive optics surveys; detection of long-period transiting planets

Positions

August 2018 - current **University of Toronto**, Toronto, ON
Dunlap Postdoctoral Fellow
PI: SOAR TESS survey (speckle imaging survey)
PI: One Hit Wonders (TESS single-transit planet survey)

Education

May 2018 **University of North Carolina**, Chapel Hill, NC
PhD, Physics and Astronomy
Thesis: “Characterization of Exoplanets and Stellar Systems with New Robots”
Advisor: Prof. Nicholas Law

August 2013 **Southern Illinois University**, Carbondale, IL
M.S., Physics
Thesis: “Adsorption of Neon on Open Carbon Nanohorn Aggregates”
Advisor: Prof. Aldo Migone

May 2009 **William Jewell College**, Liberty, MO
B.A., Physics and Mathematics
Research: variable stars, globular clusters
Advisor: Prof. Maggie Sherer

First or Second Author Publications

7. *SOAR TESS Survey. I: Sculpting of TESS planetary systems by stellar companions*
C. Ziegler, et al., The Astronomical Journal, 2020 **159** 19
6. *Measuring the Recoverability of Close Binaries in Gaia DR2 with the Robo-AO Kepler Survey*
C. Ziegler, et al., The Astronomical Journal, 2018 **156** 259
5. *Robo-AO Kepler Planetary Candidate Survey V: The effect of physically associated stellar companions on planetary systems*
C. Ziegler, et al., The Astronomical Journal, 2018 **156** 83
4. *Robo-AO Kepler Planetary Candidate Survey IV: The effect of nearby stars on 3857 planetary candidate systems*
C. Ziegler, et al., The Astronomical Journal, 2018 **155** 161
3. *Robo-AO Kepler Planetary Candidate Survey III: Adaptive Optics Imaging of 1629 Kepler Exoplanet Candidate Host Stars*
C. Ziegler, et al., The Astronomical Journal, 2017 **153** 66

First or Second Author Publications – Continued

2. *Robo-AO Kepler Planetary Candidate Survey II: Adaptive Optics Imaging of 969 Kepler Exoplanet Candidate Host Stars*
C. Baranec, C. Ziegler, et al., The Astronomical Journal, 2016 **152** 18

1. *Multiplicity of the Galactic Senior Citizens: A High-resolution Search for Cool Subdwarf Companions*
C. Ziegler, et al., The Astrophysical Journal, 2015 **804** 30

Other Refereed Publications

32. *The First Habitable Zone Earth-sized Planet from TESS. I: Validation of the TOI-700 System*
E. Gilbert, ..., C. Ziegler, et al., *In submission*

31. *TOI-954 b and EPIC 246193072 b: Short-Period Saturn-Mass Planets that Test Whether Irradiation Leads to Inflation*
L. Shao, ..., C. Ziegler, et al., *In submission*

30. *TIC 278956474: Two close binaries in one system, identified by TESS*
P. Rowden, ..., C. Ziegler, et al., *In submission*

29. *LHS 1815b: The First Thick-Disk Planet Detected By TESS*
T. Gan, ..., C. Ziegler, et al., *In submission*

28. *A hot terrestrial planet orbiting the bright M dwarf L 168-9 unveiled by TESS*
N. Astudillo-Defru, ..., C. Ziegler, et al., *In submission*

27. *TOI-677 b: A Warm Jupiter (P=11.2d) on an eccentric orbit around a late F-type star*
A. Jordán, ..., C. Ziegler, et al., *Accepted to Astronomical Journal*

26. *TIC 260128333: TESS' First Transiting Circumbinary Planet*
V. Kostov, ..., C. Ziegler, et al., *In submission*

25. *TOI-222: a single-transit event TESS candidate revealed to be a 34-day eclipsing binary with CORALIE, EulerCam and NGTS*
M. Lendl, ..., C. Ziegler, et al., *In submission*

24. *TESS discovers a remnant planetary core in the hot Neptunian desert*
D. Armstrong, ..., C. Ziegler, et al., *In submission*

23. *TOI-132 b: A short-period desert Neptune orbiting a V∼11 G star delivered by TESS*
M. Diaz, ..., C. Ziegler, et al., *In submission*

22. *TOI 564 b and TOI 905 b: Grazing and Fully Transiting Hot Jupiters Discovered by TESS*
A. Davis, ..., C. Ziegler, et al., *In submission*

21. *TESS Discovery of an Ultra-Hot Neptune*
J. Jenkins, ..., C. Ziegler, et al., *Accepted to Nature Astronomy*

20. *Planet Hunters TESS I: TOI 813, a subgiant hosting a transiting Saturn-sized planet on an 84-day orbit*
N. Eisner, ..., C. Ziegler, et al., *Accepted to MNRAS*

19. *Robo-AO M dwarf Multiplicity Survey: Catalog*
C. Lamman, ..., C. Ziegler, et al., *Accepted to AJ*

18. *Investigating the origin of the spectral line profiles of the Hot Wolf-Rayet Star WR2*
A.-N. Chené, ..., C. Ziegler, et al., MNRAS, 2019 **5834** 484

17. *TESS Spots a Compact System of Super-Earths around the Naked-Eye Star HR 858*
A. Vanderburg, ..., C. Ziegler, et al., ApJL, 2019 **881** 19

16. *HD 213885b: A transiting 1-day-period super-Earth with an Earth-like composition around a bright (V=7.9) star unveiled by TESS*
N. Espinoza, ..., C. Ziegler, et al., MNRAS, 2020 **491** 2

Other Publications - Continued

15. *An Eccentric Massive Jupiter Orbiting a Sub-Giant on a 9.5 Day Period Discovered in the Transiting Exoplanet Survey Satellite Full Frame Images*
J. E. Rodriguez, ..., C. Ziegler, et al., The Astronomical Journal, 2019 **157** 5

14. *Near-resonance in a system of sub-Neptunes from TESS*
S. N. Quinn, ..., C. Ziegler, et al., *Astronomical Journal, 2019* **158** *5*

13. *HD2685 b: A Hot-Jupiter orbiting an early F-type star detected by TESS*
M l. Jones, ..., C. Ziegler, et al., Astronomy & Astrophysics, 2019 **625** 16

12. *The Elusive Majority of Young Moving Groups*
B. Bowler, S. Hinkley, C. Ziegler, et al., The Astrophysical Journal, 2019, **877** 60

11. *Full Sky Coverage Laser-only Adaptive Optics Achieves Significant Image Quality Gains Compared to Seeing-limited Observations*
W. Howard, N. Law, C. Ziegler, et al., The Astronomical Journal, 2018 **155** 59

10. *Robo-AO Discovery and Basic Characterization of Wide Multiple Star Systems in the Pleiades, Praesepe, and NGC 2264 Clusters*
L. Hillenbrand, ..., C. Ziegler, et al., The Astronomical Journal, 2018 **155** 51

9. *Robo-AO Kepler Asteroseismic Survey. I. Adaptive optics imaging of 99 asteroseismic Kepler dwarfs and subgiants*
J. Schonhut-Stasik, C. Baranec, ..., C. Ziegler, et al., Astrophysical Journal, 2017 **847** 97

8. *Ultra Short Period Planets in K2 with companions: a double transiting system for EPIC 220674823*
E. R. Adams, ..., C. Ziegler, et al., The Astronomical Journal, 2017 **153** 82

7. *197 Candidates and 104 Validated Planets in K2's First Five Fields*
l. Crossfield, ..., C. Ziegler, et al., The Astrophysical Journal Supplement, 2016 **226** 7

6. *Probability of physical association of 104 blended companions to Kepler objects of interest using visible and near-infrared adaptive optics photometry*
D. Atkinson, C. Baranec, C. Ziegler, et al., The Astronomical Journal, 2017 **153** 25

5. *Two Small Temperate Planets Transiting Nearby M Dwarfs in K2 Campaigns 0 and 1*
J. Schlieder, ..., C. Ziegler, et al., The Astrophysical Journal, 2016 **818** 87

4. *HII 2407: An Eclipsing Binary Revealed By K2 Observations of the Pleiades*
T. David, ..., C. Ziegler, et al., The Astrophysical Journal, 2015 **814** 62

3. *KELT-8b: A Highly Inflated Transiting Hot Jupiter and a New Technique for Extracting High-precision Radial Velocities from Noisy Spectra*
B. Fulton, ..., C. Ziegler, et al., The Astrophysical Journal, 2015 **810** 30

2. *Robotic Laser Adaptive Optics Imaging of 715 Kepler Exoplanet Candidates with Robo-AO*
N. Law, ..., C. Ziegler, et al., The Astrophysical Journal, 2014 **791** 35

1. *Neon and CO_2 Adsorption on Open Carbon Nanohorns*
V. Krungleviciute, C. Ziegler, et al., Langmuir, 2013 **29** (30), 9388–9397

SPIE Instrumentation Papers

3. *SRAO: the southern robotic speckle + adaptive optics system*
N. Law, C. Ziegler, A. Tokovinin, Proc. SPIE 9907, Optical and Infrared Interferometry and Imaging V, 99070K, 2016

2. *SRAO: optical design and the dual-knife-edge WFS*
C. Ziegler, et al., Proc. SPIE 9909, Adaptive Optics Systems V, 99093Z, 2016

1. *The Robo-AO KOI survey: laser adaptive optics imaging of every Kepler exoplanet candidate*
C. Ziegler, et al., Proc. SPIE 9909, Adaptive Optics Systems V, 99095U, 2016

Talks

Conference Talks

- *SOAR TESS survey: The sculpting of planetary systems by stellar companions*
  AAS 235, January 5-9, Honolulu, HI (2020)
- *One Hit Wonders: Hunting the longest-period TESS planets*
  TESS Sci Con I, July 29-Aug 2, Cambridge, MA (2019)
- *One Hit Wonders: Hunting the longest-period TESS planets*
  CASCA 2019, June 17-20, Montreal, QC (2019)
- *Death Stars? Understanding how tight binaries impact TESS planets with SOAR speckle imaging*
  AAS 233, January 6-10, Seattle, WA (2019)
- *Robo-AO KOI Survey: LGS-AO imaging of every Kepler planetary candidate host star*
  AAS 231, January 9-12, National Harbor, MD (2018)
- *High resolution imaging of 4000 Kepler planetary candidate host stars*
  Know Thy Star, Know Thy Planet, October 11, Pasadena, CA (2017)
- *Robo-AO KOI Survey: LGS-AO imaging of every Kepler planetary candidate host star*
  Transiting Exoplanets, July 17, Keele, UK (2017)
- *Adaptive Optics Imaging of Kepler Planetary Candidates*
  North Carolina Astronomers Meeting, September 24, Jamestown, NC (2016)
- *The Robo-AO KOI Survey: Laser Adaptive Optics Imaging of Every Kepler Exoplanet Candidate*
  AAS 227, January 4-8, Kissimmee, FL (2016)
- *Study of Carbon Dioxide adsorption on Purified HiPco Nanotubes*
  American Physical Society Meeting, March 18–22, Baltimore, MD (2013)

Invited Talks

- *The Robo-AO KOI survey and the development of a Southern robotic AO system*
  Institute for Astronomy, September 14, Hilo, Hawaii (2016)

Conference Posters

- *One Hit Wonders: recovering the longest period TESS planets*
  C. Ziegler, et al., Extreme Solar Systems IV, Reykyavik, Iceland (2019)
- *Sculpting of TESS Planetary Systems by Binary Stars*
  C. Ziegler, et al., Tess SciCon I, Cambridge, MA (2019)
- *Robo-AO KOI Survey: Robotic LGS-AO Imaging of Every Kepler Planetary Candidate*
  C. Ziegler, et al., Kepler SciCon IV, NASA Ames (2017)
- *SRAO: the first southern robotic AO system*
  C. Ziegler, et al., SPIE Astronomical Telescopes + Instrumentation, Edinburgh, UK (2016)
- *The Robo-AO KOI survey: laser adaptive optics imaging of every Kepler exoplanet candidate*
  C. Ziegler, et al., SPIE Astronomical Telescopes + Instrumentation, Edinburgh, UK (2016)
- *Multiplicity of the Galactic Senior Citizens: A high-resolution search for cool subdwarf companions*
  C. Ziegler & N. Law, AAS 225, Seattle, WA (2015)

Teaching Experience

Fall 2019	**University of Toronto**, Toronto, ON *Exoplanet mini-course, AST 221* Taught 8-week course on detection of exoplanets and exoplanet demographics to Astronomy majors. Mix of lectures an in-class group projects.
Summer 2019	**University of Toronto**, Toronto, ON *AO Lab Lead, Dunlap Summer School* Led both undergraduates and graduate students in a lecture introducing adaptive optics and a lab to build a Shack-Hartmann wavefront sensor.
Summer 2019	**University of Toronto**, Toronto, ON *Summer Undergraduate Mentor* Advised summer undergraduate student in testing and implementing robotic telescope control and on-the-fly data reduction pipeline.
Spring 2017	**University of North Carolina**, Chapel Hill, NC *Undergraduate Research Mentor* Advised capstone course for UNC undergraduate to build novel methods to reduce adaptive optics images of bright stars
Summer 2015	**University of North Carolina**, Chapel Hill, NC *Summer Research Mentor* Advised high school student with *Kepler* host star multiplicity research

Teaching Experience - Continued

Fall 2013- Spring 2014	**University of North Carolina**, Chapel Hill, NC *Astronomy 101L Lab Teaching Assistant* Led five lab sections using robotic “Skynet” telescopes
Fall 2010- Spring 2013	**Southern Illinois University**, Carbondale, IL *Astronomy 101 Lab Teaching Assistant* Taught twenty lab sections in astronomy
Spring 2012- Fall 2012	**Southern Illinois University**, Carbondale, IL *Physics Lab Instructor* Taught three calculus-based physics lab courses

Professional Service and Public Outreach

- Referee for MNRAS, ApJ, AJ, PASP, and A&A
- Assisted monthly public observing nights for Chapel Hill Astronomical and Observational Society
- Two public talks for Raleigh Astronomy Club
- Organized and led astronomy booth for UNC Science Expo

Sofware Skills

Computer Programming:	- Python (primary language for astronomical data analysis) - C++ (control software for Andor EMCCD camera, WFS reconstruction) - TheSkyX (automated telescope and observatory control) - MaximDL (camera control and reduction) - Mathematica (hydrodymical simulations for graduate ISM class) - HTML (designed project sites, `roboaokepler.org` and `onehitwonders.space`) - LabVIEW (wrote control GUI for gas adsorption instrumentation) - Mathematica (hydrodymical simulations for graduate ISM class)

Instrumentation

Instrumentation Design:	- Zemax (optical design for Robo-SOAR) - SolidWorks (modeling for fabrication of custom mounts and packaging used in Robo-SOAR)
Robo-SOAR construction:	- built optical testbed of NGS-AO system - designed and constructed prototype of reflective pyramid WFS

References

Professor Suresh Sivanandam
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Professor Nicholas Law
Assistant Professor, Department of Astronomy, University of North Carolina
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Professor Christoph Baranec
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Professor Adam Kraus
Assistant Professor, Department of Astronomy, University of Texas, Austin
alk@astro.as.utexas.edu / 617-956-7740