Carl Andrew Ziegler

Assistant Professor/Observatory Director

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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

September 2020 - current
Stephen F. Austin State University, Nacogdoches, TX
Assistant Professor of Astronomy
Director of SFA Observatory

August 2018 - July 2020
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

8. *SOAR TESS Survey. II: The impact of stellar companions on planetary populations*
C. Ziegler, et al., *Accepted, The Astronomical Journal, arXiv:2103.12076*
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

First or Second Author Publications – Continued

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

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

60. *The TESS-Keck Survey. II. An Ultra-short-period Rocky Planet and Its Siblings Transiting the Galactic Thick-disk Star TOI-561*
L. Weiss, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 2

59. *Cluster Difference Imaging Photometric Survey. II. TOI 837: A Young Validated Planet in IC 2602*
L. Bouma, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 5

58. *A planetary system with two transiting mini-Neptunes near the radius valley transition around the bright M dwarf TOI-776*
R. Luque, ..., C. Ziegler, et al., Astronomy & Astrophysics, 2021 **645** A41

57. *Two young planetary systems around field stars with ages between 20 – 220 Myr from TESS*
G. Zhou, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 1

56. *TOI-431/HIP 26013: a super-Earth and a sub-Neptune transiting a bright, early K dwarf, with a third RV planet*
A. Osborn, ..., C. Ziegler, et al., MNRAS, 2021

55. *HD 183579b: A Warm Sub-Neptune Transiting a Solar Twin Detected by TESS*
T. Gan, ..., C. Ziegler, et al., MNRAS, 2021

54. *TOI-1231 b: A Temperate, Neptune-sized Planet Transiting the Nearby M3 Dwarf NLTT 24399*
J. Burt, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **162** 3

53. *TOI-269 b: an eccentric sub-Neptune transiting a M2 dwarf revisited with ExTrA*
M. Contepas, ..., C. Ziegler, et al., Astronomy & Astrophysics, 2021 **650** A145

52. *Precise Transit and Radial-velocity Characterization of a Resonant Pair: The Warm Jupiter TOI-216c and Eccentric Warm Neptune TOI-216b*
R. Dawson, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 4

51. *TESS Hunt for Young and Maturing Exoplanets (THYME). IV. Three Small Planets Orbiting a 120 Myr Old Star in the Pisces-Eridanus Stream*
E. Newton, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 2

50. *A hot mini-Neptune in the radius valley orbiting solar analogue HD 110113*
H. Osborn, ..., C. Ziegler, et al., MNRAS, 2021 **502** 4

49. *TOI-1259Ab - a gas giant planet with 2.7 per cent deep transits and a bound white dwarf companion*
D. Martin, ..., C. Ziegler, et al., MNRAS, 2021

48. *TESS Delivers Five New Hot Giant Planets Orbiting Bright Stars from the Full Frame Images*
J. Rodriguez, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 4

Other Publications - Continued

47. *Ultra-short-period Planets in K2. III. Neighbors are Common with 13 New Multiplanet Systems and 10 Newly Validated Planets in Campaigns 0-8 and 10*
E. Adams, ..., C. Ziegler, et al., The Planetary Science Journal, 2021 **2** 4

46. *TOI 122b and TOI 237b: Two Small Warm Planets Orbiting Inactive M Dwarfs Found by TESS*
W. Waalkes, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 1

45. *When Do Stalled Stars Resume Spinning Down? Advancing Gyrochronology with Ruprecht 147*
J. Curtis, ..., C. Ziegler, et al., The Astrophysical Journal, 2020 **904** 2

44. *TOI-481 b and TOI-892 b: Two Long-period Hot Jupiters from the Transiting Exoplanet Survey Satellite*
R. Brahm, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 5

43. *TOI 694b and TIC220568520b: Two low-mass companions near the hydrogen burning mass limit orbiting sun-like stars*
I. Mireles, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 3

42. *TOI 540 b: A Terrestrial Planet Smaller than Earth Orbiting a Nearby Rapidly Rotating Low-mass Star*
K. Ment, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 1

41. *The CARMENES search for exoplanets around M dwarfs. Two planets on the opposite sides of the radius gap transiting the nearby M dwarf LTT 3780*
G. Nowak, ..., C. Ziegler, et al., Astronomy & Astrophysics, 2020 **642** A173

40. *Three Short Period Jupiters from TESS*
L. Neilsen, ..., C. Ziegler, et al., Astronomy & Astrophysics, 2020 **639** A76

39. *TESS reveals a short-period sub-Neptune sibling (HD 86226 c) to a known long-period giant planet*
J. Teske, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 2

38. *KELT-25b and KELT-26b: A Hot Jupiter and a Substellar Companion Transiting Young A-stars Observed by TESS*
R. Rodriguez, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 3

37. *TESS discovery of a super-Earth and three sub-Neptunes hosted by the bright, Sun-like star HD 108236*
T. Daylan, ..., C. Ziegler, et al., The Astronomical Journal, 2021 **161** 2

36. *TOI-257b (HD 19916b): A Warm sub-Saturn on a Moderately Eccentric Orbit Around an Evolved F-type Star*
B. Addison, ..., C. Ziegler, et al., MNRAS, 2021 **502** 3

35. *Two intermediate-mass transiting brown dwarfs from the TESS mission*
T. Carmichael, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 1

34. *A pair of TESS planets spanning the radius valley around the nearby mid-M dwarf LTT 3780*
R. Cloutier, ..., C. Ziegler, et al., The Astronomical Journal, **160** 3

33. *TESS Hunt for Young and Maturing Exoplanets (THYME) II: A 17 Myr Old Transiting Hot Jupiter in the Sco-Cen Association*
A. Rizzuto, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 1

32. *The First Habitable Zone Earth-sized Planet from TESS. I: Validation of the TOI-700 System*
E. Gilbert, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **160** 3

31. *TOI-954 b and EPIC 246193072 b: Short-Period Saturn-Mass Planets that Test Whether Irradiation Leads to Inflation*
L. Sha, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **161** 2

30. *TIC 278956474: Two close binaries in one system, identified by TESS*
P. Rowden, ..., C. Ziegler, et al., The Astronimical Journal, 2020 **160** 2

29. *LHS 1815b: The First Thick-Disk Planet Detected By TESS*
T. Gan, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **159** 160

Other Publications - Continued

28. *A hot terrestrial planet orbiting the bright M dwarf L 168-9 unveiled by TESS*
N. Astudillo-Defru, ..., C. Ziegler, et al., Astronomy & Astrophysics, 2020 **636** 58

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., The Astronomical Journal, 2020 **159** 145

26. *TIC 260128333: TESS' First Transiting Circumbinary Planet*
V. Kostov, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **159** 253

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., MNRAS, 2020 **492** 1761

24. *TESS discovers a remnant planetary core in the hot Neptunian desert*
D. Armstrong, ..., C. Ziegler, et al., Nature, 2020 **583** 7814

23. *TOI-132 b: A short-period desert Neptune orbiting a V∼11 G star delivered by TESS*
M. Diaz, ..., C. Ziegler, et al., MNRAS, 2020 **493** 973

22. *TOI 564 b and TOI 905 b: Grazing and Fully Transiting Hot Jupiters Discovered by TESS*
A. Davis, ..., C. Ziegler, et al., The Astronomical Journal *160* 5

21. *An Ultra-Hot Neptune in the Neptune desert*
J. Jenkins, ..., C. Ziegler, et al., Nature Astronomy, 2020 **4** 1148

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., MNRAS, 2020 **494** 750

19. *Robo-AO M dwarf Multiplicity Survey: Catalog*
C. Lamman, ..., C. Ziegler, et al., The Astronomical Journal, 2020 **159** 139

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

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., The Astronomical Journal, 2019 **158** 5

13. *HD2685 b: A Hot-Jupiter orbiting an early F-type star detected by TESS*
M I. 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

Other Publications - Continued

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*
I. 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
Assistant Professor, Dunlap Institute for Astronomy, University of Toronto
sivanandam@dunlap.utoronto.edu / 416-978-6550

Professor Nicholas Law
Assistant Professor, Department of Astronomy, University of North Carolina
nlaw@unc.edu / 919-962-3019

Professor Christoph Baranec
Assistant Astronomer, Institute for Astronomy, University of Hawaii, Manoa
baranec@hawaii.edu / 808-932-2318

Professor Adam Kraus
Assistant Professor, Department of Astronomy, University of Texas, Austin
alk@astro.as.utexas.edu / 617-956-7740