# Kellen D. Lawson

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## Education

**Doctor of Philosophy** (Physics) — Univ. of Oklahoma, 2016 – 2022 (anticipated) (Advisor: John Wisniewski)
**Bachelor of Science** (Astrophysics) — College of Charleston, 2010 – 2014 (Advisor: Joseph Carson)

## Research Interests

- ▷ High-contrast imaging of circumstellar disks & exoplanets
- ▷ Integral field spectroscopy and polarimetry
- ▷ Software development
- ▷ Optimization algorithms

## Research Experience

**Graduate Research Assistant** (2018–Present) University of Oklahoma
Advisor: John Wisniewski; dissertation work reducing, analyzing, and modeling high-contrast integral field spectroscopic and polarimetric imagery from the Subaru observatory's SCExAO/CHARIS to study circumstellar disks and exoplanets.

**Graduate Research Assistant** (2017–2018) Univ. of Oklahoma & Univ. of Washington
Advisors: John Wisniewski & Eric Bellm; developed techniques for the identification of flare star candidates in sparsely sampled time-series photometry from the Palomar Transient Factory (PTF).

**Undergraduate Research Assistant** (2013–2015) College of Charleston
Advisor: Joseph Carson; worked to identify and assess planet candidates in high-contrast imagery from the Subaru Observatory's HiCIAO as part of the Strategic Exploration of Exoplanets and Disks with Subaru (SEEDS) survey.

## Publications

### ▷ Refereed Journal Articles

Currie, T., **Lawson, K.**, Schneider, G., et al. 2021, "*Images of Embedded Jovian Planet Formation At Wide Separations*", submitted to Nature Astronomy

**Lawson, K.**, Currie, T., Wisniewski, J., et al. 2021, "*Multiband imaging of the HD 36546 debris disk: a refined view from SCExAO/CHARIS*", AJ, 162, 293

Currie, T., ... **Lawson, K.**, et al. 2020, "*SCExAO/CHARIS Direct Imaging Discovery of a 20 au Separation, Low-mass Ratio Brown Dwarf Companion to an Accelerating Sun-like Star*", ApJL, 904, L25

**Lawson, K.**, Currie, T., Wisniewski, J., et al. 2020, "*SCExAO/CHARIS Near-IR Integral Field Spectroscopy of the HD 15115 Debris Disk*", AJ, 160, 163

Schutte, M., **Lawson, K.**, Wisniewski, J., et al. 2020, "*Discovery of a Nearby Young Brown Dwarf Disk*", AJ, 160, 156

Silverberg, S., Wisniewski, J., Kuchner, M., **Lawson, K.**, et al. 2020, "*Peter Pan Disks: Long-lived Accretion Disks Around Young M Stars*", ApJ, 890, 106

**Lawson, K.**, Wisniewski, J., Bellm, E., Kowalski, A., & Shupe, D. 2019, "*Identification of Stellar Flares Using Differential Evolution Template Optimization*", AJ, 158, 119

Blunt, S., ... **Lawson, K.**, et al. 2019, "*Radial Velocity Discovery of an Eccentric Jovian World Orbiting at 18 au*", AJ, 158, 181

Wisniewski, J., ... **Lawson, K.**, et al. 2019, "*High-fidelity Imaging of the Inner AU Mic Debris Disk: Evidence of Differential Wind Sculpting?*", ApJL, 883, L8

Currie, T., ... **Lawson, K.**, et al., 2019, "*No Clear, Direct Evidence for Multiple Protoplanets Orbiting LkCa 15: LkCa 15 bcd are Likely Inner Disk Signals*", ApJL, 877, L3

### ▷ Conference Proceedings

**Lawson, K.**, Currie, T., Wisniewski, J., et al. 2021, "*High-contrast integral field spectropolarimetry of planet-forming disks with SCExAO/CHARIS*", Proc. SPIE 11823, 118230D

Currie, T., ... **Lawson, K.**, et al. 2021, "*A new type of exoplanet direct imaging search: a SCExAO/CHARIS survey of accelerating stars*", Proc. SPIE 11823, 1182304

Currie, T., ... **Lawson, K.**, et al. 2020, "*On-sky performance and recent results from the Subaru coronagraphic extreme adaptive optics system*", Proc. SPIE 11448, 114487H

## Presentations

▷ **Invited**

*"High-contrast integral field spectropolarimetry of planet-forming disks with SCExAO/CHARIS"*, University of Kansas Astronomy and Space Physics Seminar, Nov 2021

▷ **Contributed**

*"High-contrast integral field spectropolarimetry of planet-forming disks"*, STScI ESPF Seminar Series, Nov 2021

*"High-contrast integral field spectropolarimetry of planet-forming disks with SCExAO/CHARIS"*, SPIE Optical Engineering + Applications, Aug 2021

*"SCExAO/CHARIS High-Contrast Integral Field Spectropolarimetry of Planet-Forming Disks"*, Subaru Users Meeting FY2020, Mar 2021

*"SCExAO/CHARIS Near-IR Integral Field Spectroscopy of the HD 15115 Debris Disk"*, Univ. of Michigan Star and Planet Formation Journal Club, Aug 2020

*"SCExAO/CHARIS Near-IR Integral Field Spectroscopy of the HD 15115 Debris Disk"*, AAS 236, Jun 2020

## Grants & Awards

**Bullard Dissertation Completion Fellowship** (2021) — $15000 OU Graduate College
**Grants in Aid of Research** (2020) — $3933 Sigma Xi
**Research Presentation Grant** (2014) — $450 College of Charleston
**Major Academic Year Support Grant** (2014) — $1000 College of Charleston
**Dunlap Institute Summer School Tuition & Travel Grant** (2014) — 800 CAD Univ. of Toronto
**Richard Petit Award for Outstanding Undergraduate Research** (2014) — $100 Sigma Xi
**Summer Undergraduate Research with Faculty Grant** (2014) — $2000 College of Charleston
**Major Academic Year Support Grant** (2013) — $1000 College of Charleston

## Outreach & Service

**Lunar Sooners** (2016 – Present) University of Oklahoma
A student organization that introduces under-served Oklahoma communities to astronomy using a portable planetarium, public telescope observing, discussion panels, and demonstrations. Selected Lunar Sooners events that I co-hosted:

- ▷ SW OKC Public Library (Jun 2019) – Astronomy demos and Q&A with children ages 5-12
- ▷ "Soonertarium" at Jay Elementary (Oct 2018) – All-day elementary school event using our portable planetarium
- ▷ Boys and Girls Club of Norman (Jun 2018) – Astronomy demonstrations for K-12 students

**CHARIS DPP – spectropolarimetry module** (2021) github.com/thaynecurrie/charis-dpp
An addition to the publicly available IDL data processing pipeline for Subaru/CHARIS data. This module provides calibrated final products for data from CHARIS's integral field spectropolarimetry mode.

**PyVAN** (2019) github.com/kdlawson/pyvan
A publicly available Python package for assessing variability of candidate lightcurves, especially suited to irregularly sampled light-curves from ground based astronomical surveys (Lawson et al., 2019).

## Proficiencies

**Data Processing and Analysis**

- ▷ Advanced optimization for complex/multidimensional parameter spaces
- ▷ High contrast imaging data extraction, calibration, PSF subtraction, and disk/planet forward modeling
- ▷ 3D radiative transfer and scattered light modeling of circumstellar disks
- ▷ Time-series / lightcurve analysis

**Programming Languages**

- ▷ Python: image processing and analysis, optimization algorithms, time-series analysis, multi-threading, GPU computing, plotting, animation
- ▷ IDL: image processing and analysis, optimization algorithms, plotting