COURTNEY CRAWFORD

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CAREER HISTORY

University of Sydney *July 2022 - present*
Postdoctoral Research Assistant, with Tim Bedding

Louisiana State University, Baton Rouge *Graduation: May 2022*
Ph.D. in Physics, Advised by Geoffrey C. Clayton

University of Oklahoma, Norman *Graduation: May 2018*
B.S. in Astrophysics

HIGHLIGHTS

- Developed and delivered undergraduate level astronomy lab material for 2 years
- Supervised 18 total students over 2 years (7 sole-supervisor)
- Co-organized 2 workshops at USyd
- Served the highest leadership role in 2 organizations during graduate school
- Instructed middle-school-aged students who attended Nationals in an academic event
- 14 total publications, 4 first-authored (1 more in review)
- Co-Investigator on 9 successful observing and computing proposals

TEACHING & SUPERVISION

I have found that the most rewarding aspect of academia for me has been the teaching and supervision of students. **I developed and delivered undergraduate level astronomy lab material** for 2 years during my PhD, which was well received by the students. In my postdoc, I have focused a significant amount of my time on the supervision of students, both on my own and as a co-supervisor. **I have currently supervised 18 students over 2 years, 7 of which I've been sole supervisor.** Five of these student projects have gone on to produce publishable work. Recently, I've been given the opportunity to **help develop a new course** for the university.

Courses Taught

- **ASTR 1109: Stellar Astronomy Lab** *(4 semesters, LSU)*
  This is a first and second year elective-level lab course focused on astronomy outside the solar system, including Stellar Evolution, Galaxies, and some Cosmology. It has 2 sections per semester, each with roughly thirty students. I was the sole instructor for this course for four semesters, where I developed 4 new labs to replace outdated ones. I did all the curriculum management, lab development, exam writing, and marking on my own. I have a google drive of all my lecture and lab materials on my website, including some recorded lectures from when we went online for COVID. I received very positive feedback from my students on the lab materials and on my teaching.
- **PHYS2014/PHYS2914: Data Science in Astronomy** *(1 Lecture, USyd)*
  This is a new course being offered for the first time this semester (Sem 2 2024), and I am helping the course organizers to develop some of the lecture materials. The course is on Data Science techniques, with applications to various different Big Data problems in astronomy. I will be developing and delivering the lecture and lab material during Week 10, which will be on Clustering Techniques applied to Stellar Variable sources.

Current Students

- **Isabella Treloar & Ozan Kocatepe** *(First Year SSP, sole-supervisor)*
  Spectroscopy of pulsations in RCB and dLHdC stars

- **Haonan Li** *(Honours student, sole-supervisor, 2023 Sem 1-present)*
  Anomalous peaks and potential tertiary systems found via Kepler oscillating star data
- **K.R. Sreenivas** *(PhD Student, co-supervisor, 2023-present)*
  Asteroseismology of red giants
- **Lea Schimak** *(PhD Student, co-supervisor, 2023-present)*
  Asteroseismology of binary red giants

Past Students

- **Jasmyn Curry** *(Second Year SSP, sole-supervisor, 2023 Sem 1)*
  Spectroscopy of pulsations in RCB stars
- **Josh Ferguson** *(Second Year SSP, sole-supervisor, 2023 Sem 1)*
  Dipole mode suppression in the Kepler red giant sample
- **George Feng** *(Second Year SSP, co-supervisor, 2023 Sem 1)*
  A red giant in the Pleiades cluster
- **Nikita Nikultsev** *(Honours student, sole-supervisor, 2023 Sem 1 & 2)*
  Merging With MESA: Modelling DY Pers by Fusing White Dwarfs
- **Maxwell Bennett** *(Honours student, co-supervisor, 2023 Sem 1 & 2)*
  Photometry in Crowded Stellar Fields with NASA's TESS Mission
- **Noah Smith & Nayan Gallego Sivaraman** *(First Year SSP, co-supervisor, 2023 Sem 2)*
  Analysis of the emission from Low Mass X-ray Binary A0620-00 over 6 years
- **Caleb Clark** *(Second Year SSP, sole-supervisor, 2023 Sem 1)*
  An automated pipeline to find RCB dust declines
- **Amelie Reid** *(Summer Project, co-supervisor, 2023 Summer)*
  Searching the Gaia and TESS data for delta Scuti stars
- **Yifan Chen** *(Third Year Dalyell, co-supervisor, 2022 Sem 2)*
  Automated detection and refinement of asteroseismic parameters in 16,000 stars
- **Alexander Jephtha** *(First Year SSP, co-supervisor, 2022 Sem 2)*
  A search for oscillating wide binaries
- **Cameron Davidson** *(First Year SSP, co-supervisor, 2022 Sem 2)*
  Verifying the low-mass Kepler red giants

SERVICE AND LEADERSHIP

MESA Down Under Workshop June 2024
Teaching Assistant, Local Organizing Committee

I designed all of the print materials for the workshop, handled audiovisual systems during the workshop, and assisted with the organization of the venue. I also served as a teaching assistant for the workshop, which included development of 3 lab sessions, testing of many other lab sessions, creating a website to host lab materials and instructions, and assisting the students with the labs throughout the workshop itself.

Sydney Institute for Astronomy (SIfA) Seminar Organization Jan 2023-June 2024
Co-organizer

I coordinated the weekly seminar series, including speaker invitations, scheduling, and venue management. I also implemented new strategies for the organization of the seminar to ease the burden on organizers and members of the department.

9th Australian Exoplanet Workshop 2023
Local Organizing Committee Member

I managed the audiovisual system during the workshop and helped with venue management.

Physics & Astronomy Graduate Student Organization 2019-2021
President *2020-2021 US Academic Year*

As president I facilitated once monthly meetings with the graduate student body, then garnered their grievances and opinions on student issues. During my tenure I negotiated major revisions to

our department's qualifying exam with a strong focus on increasing student outcomes, especially for diverse students.

Vice President *2019-2020 US Academic Year*

As vice president I acted as liaison between faculty and graduate students with once monthly meetings. At these meetings we discussed solutions to problems raised at student meetings.

Astronomy on Tap, Baton Rouge 2018-2022

Emcee, Lead Organizer *2020-2022*

As emcee I coordinated the monthly events, especially speaker invitations and scheduling. I also hosted the event itself, focusing on both education and entertainment.

Staff Member *2018-2020*

Staff members help with tear-down and set-up for the events, and I additionally wrote educational games for the guests to play during the event.

OUTREACH

Science Olympiad 2020

Sole Instructor

I instructed middle school aged students in the "Reach for the Stars" Program about extrasolar astronomy. These students placed first in the state and 31st out of 60 groups in their first year competing in the event.

Public Night at Landolt Observatory 2018-2020

Volunteer

I often manned one of the telescopes for public viewing, and answered attendee's science questions.

Girls Day at the Museum 2019,2020

Physics Booth Lead Organizer, Volunteer

I organized the booth at this event, where we had K-2 aged young girls built and experiment with stomp rockets to see who could achieve the furthest distance. I organized all the volunteers, built the rocket materials and launchers, and developed the activity.

REFEREED PUBLICATIONS

I have published 4 first authored papers (1 more in review), and co-authored 10 papers. I am part of a small, tight-knit collaboration on HdC star research, and **we have published 9 papers together in 6 years.** I have also been a part of many asteroseismology projects during my postdoc, **with 4 papers published in two years.**

My PhD thesis paper, titled "A spectral classification system for hydrogen-deficient carbon stars" was **described as "a seminal work for those in the field"** during the review process. It has received 10 citations in the year since it was published.

I currently have one paper in review that contains a **large portion of the work contributed by one of my former honour's students.**

Modelling Hydrogen-deficient Carbon stars in MESA— The effects of total mass and mass ratio (2024)
C. L. Crawford et al. MNRAS, In Review

The highest mass Kepler red giants - I. Global asteroseismic parameters of 48 stars (2024)
C. L. Crawford et al. MNRAS, Volume 528, Issue 4, pp.7397-7410

Identifying 850 δ Scuti pulsators in a narrow Gaia colour range with TESS 10-min full-frame images (2024)

A. Read, T. R. Bedding ; P. Mani, B. T. Montet, **C. Crawford**, D. R. Hey, Y. Li, S. J. Murphy, M. G. Pedersen, J. Kruger MNRAS, Volume 528, Issue 2, pp.2464-2473

A simple method to measure numax for asteroseismology: application to 16,000 oscillating Kepler red giants (2024)
K. R. Sreenivas, T. R. Bedding, Y. Li, D. Huber, **C. L. Crawford**, D. Stello, J. Yu MNRAS (in press)

HdC and EHe stars through the prism of Gaia DR3: 3D distribution and Gaia's chromatic PSF effects (2024)
P. Tisserand, **C. L. Crawford**, J. Soon, G. C. Clayton, A. J. Ruiter, I. R. Seitenzahl A&A (in press)

HdC and EHe stars through the prism of Gaia DR3: Evolution of RV amplitude and dust formation rate with effective temperature (2024)
P. Tisserand, **C. L. Crawford**, J. Soon, G. C. Clayton, A. J. Ruiter, I. R. Seitenzahl A&A (in press)

A spectral classification system for hydrogen-deficient carbon stars (2023)
C. L. Crawford et al. MNRAS, Volume 521, Issue 2, pp.1674-1699

TESS Observations of the Pleiades Cluster: A Nursery for δ Scuti Stars (2023)
T. R. Bedding, S. J. Murphy, **C. L. Crawford**, D. R. Hey, D. Huber, H. Kjeldsen, Y. Li, A. W. Mann, G. Torres, T. R. White, G. Zhou ApJL, Volume 946, Issue 1, id.L10, 9 pp.

Peculiar R Coronae Borealis Stars: Strontium-Rich Stars and the s-Process (2022)
C. L. Crawford et al. A&A, Volume 667, id.A85, 8 pp.

R Coronae Borealis and dustless hydrogen-deficient carbon stars likely have different oxygen isotope ratios (2022)
V. Karambelkar, M. M. Kasliwal, P. Tisserand, G. C. Clayton, **C. L.Crawford**, et al. A&A, Volume 667, id.A84, 12 pp.

The dawn of a new era for dustless HdC stars with GAIA eDR3 (2022)
P. Tisserand, **C. L. Crawford**, G. C. Clayton, A. J. Ruiter, V. Karambelkar, M. S. Bessel, I. R. Seitenzahl, M. M. Kasliwal, J. Soon, T. Travouillon A&A, Volume 667, id.A83, 22 pp.

R Coronae Borealis Star Evolution: Simulating 3D Merger Events to 1D Stellar Evolution Including Large-scale Nucleosynthesis (2021)
B. Munson, E. Chatzopoulos, J. Frank, G. C. Clayton, **C. L. Crawford**, P. A. Denissenkov, F. Herwig ApJ, Vol 911, Issue 2, id.103

Modelling R Coronae Borealis stars: effects of He-burning shell temperature and metallicity (2020)
C. L. Crawford et al. MNRAS, Vol 498, Issue 2, p.2912-2924

The age of the Galactic stellar halo from Gaia white dwarfs (2019)
M. Kilic, P. Bergeron, K. Dame, N. C. Hambly, N. Rowell, **C. L. Crawford**. MNRAS, Vol 482, Issue 1, p.965-979

CONTRIBUTED TALKS

The Dust Properties of R Coronae Borealis Stars
Advancements for Cool Evolved Stars, 2024

An MK-like Optical Spectral Classification Scheme for Hydrogen Deficient Carbon Stars and R Coronae Borealis Variables
AAS #240

3-d Mapping The Distribution Of R Coronae Borealis Stars
AAS #238, id. 323.03

Modeling Low Metallicity R Coronae Borealis Stars With MESA
Understanding Dust 30 Years After CCM, 2019

SUCCESSFUL OBSERVING AND COMPUTING PROPOSALS

National Computational Merit Allocation Scheme 2024
Asteroseismic Modelling of Massive Stars (id91)

SIH HPC Allocation Scheme 2024
Asteroseismic Modelling of Massive Stars (id91)

AAT/Veloce 2024
High resolution spectroscopy for abundance studies of HdC stars located in diverse Galactic substructures with AAT/Veloce (A/2024A/07)

SIH HPC Allocation Scheme 2023
Advancing Stellar Properties by Modelling Stellar Oscillations (ht06)

Keck/HIRES 2023
Asteroseismology of the highest-mass Kepler red giant stars (2023B-07)

AAT/Veloce 2022
Projected Rotational Velocities of Delta Scuti Stars (O/2023A/3001)

AAT/Veloce 2022
High resolution spectroscopy for abundance studies of HdC stars with AAT/Veloce (A/2022B/12)

CTIO/KOSMOS 2019
Search for the coldest Magellanic RCB stars; The early supergiant phase after WD merger (NOAO 2019B-0044)

Gemini/NIRI 2017
J and H Photometry of Ultracool White Dwarfs (NOAO-2018A-N0184)

REFERENCES

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