Ronan Kerr | Curriculum Vitae

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Education

University of Texas at Austin
PhD Candidate, Astronomy *December 2021 – Present*

My PhD Dissertation continues work on the SPYGLASS program (Stars with Photometrically Young Gaia Luminosities Around the Solar System), a publication series using Gaia photometry and astrometry to identify young stars within the solar neighborhood and the associations they reside in. Current work is focused on extending the identification of young stars and associations to 1 kpc using the upcoming Gaia Data Release 3, as well as uncovering the internal dynamics of a few notable associations discovered in SPYGLASS-I.

University of Texas at Austin
M.A. Astronomy *August 2019 – December 2021*

GPA: 4.0. My Masters Thesis was centered on the first paper in the currently active SPYGLASS paper series (SPYGLASS-I), which identified 27 large nearby associations and numerous additional subgroups, nearly half of which are either mostly or completely unknown to literature. We also performed broad structure and age analyses for all associations with visible substructure, revealing the varied star formation patterns present in nearby stellar populations. This work was published in August of 2021.

University of British Columbia
B.Sc. Combined Honours in Physics and Astronomy *September 2014 – May 2019*

Average: 86.6% A (3.80/4.0) overall, 88.1% A (3.83/4.0) across all Physics, Astronomy, and Math courses. My Honours Thesis analyzed ALMA observations of young stellar outflows in the Orion complex, which demonstrated significant interaction between the outflows and surrounding gas that may account for a discrepancy observed between the modest mass loss seen through the outflows themselves and the much more significant mass loss predicted through previous studies of star formation efficiency.

Awards

University Graduate Continuing Fellowship
UT Austin Department of Astronomy *2022*

Granted for a record of accomplishments in the graduate school

Frank N. Edmonds, Jr. Memorial Fellowship
UT Austin Department of Astronomy *2021*

Granted for strong promise in research

Paul Sykes Scholarship in Astronomy
UBC Department of Physics and Astronomy *2019*

Granted for passion, dedication, and commitment to astronomy

Publications

First and Second Author Publications

1. **Kerr, Ronan** ; Kraus, Adam L. ; Murphy, Simon J., et al., 2022, *"SPYGLASS. III. The Fornax-Horologium Association and its Traceback History within the Austral Complex"*, ApJ, 941, 143
2. **Kerr, Ronan** ; Kraus, Adam L. ; Murphy, Simon J., et al., 2022, *"SPYGLASS. II. The Multi-generational and Multiorigin Star Formation History of Cepheus Far North"*, ApJ, 917, 23
3. Bouma, L. G. ; **Kerr, R.** ; Curtis, J. L., et al., 2022, *"Kepler and the Behemoth: Three Mini-Neptunes in a 40 Million Year Old Association"*, AJ, 164, 215
4. **Kerr, Ronan M. P.** ; Rizzuto, Aaron C. ; Kraus, Adam L. ; Offner, Stella S. R., 2021 *"Stars with Photometrically Young Gaia Luminosities Around the Solar System (SPYGLASS). I. Mapping Young Stellar Structures and Their Star Formation Histories"*, ApJ, 917, 23
5. Richer, Harvey B. ; **Kerr, Ronan** ; Heyl, Jeremy ; Caiazzo, Ilaria ; Cummings, Jeffrey ; Bergeron, Pierre ; Dufour, Patrick, 2019, *"A Massive Magnetic Helium Atmosphere White Dwarf Binary in a Young Star Cluster"* ApJ, 880, 75.
6. **Kerr, Ronan** ; Kirk, Helen ; Di Francesco, James et al., 2019, *"The Green Bank Ammonia Survey: A Virial Analysis of Gould Belt Clouds in Data Release 1"*, ApJ, 874, 147.
7. Wilson, P. A. ; **Kerr, R.** ; Lecavelier des Etangs, A. ; Bourrier, V. ; Vidal-Madjar, A. ; Kiefer, F. ; Snellen, I. A. G., 2019, *"Detection of Nitrogen Gas in the β Pictoris circumstellar disk"*, A&A, 621, A121.

Co-Authored Publications

1. Newton, E. R. ; Rampalli, R. et al. including **Kerr, Ronan**, 2022, *"TESS Hunt for Young and Maturing Exoplanets (THYME). VII. Membership, Rotation, and Lithium in the Young Cluster Group-X and a New Young Exoplanet"*, AJ, 164, 115.
2. Wilson, Mikayla J. ; Tofflemire, Benjamin M. ; **Kerr, Ronan**, 2022, *"Characterization of a Solar Mass Eclipsing Binary with TESS and IGRINS"*, RNAAS, 6, 196.
3. Heitzmann, A., Zhou, G. et al. including **Kerr, Ronan**, 2022, *"TOI-4562 b: A highly eccentric temperate Jupiter analog orbiting a young field star"*, arXiv:2208.10854.
4. Mann, Andrew W. ; Wood, Mackenna L. et al. including **Kerr, Ronan**, 2022, *"TESS Hunt for Young and Maturing Exoplanets (THYME) VI: an 11 Myr giant planet transiting a very low-mass star in Lower Centaurus Crux "*, AJ, 163, 156.
5. Richer, Harvey B. ; Caiazzo, Ilaria ; Du, Helen ; Grondin, Steffani ; Hegarty, James ; Heyl, Jeremy ; **Kerr, Ronan** ; Miller, David R. ; Thiele, Sarah, 2021, *"Massive White Dwarfs in Young Star Clusters"*, ApJ, 921, 165.
6. Caiazzo, Ilaria ; Heyl, Jeremy ; Richer, Harvey ; Cummings, Jeffrey ; Fleury, Leesa ; Hegarty, James ; Kalirai, Jason ; **Kerr, Ronan** et al. 2020, *"Intermediate-mass Stars Become Magnetic White Dwarfs"*, ApJL, 901, L14.

Presentations and Conference Proceedings

Cool Stars 21 – Plenary Talk and Poster July 8, 2021
"The SPYGLASS program: Mapping the Extensive Star Formation History of the Solar Neighborhood from Young Associations to Large-scale Patterns" – Toulouse, France

2022 Meeting of the European Astornomical Society – Talk and Poster October 5, 2022
"The SPYGLASS program: Mapping the Extensive Star Formation History of the Solar Neighbor-

hood from Young Associations to Large-scale Patterns" – Valencia, Spain

Star Clusters: the Gaia Revolution – Poster and Short Presentation June 29, 2022
"The SPYGLASS Program: Mapping the Extensive Star-Forming Histories of Nearby Young Stellar Populations" – virtually anywhere

Cool Stars 20.5 – Pre-Recorded Haiku Presentation and Poster March 2-4, 2021
"The Extensive Substructure and Long Star-Forming Histories of Young Stellar Populations in the Solar Neighborhood" – virtually anywhere

UT Austin Stars and Planets Seminar – Oral Presentation April 28, 2021
"Second Year Defense: Mapping Young Stellar Structures and their Star Formation Histories" – virtually anywhere

Austin Astronomical Society – Oral Presentation February 12, 2021
"Mapping Young Stellar Structures and their Star Formation Histories" – virtually anywhere

237th Meeting of the AAS – iPoster and pre-recorded talk January 11-15, 2021
"Young Stellar Populations in the Solar Neighborhood" – virtually anywhere

THYME 2020 Conference – Oral Presentation December 8, 2020
"Bayesian Identification of Young Stellar Populations in the Solar Neighborhood Using Gaia DR2" – virtually anywhere

UT Austin Stars and Planets Seminar – Oral Presentation April 1, 2020
"Mapping the Progression of Star Formation in the Solar Neighborhood" – virtually anywhere

UBC Honours Thesis Presentation – Oral Presentation March 21, 2018
"Probing Protostar Outflows in Orion B" – University of British Columbia, Vancouver, BC, Canada

UBC Astronomy Club Grad School 101 – Oral Presentation March 21, 2018
"Investigating the Virial State of Cores in Gould Belt Clouds" – University of British Columbia, Vancouver, BC, Canada

Leiden/ESA LEAPS Program – Oral Presentation August 9th, 2018
"Exploring the Debris Disk Around β Pictoris" – Leiden Observatory, Leiden, the Netherlands

CITA/University of Toronto SURP Program – Oral Presentation August 25, 2018
"Simulating Spectral Lines in the Distant Universe" – University of Toronto, Toronto, ON, Canada

NRC Science Tea – Oral Presentation April 27, 2017
"Investigating the Virial State of Cores in Gould Belt Clouds" – National Research Council of Canada - Herzberg Astronomy and Astrophysics, Victoria, BC, Canada

Observing Proposals

Las Cumbres Observatory Proposals 2020-2022
"Characterizing Newly-Discovered Young Associations in the Solar Neighborhood" – accepted for a total of 112 hours across three proposals, proposal IDs: UTX2020B-001, UTX2021B-002, UTX2022A-002

McDonald 2.7m (Harlan J. Smith Telescope) Proposals 2020-2022
"Characterizing Newly-Discovered Young Associations in the Solar Neighborhood" (and related

proposals) – all accepted for a total of 32 nights (31 requested) across four trimesters: 20-3, 21-1, 21-3, 22-1

NSF OIR Lab AAT Proposal 2021
"Exploring the Star Formation History and Dynamics of the Sco-Cen Association" – accepted for two nights of observations, proposal ID: 2021A-0265

Gemini South Observatory Fast Turnaround Proposal 2019
"Red and Infrared Spectroscopy of a Peculiar White Dwarf System" – accepted for full time requested, proposal ID: GS-2019B-FT-203

Gemini North/South Observatory Fast Turnaround Proposal 2019
"Spectroscopy of Massive White Dwarfs in Open Clusters" – accepted for the full time requested, proposal IDs: GN-2019A-FT-214 (North), GS-2019A-FT-115 (South)

Gemini South Observatory Fast Turnaround Proposal 2018
"Spectroscopy of Massive White Dwarf Stars in Young Open Clusters" – accepted for the full time requested, proposal ID: GS-2018B-FT-108

Research Employment

- **University of Texas at Austin**
  Graduate Research Assistant *August 2019 – Present*

  I am using Gaia observations to uncover young stellar populations in the solar neighborhood and the associations they reside in, a program referred to as SPYGLASS (Stars with Photometrically Young Gaia Luminosities Around the Solar System). In the recently-published SPYGLASS-I paper, we identified many young associations including a few that are largely absent from literature, while also performing analyses of the substructure and star formation histories of regions with notable internal variation. We are currently improving the depth of our young association survey to a distance of 1 kpc, while also performing targeted studies of the star formation histories of a few young associations from SPYGLASS-I.

- **University of British Columbia**
  Undergraduate Research Associate *May 2018, September 2018 – July 2019*

  I used Gaia data to uncover white dwarfs within young star clusters, supervised by Professor Harvey Richer. Multiple previously unknown ultramassive white dwarf candidates were discovered, and I led three successful Gemini Fast Turnaround proposals to confirm their nature spectroscopically. We revealed a tendency for intermediate mass stars to produce highly magnetised white dwarfs, while also discovering a series of high-mass white dwarfs with some of the highest mass progenitors currently known. This research has produced three papers to date that I am a co-author on, and I am the second author on the first paper in the series.

- **Leiden Observatory**
  Research Assistant *June 2018 – August 2018*

  I used Hubble Space Telescope data to investigate the debris disk around β Pictoris, supervised by Dr. Paul Wilson. I developed a method for the removal of airglow effects, before fitting the combined data set using python-based least squares and MCMC programs. We used this fitting to determine the radial velocities and column densities of nitrogen in the β Pictoris debris disk, which appears to originate from populations of comets in the system. I am the second author on a paper on the topic, which has been published in A&A.

- **Canadian Institute for Theoretical Astrophysics**
  Research Assistant *May 2017– August 2017*

I worked under Professor Richard Bond researching large-scale structure using Fortran simulations and Python programming. The goal was to gain information on what we could expect to see in future surveys observing different emission lines from galaxies. This research involved generating simulated images of the galaxy distribution smoothed to different scales according to the desired resolution, as well as creating image stacks which give a more statistical view of the large-scale structure.

- **NRC - Herzberg Astronomy and Astrophysics Research Centre**
  Research Assistant *January 2017 – April 2017*

  I conducted research on the dynamics of dense gas in star-forming regions, supervised by Professor James Di Francesco and Dr. Helen Kirk. Python and image-processing tools such as Starlink were employed to analyse the fits data files provided. These data included ^{13}CO spectral cubes from the Five College Radio Astronomy Observatory, continuum maps from the James Clerk Maxwell Telescope (JCMT), column density maps from the Herschel Space Telescope, and property maps from the Green Bank Telescope. I conducted a virial analysis of dense cores in three star-forming regions, and concluded that turbulent pressure dominates the forces binding many cores, although with increasing influence from cloud weight pressure in more massive star forming complexes. I am the first author on a paper describing these results, which was published in ApJ.

- **University of British Columbia**
  Research Assistant *May 2016 – August 2016*

  I worked with Professor Harvey Richer reducing and analyzing Hubble Space Telescope data from 55 Globular Clusters. This project included computing an incompleteness correction for the cluster photometry, which made use of PyRAF/IRAF, Linux shell programming, and Python. This procedure allowed us to correct for the imperfect detection rate of faint objects and objects in crowded areas. This correction allowed for improved dynamical studies of these clusters, enabling a future search for intermediate-mass black holes.

Volunteer Experience

- **UT Austin PMA Star Parties**
  Telescope Operator *September 2019 – Present*

  I help at UT Austin's public star parties on top of the PMA building, operating one of the smaller telescopes and answering astronomy-related questions from the public

- **UT Austin TAURUS Program**
  Graduate Mentor *June 2021 – August 2021*

  I served as the graduate student mentor for for one of the participants in TAURUS (Texas Astronomy Undergraduate Research experience for Under-represented Students).

- **UBC Astronomy Club**
  General Officer, VP Observational, President, Advisor *September 2014 – May 2019*

  I was elected president in first year after a few months as VP Observational (responsible for running observing events). Over the course of two terms, we doubled membership, modernized our website and social media presence, and expanded our dark-sky observing events. I finished my time in the club as an advisor in 2018-19, during which time I worked to train the next generation of amateur astronomers at UBC, teach introductory astronomy classes at elementary schools and, in general, help to maintain the reputation of the club as an advocate for astronomy in Greater Vancouver.

- **Science Undergraduate Society**
  Astronomy Representative *September 2017 – August 2019*

I was the two-term elected representative of the Astronomy program at the UBC Science Undergraduate Society (SUS) Council, and served continuously on both core administrative committees: Code and Policy (which is responsible for amending and reforming the society's constitution), and Budget (which oversees the society's finances). I led a student consultation initiative in 2019 which led to the widespread restructuring of the society's finances and constitution, diverting thousands of dollars towards student initiatives that was originally used largely for benefits to the SUS councillors themselves.

Other Employment

- **University of British Columbia**
  Teaching Assistant *January 2019 – April 2019*

  I served as a teaching assistant for ASTR 205 - Stars and Stellar Populations, taught by Professor Harvey Richer. I took part in creating and marking assignments, and helping students with the assignments

- **Vancouver Telescope Centre**
  Sales Associate *June 2010 – December 2016*

  I was responsible for sales and tidying the shop, working full time during most breaks from school, and on weekends during school. I also provided telescope tutorials for customers, and taught amateur astronomy classes alongside the shop's manager.