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Subject: Michigan ELT Fellowship Cover Letter

I intend to pursue a career as an observational astronomer in the field of high-contrast imaging and exoplanet science. I propose to build on my experience modeling exoplanet reflected light spectra by applying my models to ELT/HARMONI and ELT-PCS instruments to predict survey yields, estimate spectroscopic atmosphere characterization, and inform instrument design and observing strategies. This proposal will be a key piece of planning for one of the main science cases of the next generation of ground-based astronomy.

I began this work during my PhD at the University of Arizona with the MagAO-X team. Working with Natasha Batalha at NASA Ames, I produced a suite of reflected light models, called ReflectX, which I applied to planning MagAO-X reflected light observations expected in the next few years, and to the Preliminary Design Review of GMagAO-X, the follow-on instrument the team is building for GMT (PDR will be in Spring 2024). This work is ongoing and publication is planned for Spring 2024. With the support of this fellowship I will continue this exciting and important work with ELT instruments, continue to work with MagAO-X and GMagAO-X team on reflected light observations, and continue to develop and improve the ReflectX model suite through collaboration with folks at Michigan, NASA, and beyond.

Additionally, locating my postdoc fellowship at Michigan allows me to continue my white dwarf - main sequence star binary survey called the Pup Search, novel research benefiting both the exoplanet and white dwarf science communities. My program uses ground-breaking new ground-based telescope high-contrast imaging instrumentation to detect new white dwarf companions to main sequence stars and study the pollution rates of white dwarfs in wide binary systems compared to single white dwarfs, in order to study the influence of the wide companion on planets and planetesimals around the white dwarf, and to enable population-level statistics by uncovering new systems. This survey relies on MagAO-X on the Magellan Clay telescope, of which Michigan is a consortium member.

Finally, with the support of this fellowship I will build on my previous work to continue to serve my student veteran community and encourage veteran participation in STEM research through the Student Veterans Research Symposium. Student veteran participation and graduation rates in STEM fields lags their non-veteran peers. Veterans face several barriers to success in STEM degrees not faced by non-veteran students, and are more likely to come from traditionally underrepresented groups in STEM such as first-generation college students and racial minorities. In my Future Plans section, I discuss how a veteran-specific research symposium will help encourage participation in STEM research at Michigan-area schools.

In summary, the research program I am proposing is ideally suited to the resources provided by this fellowship and will be a significant impact to the next generation of exoplanet science, and the support of this fellowship will be vital for accomplishing my professional and outreach goals.

A handwritten signature in purple ink that reads "Logan A Pearce".  
Logan A Pearce

## RESEARCH PROPOSAL

### *Preparing for the Next Generation of Exoplanet Science: Reflected Light Spectroscopic Modeling for Extreme AO in the ELT Era*

**MOTIVATION:** The Astro 2020 decadal survey listed detecting and characterizing Earth-like exoplanets and potentially habitable worlds as one of the top three scientific priorities for the next decade of astronomy. To date, all directly imaged exoplanets have been detected in their thermal emission, limiting the systems probed by this method to young, large planets on wide separations from their host stars. To directly image an Earth-like or potentially habitable exoplanet, it is necessary to detect them in the light they reflect from their host star. The contrasts inherent in these detections have been prohibitively high, but technology platforms like the extreme AO (ExAO) instrument MagAO-X on the Magellan Clay Telescope are pushing technology like AO system design, wavefront control, and post-processing techniques to necessary regimes, and the first reflected light exoplanet detections with MagAO-X are expected in the next few years. The next generation of 30-m class telescopes is poised to directly image hundreds of exoplanets in reflected light and provide detailed spectra of their atmospheres.

As first light with the first of these telescopes is approaching, now is the time to prepare for these observations and understand what can be learned about these exoplanets and what instrument designs are needed to maximize scientific yield. In 2023 I spent 6 months on an NSF INTERN-funded internship at NASA Ames Research Center working with Natasha Batalha, the PI of the Picaso radiative transfer exoplanet modeling package [2], to produce the ReflectX model grid of reflected light planets. ReflectX<sup>1</sup> consists of two generic planet model grids spanning a wide range of star and planet properties for gas giant and terrestrial planets, and provides 1d reflected light spectra in the range of 0.4-2  $\mu\text{m}$ . ReflectX also contains models of the nearest known RV-detected exoplanets. I am currently working with this model grid to predict survey yields for reflected light imaging with MagAO-X, and to inform the design of GMagAO-X, the first light ExAO coronagraphic instrument for the Giant Magellan Telescope (GMT). Preliminary Design Review for GMagAO-X is planned for spring 2024, and the analysis using ReflectX models will be a key part of the design and review. Figure 1 displays a preliminary example of an exposure time estimate using ReflectX models. It shows three known nearby gas giant exoplanets modeled using ReflectX combined with a noise model based on Males et al. 2021 [7] Sec 2 for GMagAO-X on the Giant Magellan Telescope (see caption for details). We see that all three planets are detectable ( $S/N > 5$ ) in most filters in less than an hour exposure time. This is an example of the type of analysis proposed for this fellowship. This analysis for GMT/GMagAO-X is ongoing at this time.

**PROPOSAL: I propose to apply the ReflectX model suite to the European Extremely Large Telescope (E-ELT) instruments ELT-PCS and HARMONI to assess capabilities and science yield and inform the design of both instruments.** The extreme AO coronagraphic

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<sup>1</sup><https://reflectx.readthedocs.io/en/latest/index.html>

<sup>3</sup>[https://jaredmales.github.io/mxlib-doc/group\\_\\_planets.html#ga4b350ecfdeac1bedb897db770b09789](https://jaredmales.github.io/mxlib-doc/group__planets.html#ga4b350ecfdeac1bedb897db770b09789)

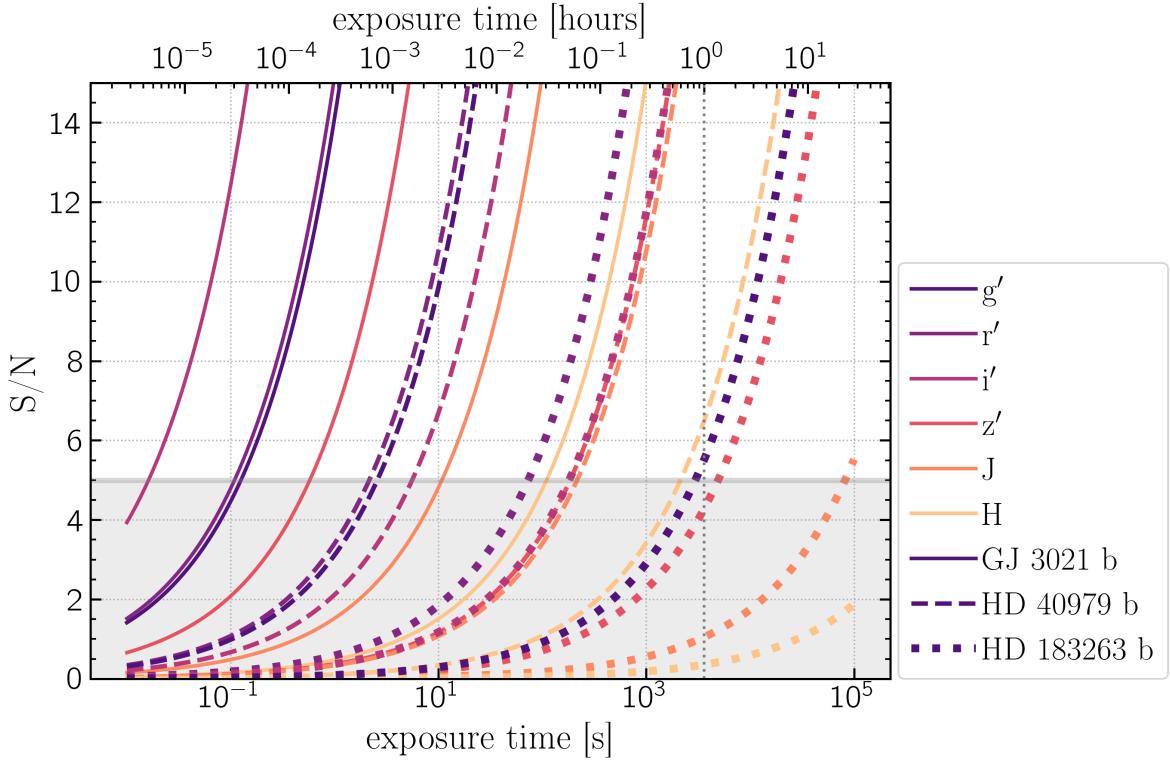


Figure 1: Exposure time vs signal-to-noise ( $S/N$ ) in SDSS and MKO filters for preliminary ReflectX models of three known nearby gas giant planets, all with  $R \approx 11R_{\oplus}$  at 18, 34, and 55 pc respectively, for GMagAO-X on the Giant Magellan Telescope (diameter = 25.4 m). Photometric signal was estimated using ReflectX output of Picaso climate calculation and combined with the filter transmission curve. The noise model was adapted from Males et al. 2021 [7] Sec 2, which assumes an atmospheric-speckle dominated regime. Where unknown, radius was derived using an exoplanet mass-radius relation<sup>3</sup> and RV minimum mass estimate. The grey shaded region marks  $S/N < 5$ , which is typically considered a non-detection. The dashed grey line marks exposure time of 1 hour. All three planets are easily detected photometrically in most filters in less than an hour of exposure time.

photometric and spectroscopic instrument ELT-PCS, along with GMagAO-X, is poised to make the biggest impact in this science case so careful modeling and planning is essential to informing design to maximize science capabilities and yields. The ReflectX model suite is already being used for this for GMagAO-X, and can easily be applied to both HARMONI and ELT-PCS characterization. All of this is being tested right now on MagAO-X, which the University of Michigan (UM) is invested in, and with which I have a demonstrated history of impactful science. As part of this proposal I will continue to collaborate with the MagAO-X team as a key partner in reflected light survey design and observations with both MagAO-X and GMagAO-X. I plan to work with Michael Meyer on this program, one of the significant users of MagAO-X and invested in E-ELT instrumentation. The funding of this fellowship will allow me carry out this vital project at UM.

In Year 1 of my fellowship I will combine ReflectX models with ELT-PCS and HARMONI noise models to produce survey yield predictions and atmospheric signal detection predictions using the two generic planet grids, with publication of survey design expected near the end of Year 1. I will also continue to work with GMagAO-X and my collaborators at the University of Arizona

to produce robust analysis and deliver near-term impacts to the US exoplanet ELT community. In Years 2 and 3 of my fellowship I will work with exoplanet atmosphere experts at Michigan, such as Ryan MacDonald (with whom I've collaborated on analysis of JWST observations of WD 1856 b [16]) and my collaborators at University of Arizona, UCSC, and NASA Ames to continue to improve the ReflectX model grids and investigate more and diverse planetary atmosphere characteristics, such as the influence of disequilibrium chemistry, tidal heating and thermal emission, and the influence of hazes. I will continue to expand the public-facing interface of ReflectX to enable community use of the models with a wide range of telescopes and instruments. I expect multiple publications resulting from these analyses. Throughout the fellowship term I will collaborate with the MagAO-X team to design and carry out the planned reflected light observations in the next few years.

The short-term outcomes of this fellowship will be the first ground-based reflected light observations with MagAO-X, an analysis of the capabilities of GMagAO-X, HARMONI, and design input for ELT-PCS on this key science case, and a robust public model suite with an effective public interface.

## SUMMARY OF PREVIOUS AND CURRENT RESEARCH

This proposal builds on my past research in both reflected light modeling and high contrast imaging with extreme AO instruments and is a natural extension of expertise, experience, and collaborations developed during my PhD at the University of Arizona.

**Previous research #1: The wide stellar companion to Boyajian's Star:** The transit light curve of Boyajian's Star (aka KIC 8462852) exhibits large aperiodic dips in a variety of shapes that are inconsistent with any astrophysical explanation [4]. In **Pearce et al. 2021** [10], we used three epochs of Keck/NIRC2 infrared imaging with adaptive optics (AO) to show that a candidate wide stellar companion at 880 AU (shown in Figure 2) is gravitationally bound, and argued that it is possible that the companion's gravity is or recently was influencing the planetary regime even at such a large distance.

**Previous research #2: Binary Differential Imaging and the HIP 67506 AC system:** One method for removing the stellar PSF in AO imaging is to image a reference star that does not contain a companion signal, and use it to model the stellar PSF and subtract from the science target star. In **Pearce et al. 2022** [11], I analyzed infrared images of 17 wide stellar binaries, obtained from 2015-2017 with MagAO [5] on the Magellan Clay Telescope, using each star in the binary as the reference star for the other, called Binary Differential Imaging [BDI; 14]. HIP 67506 A contained a candidate signal at  $\sim 2''$  (Figure 3, top).

We observed HIP 67506 A in April 2022 with the MagAO-X instrument on the Magellan Clay Telescope and easily confirmed the companion signal, HIP 67506 C, at  $0.1''$  (Figure 3, bottom). We characterized the HIP 67506 AC system with our photometry and astrometry in **Pearce et al. 2023** [12]. This was the first MagAO-X paper published using on-sky data.

**Current Research Project #1: Accelerating Stars with MagAO-X:** The 25-year astrometric baseline provided by the Hipparcos and Gaia satellites provides a way to identify stars experiencing

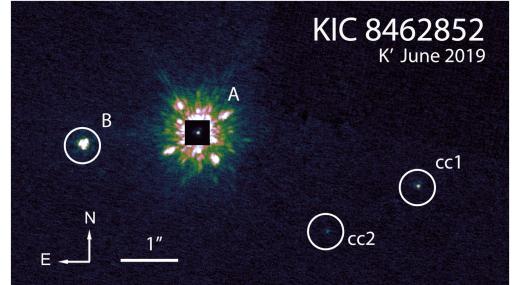


Figure 2: Figure 1 of Pearce et al. 10 showing Boyajian's Star, marked A, with the confirmed companion, marked B, 2'' to the east.

long-period accelerations due to a hidden companion. I am Co-PI on a survey of accelerating stars in the young Scorpius Centaurus star forming region with MagAO-X, called Xoomies, to discover new giant planet and brown dwarf companions to young stars. The first Xoomies observations are planned for Spring 2024.

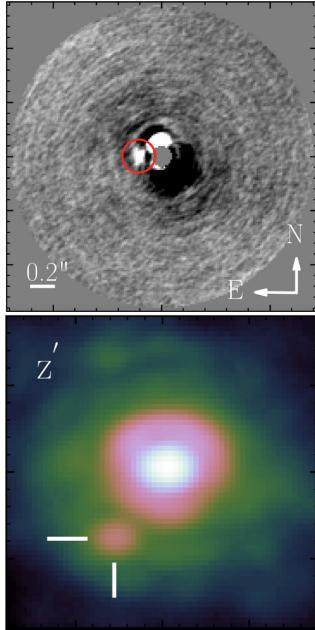


Figure 3: Top:  $L'$  BDI-reduced image of HIP 67506 A with candidate signal marked in red. Bottom: MagAO-X  $z'$  with companion HIP 67506 C marked by white cross

**Current Research Project #2: ExAO Pup Search:** The influence of a wide stellar companion on exoplanets around a star is crucial to probe for understanding how planets in binaries form and evolve. Observational tests are critical for predictions of how and to what degree companions influence planetary systems throughout the star's lifetime. White dwarfs (WD) with (non-interacting) main sequence star companions (WDMS) are an excellent laboratory for probing the influence of a wide companion at late stages of planetary system evolution. WDs are expected to have pure H/He photospheres, and it has been shown that any metals observed in their spectra were deposited recently from the planetary regime [19], making "polluted" WDs the only method of probing the refractory compositions of exoplanetary material [e.g. 20, 17, 21, 13]. The role of a wide companion in deposition of material onto the WD is unknown and hampered by low population statistics. I am currently conducting the ExAO Pup Search: a survey to probe planets in wide binaries by leveraging the power of extreme adaptive optics towards White Dwarf + Main Sequence star systems<sup>4</sup>.

#### The Pup Search has three main objectives:

1. Detect new non-interacting WDMS binary systems with MagAO-X on the Magellan Clay Telescope and SCExAO on Subaru Telescope.
2. Monitor orbits of new and previously known resolved WDMS systems with imaging and radial velocity to determine prevalence of high-eccentricity orbits of MS companions for polluted WDs and compare to estimated orbital parameters for the binary to be influencing pollution, such as those in Stephan et al. [15] and Veras et al. [18] Fig 3.
3. Determine pollution rates for WDMS systems with Keck/HIRES and HST, compare to single WDs and as a function of cooling age, and compare to estimates such as Veras et al. [19]

The first Pup Search observations were conducted in fall 2022 with MagAO-X on the Magellan Clay Telescope, with one new WDMS detection, shown in Figure 4. Another MagAO-X observation of the Pup Search target list will occur in Spring 2024. This survey will provide the **exoplanet community** with a robust investigation of S-type planets in binaries at the end of the star's lifetime, with new WD pollution data providing more evidence of refractory compositions of exoplanets, and provide the **white dwarf community** with an expanded population of WDMS systems. These data produced by this survey will be invaluable to both fields.

#### Current Research Project #3: Exoplanets in Reflected Light with GMT and GMagAO-X:

A detailed above, in 2023 I won funding through the NSF INTERN program to spend 6 months

<sup>4</sup>The name is a reference to the first known wide White Dwarf- Main Sequence system, Sirius AB discovered in 1844 by Friedrich Bessel when he observed changes in the proper motion of Sirius [3], first observed by Alvin Graham Clark [6], and confirmed as the second ever known WD via its spectrum obtained by Walter Adams [1]. Since Sirius A is the "Dog Star", Sirius B was nicknamed "The Pup"

at NASA Ames Research Center to work with Dr. Natasha Batalha, an expert in exoplanet atmosphere modeling. I am using the exoplanet atmosphere modeling code Picaso [2], which she maintains, to produce the ReflectX model reflected light spectra of hundreds of star and planet configurations and combine them with noise models to produce signal-to-noise and exposure time estimates for broadband and high-resolution spectroscopic observations of exoplanets in reflected light, particularly for upcoming MagAO-X and GMagAO-X reflected light surveys. ReflectX models are being made public for the DI community working on ground-based reflected light exoplanet imaging, and are contributing to the design of GMagAO-X and GMT. ReflectX is open-source, maintained publicly on GitHub, with extensive documentation in accordance with software best practices.

**Outreach #1: Veteran Outreach:** My status as a student veteran has been a significant part of my identity as a researcher. I am motivated to help my student veteran peers make the most of the opportunities available in undergraduate and graduate programs. As a PhD student at the University of Arizona I worked for three summers as a Research Project Leader for the Warrior Scholar Program (WSP), conducting week-long projects introducing scientific research and coding as part of WSP's two week "boot camp" for veterans transitioning into undergraduate programs. In 2022-2023 I worked for a full academic year as a consultant for WSP's Diana Davis Spencer Scholars program in which I gave workshops, shared resources, and gave application material feedback for a cohort of 25 WSP alumni who were applying for graduate school. I created and presented three professional development workshops with DDSS, and three different research projects with WSP, all of which are publicly available on my website and GitHub. Finally in 2021 I founded the Student Veterans Research Network (SVRN), a peer network of graduate student veterans connecting across disciplines and across the country to support each other and share resources. In 2022 I presented SVRN at the Student Veterans of America National Conference in Orlando, FL.

I am currently starting the annual Student Veteran Research Symposium to showcase veteran research at the undergraduate, graduate, and post-doc levels and encourage recruitment and retention of veterans into STEM research. I have developed a detailed plan for the Symposium with my PhD advisor Dr. Jared Males (also a Navy veteran) and have begun the initial work to host a local Symposium for Arizona schools this upcoming spring at UA.

**Outreach #2: Astronomy on Tap Tucson:** Since 2021 I have served as Lead Organizer for Astronomy on Tap (AoT) in Tucson. AoT is a worldwide organization of local public astronomy outreach talks in bars and breweries. In Tucson we operate as Space Drafts and host public talks every month at a local brewery. We have a robust program of talks, trivia, games, and merchandise and see a loyal audience month after month. I lead a team of six to put on the show in a relaxed

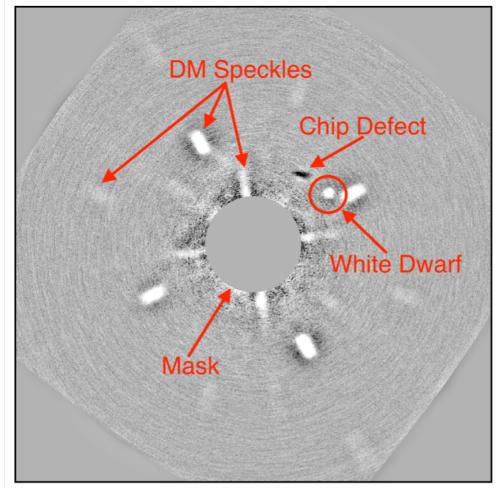


Figure 4: A new WD companion (red circle) to a main sequence star discovered in  $i'$  band with MagAO-X in 2022 as part of the Pup Search program. Host star PSF was removed by unsharp mask and radial profile subtraction; mask, chip defect, and speckles caused by the deformable mirror are labeled. The new WD companion is indicated by the red circle.

atmosphere making the cutting edge astronomy happening in Tucson accessible and fun to a public audience. I love AoT and intend to participate in the Ann Arbor show if awarded this fellowship.

## ADDITIONAL PLANS FOR THIS FELLOWSHIP

**Continuation of the Pup Search:** Locating my postdoc at Michigan has the added benefit of enabling the continuation of the Pup Search survey described above. As described in the previous section, the Pup Search targets new and known non-interacting white dwarf + main sequence binaries in an effort to obtain new population members and understand how the wide companion influences the planetary regime around the white dwarf. This survey relies heavily on data from the MagAO-X instrument on the Magellan Telescope, of which Michigan is a consortium member. The Pup Search also relies on access to SCExAO, Keck, and HST, all of which I plan to apply for through public time allocations. As a member of the MagAO-X team during my PhD I have had 24 hours MagAO-X observing time as PI awarded over 2 semesters, 18 of which were for preliminary Pup Search observations. The remaining 6 hours resulted in publication of a new binary system HIP 67506 AC [12]. Additional MagAO-X Pup Search observations are planned for Spring 2024. I have extensive experience with long-period orbit monitoring [8, 9, 10] and with high-contrast image processing and data analysis [11, 12], so I am well qualified to carry out this project during my postdoc tenure.

**Student Veterans Research Symposium with Michigan Area Universities:** Finally, I intend to continue my outreach to the student veteran population during my postdoc tenure. Veterans are a statistically underrepresented group in higher education despite the numerous education benefits accompanying veteran status. Veterans are 7% of the US population over 18, yet they make up 3.7% of undergraduate students at the University of Arizona (UA), and 3.6% of STEM majors. At UA, veteran retention also lags compared to all students, with 31% of veteran STEM majors graduating after 6 years compared to 63% of all undergraduates<sup>5</sup>. The veteran population disproportionately comes from other underrepresented groups as well, such as racial minorities and first-generation college students. Veterans are significantly more likely to have dependents, military reserve obligations, and specific requirements related to education benefits (e.g. needing to take a full course load in order to receive a housing stipend), all of which can limit access to the kinds of opportunities that make graduate school applications stand out.

Veterans often don't realize how their military experience can be applied to STEM academics and careers. In addition to technical skills, veterans tend to underestimate the "soft skills" they've attained in the service, such as leadership and management, and how they can be leveraged for academic and research success. Many student veterans I've known were nervous about how their age and life experience makes them different from their college peers, something which actually is a major strength.

	Year 1			Year 2			Year 3		
	Fall 24	Spr 25	Sum 25	Fall 25	Spr 26	Sum 26	Fall 26	Spr 27	Sum 27
Local symposium for host institution and local community colleges			X						
Regional symposium including schools from neighboring states						X			
National symposium								X	

Figure 5: *Symposium timeline*

<sup>5</sup>Source: UA Analytics as of 2020

Getting STEM-inclined veterans involved in STEM research in undergrad can increase retention by (1) helping them see past barriers such as difficult classes, (2) fostering community in academia by becoming contributing members of a research group, mitigating perceptions of otherness due to age and life-stage differences with peers, (3) fostering a sense of purpose by contributing meaningfully to active research, and (4) utilizing skills from service in a new way or uncovering new skills.

Budget	
Keynote speaker travel and accomodation	\$1,000
Coffee, lunch, snacks throughout day	\$1,000
Conference dinner/reception	\$2,000
Total	\$4,000

Figure 6: *Example Symposium budget for the first local Symposium.*

I propose to start the annual **Veterans Research Symposium** at the University of Michigan, a student veteran focused scientific research conference showcasing the research produced by veterans across disciplines at undergraduate, graduate, and post-doc levels. Together with my PhD advisor at UA, Dr. Jared Males (also a US Navy veteran), we have already begun the work of refining this idea and taking the first steps at the University of Arizona; I will extend this to UM and

Michigan-area schools. The goal of the conference is to **promote community** among student veterans across disciplines, **increase visibility** of veteran researchers and encourage recruitment into research, **enable connection** for graduate programs looking to recruit student veterans, and **showcase the skills and achievements of veterans in STEM** research to encourage recruitment and retention of veterans. Taking place over two days, the conference will consist of multiple poster and/or talk sessions, workshops, and a keynote speaker. We plan to begin with local area universities initially, building eventually to a national conference. Figure 1 displays a proposed timeline; Figure 2 displays an example budget for the first local Symposium. We will work closely with UM and veteran groups to fund the initial Symposium, and build on its success to expand funding for the larger events. We will track participation rates by veteran researchers, as well as attendance by non-veterans to assess the utility of this symposium. **If funded through the Michigan ELT Fellowship, I will continue this work with Dr. Males to make this dream a reality.**

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  - [17] D. Veras. Post-main-sequence planetary system evolution. *Royal Society Open Science*, 3:150571, Feb. 2016. doi: 10.1098/rsos.150571.
  - [18] D. Veras, N. Georgakarakos, I. Dobbs-Dixon, and B. T. Gänsicke. Binary star influence on post-main-sequence multi-planet stability. *Mon. Not. R. Astron. Soc.*, 465:2053–2059, Feb. 2017. ISSN 0035-8711. doi: 10.1093/mnras/stw2699.

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# PUBLICATIONS

## FIRST AUTHOR

- Pearce, L. A., Males, J. R., Haffert, S. Y., Close, L. M., Long, J. D., et al. (2023) HIP 67506 C: MagAO-X confirmation of a new low-mass stellar companion to HIP 67506 A *Monthly Notices of the Royal Astronomical Society* 521, 4775
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- Pearce, L. A., Kraus, A. L., Dupuy, T. J., Mann, A. W., Newton, E. R., et al. (2020) Orbital Parameter Determination for Wide Stellar Binary Systems in the Age of Gaia *The Astrophysical Journal* 894, 115
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## CONTRIBUTING AUTHOR

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- Venner, A., Pearce, L. A., Vanderburg, A. (2022) An edge-on orbit for the eccentric long-period planet HR 5183 b *Monthly Notices of the Royal Astronomical Society* 516, 3431
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## CO-AUTHOR

- Males, J. R., Close, L. M., Haffert, S., Long, J. D., Hedglen, A. D., et al. (Pearce, L. A., 6 of 18) (2022) MagAO-X: current status and plans for Phase II *Adaptive Optics Systems VIII* 12185, 1218509
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- Close, L. M., Males, J., Long, J. D., Van Gorkom, K., Hedglen, A. D., et al. (Pearce, L. A., 23 of 26) (2020) Prediction of the planet yield of the MaxProtoPlanetS high-contrast survey for H-alpha protoplanets with MagAO-X based on first light contrasts *Adaptive Optics Systems VII* 11448, 114480U
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- Steckloff, J. K., Soderblom, J. M., Farnsworth, K. K., Chevrier, V. F., Hanley, J., et al. (Pearce, L. A., 9 of 11) (2020) Stratification Dynamics of Titan's Lakes via Methane Evaporation *The Planetary Science Journal* 1, 26
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- Nielsen, L. D., Brahm, R., Bouchy, F., Espinoza, N., Turner, O., et al. (Pearce, L. A., 7 of 77) (2020) Three short-period Jupiters from TESS. HIP 65Ab, TOI-157b, and TOI-169b *Astronomy and Astrophysics* 639, A76
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- Cook, J. C., Dalle Ore, C. M., Protopapa, S., Binzel, R. P., Cruikshank, D. P., et al. (Pearce, L. A., 26 of 28) (2019) The distribution of H<sub>2</sub>O, CH<sub>3</sub>OH, and hydrocarbon-ices on Pluto: Analysis of New Horizons spectral images *Icarus* 331, 148
- Mayo, A. W., Rajpaul, V. M., Buchhave, L. A., Dressing, C. D., Mortier, A., et al. (Pearce, L. A., 23 of 30) (2019) An 11 Earth-mass, Long-period Sub-Neptune Orbiting a Sun-like Star *The Astronomical Journal* 158, 165

- Gaidos, E., Jacobs, T., LaCourse, D., Vanderburg, A., Rappaport, S., et al. (**Pearce, L.**, 7 of 16) (2019) Planetesimals around stars with TESS (PAST) - I. Transient dimming of a binary solar analogue at the end of the planet accretion era *Monthly Notices of the Royal Astronomical Society* 488, 4465
- Vanderburg, A., Huang, C. X., Rodriguez, J. E., Becker, J. C., Ricker, G. R., et al. (**Pearce, L. A.**, 36 of 51) (2019) TESS Spots a Compact System of Super-Earths around the Naked-eye Star HR 858 *The Astrophysical Journal* 881, L19

# Logan Pearce

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## EDUCATION

### UNIVERSITY OF ARIZONA

PHD CANDIDATE IN ASTRONOMY  
 Current | Tucson, AZ  
 Degree expected Spring 2024

### UNIVERSITY OF TEXAS AT AUSTIN

BS IN ASTRONOMY (HONORS)  
 BS IN PHYSICS  
 May 2019 | Austin, TX  
 Cum. GPA: 3.93 / 4.0

### MA IN EDUCATION

August 2014 | Austin, TX  
 Conc. in Secondary Engineering Ed.  
 Cum. GPA: 3.95 / 4.0

### NAVAL NUCLEAR POWER TRAINING COMMAND

REACTOR PLANT OPERATIONS &  
 THEORY  
 March 2005 - March 2006 |  
 Charleston, SC & Ballston Spa, NY

### PURDUE UNIVERSITY

BS IN CHEMISTRY  
 May 2003 | W. Lafayette, IN  
 Cum. GPA: 3.11 / 4.0

## LINKS

Website:// [loganpearcescience.com](http://loganpearcescience.com)  
 Github:// [github.com/logan-pearce/](https://github.com/logan-pearce/)  
 LinkedIn:// [loganpearce](https://www.linkedin.com/in/loganpearce/)  
 Twitter:// [@loganpearce](https://twitter.com/@loganpearce)

## WORK EXPERIENCE

### UNIV. OF ARIZONA STEWARD OBSERVATORY | GRADUATE

#### RESEARCH ASSISTANT

August 2019 - Current | Tucson, AZ

- PhD candidate in astronomy with specialty in high-contrast imaging.
- Completed requirements for a master's degree in astronomy in Nov 2021.
- NSF GRFP fellow.
- NSF GRFP INTERN program supplemental funding recipient
- Assisted ~20 students with NSF GRFP application preparation as a consultant with the UA GRFP Application Development Program.
- Taught exoplanet-based research projects to student veteran cohorts as part of the Warrior Scholar Project in summer 2020, 2021, and 2022.
- Taught workshops and consulted on application materials for ~25 student veterans applying to graduate school via the Diana Davis Spencer Scholars program.
- Founded the Student Veteran Research Network in August 2021.

### UNIV. OF TEXAS AT AUSTIN | RESEARCH ASSISTANT + LAB

#### TECHNICIAN + WRITING CENTER CONSULTANT

August 2015 – August 2019 | Austin, TX

- Assisted >250 students on any piece of writing at any stage as a University Writing Center Consultant for 3 semesters.
- Assisted in all aspects of fabrication and testing of the VIRUS spectroscopic instrument for the Hobby Eberly Telescope Dark Energy Experiment for 2 semesters.

### KEALING MIDDLE SCHOOL | TEACHER, PHYSICS AND ENGINEERING

Aug 2009 – May 2015 | Austin, TX

- Created and implemented accelerated physics curriculum for 6th grade.
- Developed and implemented two engineering elective courses on flight and space exploration.
- Lead a team of ~20 teachers as 6th grade team leader, 2013-2015.
- Obtained master's degree in engineering education in August 2014.

### US NAVY | OFFICER, NUCLEAR POWER SPECIALIST

Mar 2006 – May 2008 | USS John C. Stennis (CVN-74), Bremerton, WA

- Managed all aspects of reactor plant operations as reactor Propulsion Plant Watch Officer in both at-sea wartime and maintenance conditions.
- Managed a team of 30 mechanics maintaining potentially-contaminated reactor plant systems as Mechanical Maintenance Division Officer.

May 2003 – Mar 2005 | USS Samuel B. Roberts (FFG-58), Mayport, FL

- Managed a team of 10 electronics technicians as Combat Electronics Division Officer.
- Managed all aspects of bridge and combat center operations as Bridge and Combat Center Watch Officer.

# PUBLICATIONS (REFEREED)

## FIRST AUTHOR

- Pearce, L. A., Males, J. R., Haffert, S. Y., Close, L. M., Long, J. D., et al. (2023) HIP 67506 C: MagAO-X confirmation of a new low-mass stellar companion to HIP 67506 A *Monthly Notices of the Royal Astronomical Society* 521, 4775
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- Mayo, A. W., Rajpaul, V. M., Buchhave, L. A., Dressing, C. D., Mortier, A., et al. (Pearce, L. A., 23 of 30) (2019) An 11 Earth-mass, Long-period Sub-Neptune Orbiting a Sun-like Star *The Astronomical Journal* 158, 165

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## PRESENTATIONS (SELECTED)

### INVITED TALKS

- Invited speaker, IFA Exoplanets Lunch Seminar Univ of Hawai'i, Sep 2023
- Invited speaker, Exoplanets Seminar Univ of Cali. Berkeley, Jun 2023
- Invited speaker, Lab for Adaptive Optics Seminar Univ of Cali. Santa Cruz, Jun 2023
- Invited speaker, APS Lunch Seminar Univ of Colorado, Oct 2022
- Invited speaker, Gemini Observatory North, Hilo HI, Feb 2019

### CONTRIBUTED TALKS

- Other Worlds Laboratory, Santa Cruz CA, July 2023
- Bay Area Exoplanets Meeting, Mountain View CA, April 2023
- Alien Earths All Hands Meeting, Tucson AZ, 2023
- Steward Observatory Internal Symposium, Nov 2022

### OUTREACH TALKS

- Student Veterans of America National Convention, Orlando FL, 2022
- Astronomy on Tap Tucson, Dec 2021. Link: <https://www.youtube.com/watch?v=y-04uo6zsGE>
- Astronomy on Tap ATX, May 2019. Link: <https://www.youtube.com/watch?v=KAZRro0Qd7Y&t=291s>
- Univ of Texas Astronomy Board of Visitors Winter Meeting, Feb 2019

### POSTERS

- GMT Science Meeting, Washington DC, 2023
- Astrobiology Graduate Student Conference, San Diego, 2023
- Spirit of Lyot 2022, Leiden Netherlands, 2022
- AAS Division of Dynamical Astronomy, virtual, 2021
- Exoplanets III, virtual, 2020
- 233rd American Astronomical Society Meeting, Seattle, WA, 2019

### WORKSHOPS

- Various, Diana Davis Spencer Scholars, Warrior Scholar Project, 2022-2023
- Research Project Leader, Warrior Scholar Project, 24 July - 29 July 2022
- PhD and Grad School Basics, SVRN (virtual), June 2022
- Resume/CV Workshop, UA VETS Center, Jan 2022
- Graduate School Application, UA VETS Center, Fall 2021
- Research Project Leader, Warrior Scholar Project, 25 July - 30 July 2021
- Research Project Leader, Warrior Scholar Project, 21 June - 26 June 2020

## OBSERVING TIME AWARDED

### As PI

- MagAO-X 2022B: 18 hours
- MagAO-X 2022A: 6 hours
- Gemini/NIFS: 2 hours

## AWARDS AND FELLOWSHIPS

### GRADUATE

- |      |                                      |  |
|------|--------------------------------------|--|
| 2023 | NSF GRFP INTERN Supplemental Funding | to NASA Ames, April-Sept 2023                      |
| 2021 | Travel Grant                         | UArizona Graduate and Professional Student Council |
| 2019 | Graduate Research Fellowship         | National Science Foundation                        |

## UNDERGRADUATE

2019	Dean's Honored Graduate	Univ of Texas College of Natural Sciences
2019	George Mitchell Award	Univ of Texas Co-op
2019	Ralph Cutler Green Endowed Scholarship	Univ of Texas Astronomy/ McDonald Observatory Board of Visitors
2018	Astronaut Scholar	Astronaut Scholarship Foundation
2018	Barry Goldwater Scholar	Barry Goldwater Scholarship and Excellence in Education Foundation
2018	Jean Perkins Foundation Scholarship	Jean Perkins Foundation Grant for Undergraduate Combat Veterans
2017	Karl G. Henize Endowed Scholarship	Univ. of Texas at Austin Astronomy Department Award
2017	Chambliss Prize Honorable Mention	230th American Astronomical Society Meeting
2017	J. W. Cox Endowed Scholarship	J. W. Cox Endowment for the Advanced Studies in Astronomy
2017	Award for Excellence in Astronomy and Astrophysics Research	College of Natural Science Undergraduate Research Forum, University of Texas at Austin
2017	Jean Perkins Foundation Scholarship	Jean Perkins Foundation Grant for Undergraduate Combat Veterans
2016	Best Presentation	Fall Undergraduate Research Symposium, Univ. Texas
2016	Honorable Mention	Gulf Coast UG Research Symposium, Rice Univ.
2016	Jean Perkins Foundation Scholarship	Jean Perkins Foundation Grant for Undergraduate Combat Veterans
2015	W. Dawson Sterling Endowed Fellowship	Univ of Texas Board of Regents Award

## OTHER

2009	Teacher of Promise	Kealing MS, Austin TX
2008	US Navy Commendation Medal	USS John C. Stennis (CVN-74)

## BROADER IMPACTS

2022-2023	Mentor & Consultant	Diana Davis Spencer Scholars/ Warrior Scholar Project
2021-	Founder	Student Veterans Research Network
2020-2022	Research Project Leader	Warrior Scholar Project
2020-2021	Liaison	Steward Observatory DEI Mentoring Task Force
2019-	Co-host/ organizer	SpaceDrafts (Astronomy on Tap Tucson)
2016-2019	Graphics and Merchandise	Astronomy on Tap ATX
2016-2019	UG Representative	University of Texas Astronomy Department
2016-2017	Co-author	White paper for UT Astro Dept external review
2017	Co-founder	Undergraduate Astronomy Journal Club
2018	Peer mentor	Student Veteran Association

## REFERENCES

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Dr. Adam Kraus	University of Texas at Austin (alk@astro.as.utexas.edu)