REU Application to Univ of Hawaii Institute for Astrophysics

Logan Pearce, 2018

- **In short, what do you want?**

A. We ask for an essay (600 to 800 words) describing your background, interests, and why you would be a good candidate for our program.

You should include your impression/discussion of prior research experiences and your career goals. You should also include a discussion of outreach activities or class projects that were memorable, leadership experience, your outside activities and hobbies, i.e., what makes you uniquely you, and, of course, what interests you most or what you want to gain experience at in astronomy, and why this internship would be a good fit.

Do not include material covered elsewhere on the application. Essays that just repeat a list of classes taken or computer skills listed earlier on the application or in your transcript are really tedious for the selection committee to read and do not make a good impression.

Q. Should it be single or double spaced?
A. Single spaced, please.

Q. Should I include anything in particular in my essay?
A. In addition to the above, note any projects or science areas you have particularly enjoyed or ones that you didn't enjoy. Tell us what new areas, if any, in astrophysics you would like to explore.

Q. How important is the essay?
A. It's essential. We can't interview candidates in person. The essay is the next best thing. Applications without an essay are considered incomplete and are REMOVED from consideration by the Selection Committee.

Some suggestions are given under "General Suggestions" (question #27 above, bullet #4).

I have loved astronomy since I could read a book. It has always fueled my imagination more than anything else. When I was in high school however, I was also enamored with the idea of flying, particularly for the US Navy. When I went to college in the early 2000's, I whole-heartedly pursued that end through Navy ROTC and a degree in chemistry. While I didn't end up as a pilot, I did serve as a US Navy officer for 5 years following college, specializing in nuclear reactor operations. When I left the Navy, I decided I wanted to share my love for science by pursuing a career getting others excited about science - a middle school science teacher. For 6 years, I told my students all about physics and astronomy, and even created an elective class about space exploration. Getting kids excited about space reminded me of something I had forgotten – just how thrilling it is to learn about space.

So, I left teaching and decided to pursue a career that will let me do just that. 3 years ago, I returned to college to pursue a second bachelor's degree in astronomy and physics. This time through, I am finding that I am much more focused, much more driven, and am pursuing

astronomy research with a fervor. For 2 semesters, I worked in the VIRUS instrumentation lab building the largest fiber-fed spectrograph for the HETDEX project. In summer 2016, I attended an REU at Norther Arizona University, where I conducted an astrophysical lab project exploring the stability of liquid mixtures in the Titan environment, and how the lakes on Titan might interact with that environment. I presented my work at several undergraduate research symposiums across Texas, and at the Lunar and Planetary Science Conference.

In Jan 2017, I began a research project with Dr. Adam Kraus on determining the allowed orbital parameters for several directly-imaged wide exoplanet systems based on observation. Without a doubt, my work with Dr. Kraus has had a significant impact on my career goals. My earlier research experiences taught me that I love research; this project taught me that I *really* love exoplanet research. This project has significantly challenged me. I have studied in depth the physics of Keplerian orbits. I have developed two statistical modeling tools for my analysis – a custom-built Metropolis-Hastings MCMC for high precision astrometry and a rejection sampling algorithm for fitting orbital parameters (modeled after Orbits for the Impatient by Blunt et. al. 2017). I have presented my work as numerous astronomy conferences and undergraduate research seminars. I have traveled to the W. M. Keck Observatory to collect data for my analysis (and fell in love with observing and the Big Island). I am currently writing up my results and intend to submit to a journal in early 2018. Additionally, I am working with Sarah Blunt at Cal Tech and collaborators to create an open-source orbit-fitting python package which will be made available to astronomy community. I have attended three AAS meetings, two of which I presented a poster of my research. I am very proud of the work I have achieved so far in astronomy research, and I am ready to continue to push my skills, experiences, and involvement.

Outside of the classroom and computer lab, I am involved in several activities both on and off campus. I am an active member of the Astronomy Student's Association, which conducts weekly meetings on astronomy topics, as well as outreach to the local on- and off-campus community. I serve as one of the Department of Astronomy Undergraduate Representatives, a liaison between the faculty and the undergraduate student population. I create graphics for the Astronomy On Tap ATX show each month and set up the venue. I am an active member of the Student Veteran's Association, and am currently serving as a peer mentor, helping new veteran students transition to life as a college student. I also serve as a deacon in my church, and am big fan of backpacking and America's national parks.

Following my time at UT, I plan to attend graduate school in astronomy, with a focus on exoplanets. I very much enjoy working with directly imaged exoplanets, but I am looking to explore other areas of the field as well. Following graduate school I am less clear, but I know I want a path that lets me continue to do exoplanet science.

Exoplanet science is most certainly where my interests lie. Dr. Kraus and several faculty members at UT Austin have come from University of Hawaii at some point in their careers, and I know that the exoplanet and high-contrast imaging research being conducted there is very interesting to me. I am especially interested in the work being conducted by Dr. Michael Liu on

high-contrast imaging, and the submillimeter imaging of protoplanetary transition disks. I am very interested in expanding my exoplanet experience into the study of planet formation and transition disks, and I very much enjoy the high-resolution imaging work I have done so far, so the work of Jonathon Williams' research group is of the most interest to me.

Additionally, in the course of conducting my astrometry project, I had the opportunity to travel to W. M. Keck Observatory to collect more data for my project. I fell in love with Hawaii and observing. I found Keck to be an exciting place, and using the telescope was interesting and challenging. I determined after my experience at Keck that observational astronomy is what I wanted to pursue as a career. The possibility of using Keck or other Maunakea telescopes is one of the main motivating factors in my application to your program. Another is Hawaii. I took the opportunity to explore the Big Island a bit on this trip and absolutely fell in love (I had previously only ever had a brief stop in Honolulu while in the Navy). I visited the volcano and Hilo and Wiapio valley, but it was much too short. The entire trip left me with an overwhelming desire for more observing and more Hawaii.

For these reasons, I feel that the IfA is an ideal choice for a valuable and exciting summer research internship for 2018.

I bring a unique set of skills and past experiences which have allowed me to excel at UT. The reputation of the IfA for excellence in exoplanet research leads me to believe I would be an asset to your program, and your program would be a critical and life-changing part of my pursuit of a research career.