

## **Yale applicant majoring in Astrophysics who applied to the MIT HAYSTACK OBSERVATORY**

### **Question:**

**A letter (2 pages maximum) to the REU committee, describing your interest in the summer research program and projects, your relevant educational and work experience, your career goals, and any other information that you wish to share with us.**

### **Essay:**

Applying to college, I was constantly worried about the extra challenges that I would face as a low-income woman of color compared to peers from more advantaged backgrounds. Once arriving, I realized how few people resembling me in these aspects pursued STEM majors. I distinctly remember classes of over 20 or 30 students during my first few years in college where I was one of the only women or people of color present. Because of the stark difference between my classmates and I in terms of background and preparation, I became discouraged about my “eligibility” to be in STEM in general, let alone my dream of studying space. I had toyed with the idea of studying astrophysics in college, but because of a lack of resources, classes, and funding in my struggling high school I wasn’t qualified to take introductory astronomy or physics courses during my first year of college. To decide if I wanted to seriously pursue astrophysics as a potential major, I applied for a research fellowship the summer after my first year despite no classroom experience in the area. I was fortunate enough to be granted the fellowship, but had to face the steep learning curve of mastering the basics of Python, astronomy, and physics and cohesively combining them in a productive and creative manner over the course of just a few months. That intense challenge was arguably the best experience of my college career. I was able to confirm that despite not taking any actual classes, I loved astronomy and wanted to continue in it. Research enabled me to find confidence in myself as a scientist despite the lack of representation of people with my background and it deepened my love for astronomy. Since then, I have sought out circumstances to conduct research constantly. In my second year, I took a class each semester focused on research in astrophysics. This year, I was given a fellowship to analyze dwarf galaxies near the Milky Way. I know I want to continue research, so the opportunity to work at MIT Haystack and challenge myself there is invaluable to me.

The projects available for study at MIT Haystack are what attracted me to this particular REU. My first choice project would be LEGO. Circumventing the issue of directly observing objects far away and instead using the Milky Way as a proxy is a specific research interest of mine and one that I have pursued in previous projects, such as the Satellites Around Galactic Analogs project, which centered around determining if the Milky Way was truly representative of other galaxies in terms of its star formation rate and evolution through SDSS g-r-i colorspace. This project would be the perfect opportunity to combine my love of galaxies and specific drive for that area of astrophysics with my previous experience studying gas through looking at protostars in the Perseus molecular cloud. Additionally, I’ve only ever plotted data in pretty intuitive graphs or worked with Miriad to depict outflows of protostars, so visualizing data in a different way with this project would present a unique, different challenge to me in an area that I know that I’m already excited to work in.

The prospect of working with the Event Horizon Telescope is also very interesting to me. I've only learned about black holes through the classroom, whereas all of the other areas of astrophysics that have really piqued my interest (star formation and galaxy surveys) I have been able to explore in a more hands on way. The opportunity to fulfil somewhat of an astronomy guilty pleasure would be fun and informative to begin with. Additionally, the ability to resolve within a few Schwarzschild radii of the event horizon is nearly incomprehensible to me and I am so excited to have access to data from an instrument this precise. The second half of the project, described as developing "new techniques to constrain the black hole spacetime," is one that sounds extremely challenging and more physics intensive. Though this is definitely a daunting task, I feel like I am used to steep learning curves when it comes to physics. I had to tackle the challenge of transitioning from the most introductory physics course immediately to a 400-level physics course the next semester, per the physics track at my college. This was definitely a difficult shift to accomplish, and there were many times when I had to work much harder than my better prepared classmates. However, ultimately I was able to be proud of my performance and, possibly more importantly, gained a love for physics that I was unaware of previously.

My long-term career goal is to be a scientific researcher who brings both innovation and tolerance to the scientific table. As long as I am able to continually learn and contribute to a base of knowledge while I work, whether it be through working in industry or continuing through academia, I will be more than satisfied. I currently plan to continue through school to earn my PhD.

To speak more about my original motivations for research and science, I love innovative ways in which astronomers create solutions to solve challenges in observing. Though science can be seen as a very logical pursuit, astronomers have to be extremely creative to access data that other areas of science don't have to struggle with in quite the same way. Astronomy is a perfect combination of mathematical physical challenge along with appreciating and utilizing creative endeavors. I love the melding of right and left brain thinking, which is what attracted me to this specific field in the first place.

To conclude, research has only intensified my passion for astronomy. I learn best with hands on experiences and am driven by the opportunity to add to a growing knowledge base through my own original efforts. I welcome challenges and would do everything I could to rise to occasions I would be called to. My academic journey from a high school that consistently couldn't pass state examinations to a top tier research university has been mind-boggling, and I don't want it to stop there. To participate in research at MIT Haystack would be a truly priceless experience.