

# Personal History Statement

Xavier Boluna

December 30, 2021

When I was a kid, my dad and I would go backpacking. We would camp out on granite slabs in the high Sierras and wait for night, until the stars emerged like little freckles on the Milky Way's outstretched arms. We'd bundle up with cups of hot cocoa and lay out beneath them. See that bright spot there?, he'd say. It's a system with three suns – the Romans called it Alpha Centauri. That dim blip there is the Andromeda Galaxy. We'd go that way, one by one. Imagine! Our night sky brimming with stars and an uncountable number more lingering just beyond the limits of our vision.

One of the most appealing parts of my chosen discipline is the opportunity to learn more about the world around me. The study of physics has provided me the perfect opportunity to do that. I relish the problem solving, the unraveling of riddles to reveal the elegance of nature. I love the moments of pause when my understanding deepens suddenly; when I finally "get it". Even moreso, I enjoy being able to put my knowledge to the test, such as in conducting research.

In the summer of 2019, I began an internship at Stanford University at KIPAC. I studied the effects of extragalactic background light on a catalog of high redshift gamma-ray bursts observed by the Fermi-LAT satellite telescope. Extragalactic background light is a proxy for the ambient starlight in intergalactic space. Using signals from blazars that are many billions of years old, we can measure the "amount" of ambient starlight in the universe. Naturally, I was very enthusiastic, and the project was a great success.

My adviser, Nicola Omodei, took me on after the conclusion of the internship as a research assistant to continue working on a number of projects, including a plugin for an X-ray polarimeter named IXPE which will measure the magnetic fields of stellar bodies in great detail. The course of this project has coincided with a few of my graduate-level classes – electromagnetism, computational physics and machine learning – which I have been able to directly apply to my research.

I have recently begun working with Stefano Profumo in the dark matter search group, looking into evaporating primordial black holes. I am pleased to discover that many of the skills I've developed at Stanford are readily mapped to this new project.

I am deeply grateful for the opportunities I have been provided to nurture and grow my passion for physics. In turn, my love of the natural world has blossomed and I find myself pursuing rock climbing, surfing, travelling and always exploring more. When I go backpacking with my dad, I find myself excited to trade stories. I believe that the universe is best experienced holistically, and I enjoy grounding my science background in the real world.

My best friend once quoted to me: "Be childlike, not childish." I believe that the study of science requires an inquisitiveness that is childlike in spirit. In order to investigate the world, you first must ask the right questions. I'm thankful for the environment in UCSC's physics department, which is full of genuine people who nurture this kind of culture. I'm thrilled to continue learning from my professors and peers and to contribute in kind to our community and collective body of research.