My first lessons in making were with my uncle. When he got out of prison, he zealously taught me what he wished he had learned earlier. He told me, “be good to your tools, and they’ll be good to you.” Nothing in my early life was as educational or rewarding as helping him on the job– particularly working for people we knew. Insulating my aunt’s house, or putting a floor in my parents’, I developed a reverence for tools and the spaces we could create with them.

From that early age, I preferred real-world solutions to school’s practice problems. My uncle instilled in me a work ethic and dedication to pragmatic problem-solving. Even in kindergarten, I understood that *schooling* and *education* were not the same. While schools reward students who follow a curriculum, I wanted to follow my own path and find more people who valued learning by doing.

To that end, I left public school and enrolled at the Eli Whitney Museum, an experimental learning workshop. These workshops require defining questions and figuring things out. They require pluralism and pragmatism in learning. At the museum, it doesn’t matter where you’re from or if you can pay– I couldn’t. All that matters is that you’re curious. The museum rewards a genius often overlooked in the classroom; Eli Whitney, like many pioneers of our industrial revolution, was not an exceptional student. I am one of many who might not have found success if not for this community.

As a kid, although I was often uncomfortable with myself, I found confidence and pleasure in making things. Even when I've felt I lack control over myself or my life, I’ve always known that I can have control over the things I create. I’ve known that I can make them in the image of myself that I like; that I can iterate over and improve them; that they can be more beautiful or useful than I could hope to be, which in turn has made me feel useful and beautiful. Learning those design methodologies encouraged me to reflect on and continually improve myself.

At eight, I took my first week of classes in flight physics at the museum, taught through model airplane design, construction, and flight: Building models from balsa and tissue, watching them fly (or not), adjusting and trying again, always probing that invisible, fluid atmosphere we breathe, with the pure goal of making a better flight than the one previous. This required not just making a good plane but also learning to read air currents to put a plane into “good air”; internalizing physical laws most students learn by rote memorization. In that way, my mastery of building and flying took off. At age 10, my family packed the car to travel farther than I ever had: to the National Free Flight competition in Indiana. Winning first prize reinforced in me the sense that I was my creations, that making planes that flew far could carry me far. I discovered that I could improve myself in the same way I could improve my planes, and that making something elegant was a reflection of something inside me.

At 13, the museum's director invited me to join their apprentice program, where I worked to make the experiences I loved available to a new class of makers. I designed and engineered new projects, exhibitions, and experiments; reinvented myself to teach and guide students and visitors. As challenging as that was for my devastatingly shy adolescent self, my apprenticeship and mentors were a guiding light through an otherwise painful period of development. Growing up through that program and community, I realized my interest not just in making, but in making communities for kids who needed them like I did.

Starting high school in an overwhelmingly white suburb, I missed the diverse community of people and projects taken for granted at the museum. My only rewarding experiences were those where I escaped high school’s homogeneity and made new things. I captained a FIRST robotics team that traveled twice to international championships, where I learned orders of magnitude more than I ever did in class. I loved teaching and learning, collaborating and competing with people from around the world. When we needed parts or material, I

would approach foreign teams and when words failed, mime the mechanical process we needed to engineer. Maker culture in general prizes this type of communication, this synthesis of ideas from disparate sources. Comparing my beloved robotics and museum experiences with the mundane, academically stratified curriculum of my high school, I began to feel that more traditional schooling might not be for me.

In true maker spirit, however, I applied to college looking for new academic experiences. Thankfully, I was accepted to Wheaton, and learned I could pursue Liberal Arts *and* Engineering through its Dartmouth College partnership. There, I found a wealth of resources and opportunities, allowing for a more eclectic and tailored academic experience than I imagined. As Dartmouth's machine shop is transitioning toward a more liberal arts-based, maker culture, Wheaton is establishing designated makerspaces across campus. Teaching and collaborating in, designing, and administering those spaces has made me more curious about how to improve the reach and efficacy of such spaces; how to engage and empower students like me who don't have resources or means of empowerment; how to better understand and communicate the different cultures of extant makerspaces to make them work better for more people.

Last summer, I did some grant work developing Wheaton's recording studio as an interdisciplinary community space. Before conceptualizing new music technologies and instruments, I needed to learn music theory. I found the piano keyboard's one-dimensional, linear layout less a logical musical system than a historical manifestation of western music's evolution. Having just studied tessellations in both math and studio art, I superimposed notes on 2D tilings, translating the piano's 1D system of notes into 2D space and discovered all kinds of higher dimensional intervallic relationships that the piano keyboard obscures. One organizational scheme predictably and systematically encoded the various triads which together form the basis of western harmony. My music professor, whose specialties include traditional Indian music, realized that another layout I stumbled upon replicated an Indian Raga in its hexagonal rings.

Translating music theory into tessellations I had explored in art and geometry classes taught me new things, but applying my engineering and computer science experience to build a digital keyboard elevating the project to another level of experimentation and learning. Making the idea into something tangible helped solidify it and facilitated conversations. Despite having no prior music experience, I created a new instrument that engaged music faculty and students for hours; likewise, they conceived applications of the instrument I hadn't considered, like using it to better teach solfege and intervals. While these new ideas, conversations, and interpretations were rewarding, the greatest take-away was affirmation of the value of interdisciplinary collaboration in innovation.

Though this paradigm is quickly expanding, the vast majority of people remain outside it. Most are confused when they hear that I'm a Math and Studio Art double major with Physics and Computer Science minors with a dual degree in Engineering. "What do you want to do?" they'll ask; and usually I'll reply with "a little bit of everything" or "I'm not sure yet," because the truth is harder to explain. To me, all these seemingly disparate experiences and interests are shadows cast in different directions by my one central motivation: making. I'm still chasing the same thing as when crafting those model planes: making tools to explore the invisible stuff that surrounds us, that makes the world work, that keeps us alive. I still use the same scientific approach to make mathematical models, sculpture, or digital circuits, see how they "fly," internalize what I notice, and repeat.

As diffuse as that approach may seem, and though I'm not always sure where this broad passion might lead me next, I think it's better this way. I firmly believe that future progress won't come from prolonged, increasingly niche study, but from the confluence of ideas developed by a maximal cross-section of different places and people. In a world where the pace of discovery and change is increasing exponentially, we need to be

prepared to move between fields and continuously update ourselves to stay relevant. Maker culture demands this kind of antidisciplinary thought.

My *schoolwork* first requires focusing on this important aspect of my *education*. My work in engineering and creative workplaces will be better informed and more productive if I first examine how these diverse spaces really work. The Watson offers everything I need to collaborate and communicate with different interesting people and institutions around the world; to find people who need these spaces like I do; to improve my understanding of invention, making, learning; to share that information and experience in the spirit of open-source; to take my practice beyond just making *things* to making spaces, communities, systems, *worlds*.