Eric Schweikardt Personal Statement

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I get awfully excited by the *wicked problems* that we see in the world but tend to think of as intractable: problems like environmental degradation, economic uncertainty, and societal fractures like war and inequality. We tend to throw up our hands at these problems, thinking that individually, we can't make a difference, or that the problems are just too complicated. What these problems all have in common, actually, is great *complexity*; they are an emergent pattern caused by the local interactions of a large number of individual agents. We lack the tools to think clearly about these problems. My work explores the design of complex hardware/software systems; what humans need to understand to build complex systems of their own and better understand those they see in the world.

I use my background in design and computation, combined with knowledge of robotics, engineering and rapid prototyping methods, to explore the space of robot design by building real, physical systems. I try to answer questions by making things. I'm working on *Cubelets* (formerly roBlocks), a robotic construction kit for kids. It's a set of building blocks with magnetic connectors on each face and a tiny computer inside each block. There are Sensor blocks that recognize sound, light, and touch, and there are Action blocks that drive around, flash lights, or make noises. When kids snap a bunch of these blocks together, they all run at the same time, communicating with their neighbors and passing simple data around the construction. Each robotic block is rather dumb on its own, but when a young user steps back and looks at the contstruction as a whole, it can appear very smart, even intentional.

Some things are best learned from the *top-down*: we learn about plants and engines, for instance, by taking them apart and studying the pieces. But we can best develop intuitions about patterns and complexity from the *bottom-up*. Through play with Cubelets, kids can gain valuable insight into how the rich mosaic of the world is created from a huge number of simpler elements interacting. These insights will drive the fields of science and design in the next century as we focus on more integrated and networked solutions to the big problems that loom in our future.

I finished my PhD at Carnegie Mellon in 2008 and spent a year doing post-doc research in evolutionary robotics at Cornell. In an attempt to have the broadest possible impact with my work, however, I've taken a break from academia to start a small business called Modular Robotics. We're partnering with science centers and children's museums to get Cubelets in the hands of as many kids as possible, and we're off to a strong start with a recent $500,000 grant from the National Science Foundation's SBIR program.

I think the best way to change the world is to help kids understand it.