Manufacturing is about controlling the position and state of matter in 3D space. From humble beginnings knapping spearheads to remove unwanted material, to the latest semiconductor fab – where dozens of elements are integrated together with nanometer-scale resolution – we have steadily improved the precision, sophistication, and throughput of our manufacturing capabilities. Unfortunately, the cost of modern manufacturing is increasing at an unsustainable pace. Many of the devices we use every day required individual components fabricated in highly specialized factories spread across the globe and travel tens of thousands of miles to be assembled before being shipped thousands of miles yet again. The long-term goal of Dr. Hildreth’s research is to replace these massive buildings and global supply chains with printers capable of fabricating complex, integrated devices at the push of a button. Toward this goal, his research focuses on advancing additive manufacturing to point that we can control the arbitrary composition, position, and state of matter in 3D space with nanometer resolutions.

This talk will discuss new approaches to additive manufacturing that will help this technology make manufacturing a local endeavor while reducing ecological costs and enabling entirely new technologies. It will first give a brief overview of the ~50 year history of additive manufacturing within the context of what challenges and limitations exist within current technologies. Next, it will detail advances in reactive ink chemistries and how, by printing chemical reactions instead of particles, we can improve feature resolution, improve device performance, enable multi-material direct manufacturing, and reduce materials cost by orders of magnitude. Lastly, the talk will highlight how new perspectives can often solve old problems by detailing Dr. Hildreth’s unique approach towards dissolvable metal supports for 3D printed metals.