Zach Fredin

Cambridge, MA
https://zachfred.in

A highly motivated engineer and designer with a deep understanding of digital fabrication, instrumentation, and electronics.

EXPERIENCE

The Possible Zone, Boston, MA — *Maker-in-Residence*

March 2023 - May 2023

- Rapidly design, fabricate, document, and share a portfolio of projects designed to wake up and demonstrate the capabilities of the TPZ FabLab.
- Assist with classes that come through the FabLab, and assist with preparations for off-site classes.
- Develop and document best practices for critical FabLab machines, such as the Zünd Digital Cutter.

Commonwealth Fusion Systems, Devens, MA — *Tokamak I&C Team Lead*

December 2022 - March 2023

- Hire, supervise, and retain a highly skilled team of electrical and instrumentation engineers to design and field the I&C systems supporting SPARC.
- Ongoing I&C design work for magnet protection systems and other SPARC groups.

Tokamak Instrumentation Engineer

January 2022 - November 2022

- Design and develop in-cryostat instrumentation systems used to protect the SPARC tokamak, a net-energy fusion demonstrator currently under construction in Devens, MA.
- Architect control schemes for machine protection functions, particularly cable magnet quench detection and protection.
- Build harnesses and routing methods in AVEVA Instrumentation.

Massachusetts Institute of Technology, Cambridge, MA — *Graduate Research Assistant*

September 2019 - December 2021

Lab: The Center for Bits and Atoms

- Designed and fabricated several modular computational structures and corresponding robotic assembly systems.
- Developed and characterized a novel modular superelastic flexure

SKILLS

Rapid Prototyping

Digital Fabrication

CAD/CAM

Embedded Development

Laser Micromachining

Machine Design

SMD Soldering

Instrumentation

Technical Instruction

SEM

Electronics Design

ACHIEVEMENTS

Co-First Author, "Diamond Rotors", July 2023 Journal of Magnetic Resonance

First Author, "Discrete Integrated Circuit Electronics", 2020 IEEE HPEC Conference

Hackaday Superconference Soldering Contest, 2019 Runner-Up

Senior Personnel, NSF SBIR Phase II #1660086, "Development of a STEM Educational Platform Using Electronic Neuron Simulators", $770,000

system for rapid prototyping of precision machines.
- Designed and fabricated a unique micron-accurate laser lathe for machining single crystal diamonds into MAS NMR rotors.
- Maintained and provided training for several key machines, including a wire-EDM and a laser micromachining system.

NeuroTinker, LLC, Minneapolis, MN — *Co-Founder and Lead Engineer*

March 2015 - May 2019

Neuroscience Education for Everyone!

- Provided key assistance writing all technical portions of successful NSF SBIR Phase I and Phase II grants.
- Developed open-source NeuroBytes product line through three distinct pilot-scale production generations.
- Scaled five kits to commercial production, including EMC certification, contract manufacturing, and documentation.

Jasper Engineering, Medina, MN — *Outside Sales and Application Engineer*

September 2010 - April 2015

- Instrumentation, Control Valves, and Gas Analyzers.
- Hosted technical lunches focused on explaining a specific instrumentation technology.
- Commissioned a vast range of process instruments, including flow meters, pressure transmitters, and gas analyzers.
- Received significant factory training on many products.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA — *M.S., Media Arts and Sciences*

September 2019 - September 2021

Thesis: Assembling Integrated Electronics

Coursework: How to Make (Almost) Anything: TA, student

Case Western Reserve University, Cleveland, OH — M.E.M., Engineering and Management

June 2007 - June 2008

Case Western Reserve University, Cleveland, OH — B.S., Materials Science and Engineering

September 2003 - June 2007

Interesting Projects (see zachfred.in)

Hand-Cranked Persistence-of-Vision Display, built with wooden gears and fiber-coupled green LEDs, TPZ, 2023

Diamond Laser Lathe, used to turn lab-grown diamonds into micron-accurate tubes for magic-angle-spinning (MAS) NMR at ~7 million RPM, MIT CBA/FBML, 2020-2022

Badge Card Reader, an electronic conference badge hacked into an optical punch-card reader, Hackaday Supercon, 2022

MicroPanto 50:1 CNC pantograph, Haystack Mountain Craft School, 2021

3-RRR CPM microfabrication machine built of superelastic flexures, MIT CBA, 2021

Cyborg Ring, open-source blinky rig built with novel SMD cordwood construction, Minneapolis, MN, 2018

TP-BMP, open-source ARM programmer/debugger built into an old Thinkpad, Minneapolis, MN 2017