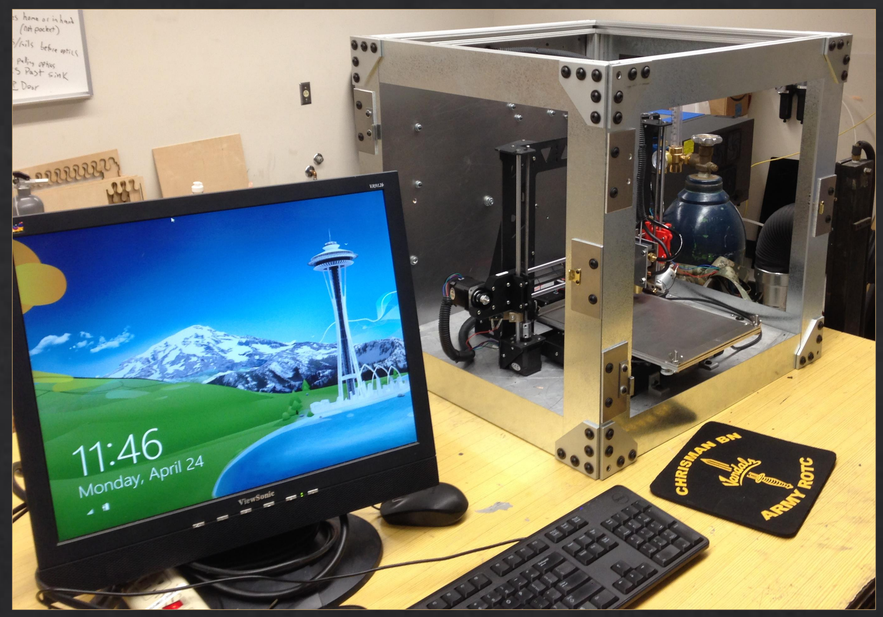
XXIV TwentyFourth Annual engineering ▪ design expo2017

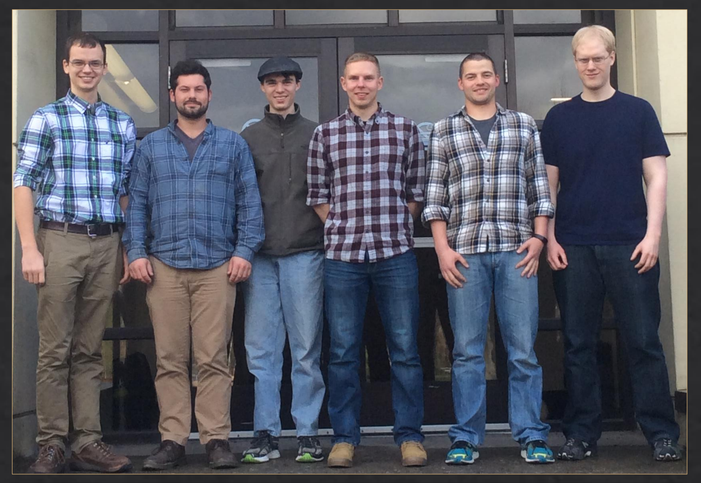
VandalForge
3D Metal Printer

University of Idaho
College of Engineering

Problem
Current 3D printers are limited in material or cost. Low-cost plastic 3D printers exist, but produce relatively fragile parts. 3D metal printers exist, but cost $50,000 or more. Our task is to develop a low-cost metal 3D printer for use in academic, home, and small-business environments.

Solution
Combine current plastic printing technology with wire-feed MIG welding technology. MIG welders use an electrical arc to melt a wire, which gets deposited on the welding surface. This is similar to how FDM plastic printers work.

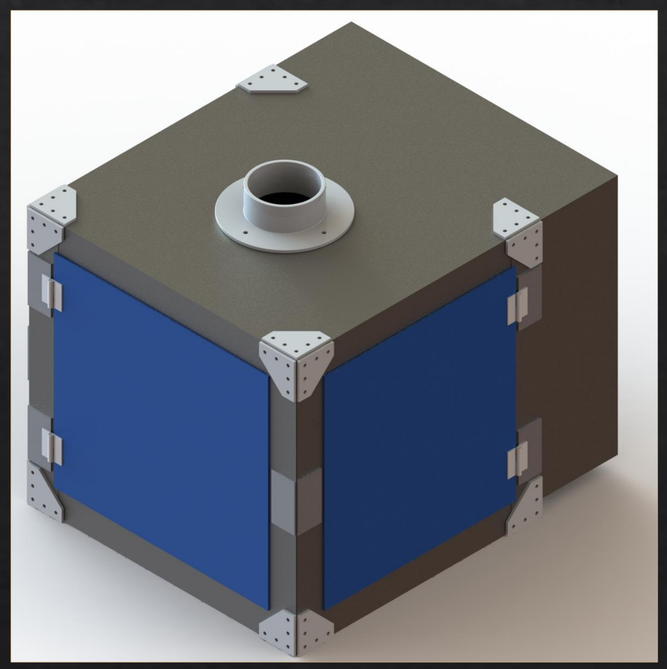




From the left: Nathan Wagner, Kyle Krieg, Peter Haley, Maxwell Emerson, Matthew Buchanan, and Jay Van Gerpen

Design Features
- Wire cutter for consistent layer conditions and removal of welding wire balls
- Aluminum print bed-with easy print-surface removal
- Smoothie board controller for extreme expandability
- Based on the P3Steel design for easy assembly and stability
- Power systems based on a low-cost flux core welder
- Computer control for all variables in welding process, such as power, wire feed rate, and gas flow.
- Fume extractor to remove harmful welding fumes.
- Safety doors that are transparent, UV protected, and feature automatic shutoffs to prevent eye injuries.

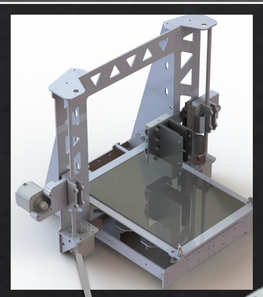
Product Specifications
- Print volume of 9.84” x 8.3” x 8”
- Target resolution of 0.029” - 0.035”
- Input Voltage 120V, 15A
- End User Cost: $3500-$5000



3D Metal Printer Render

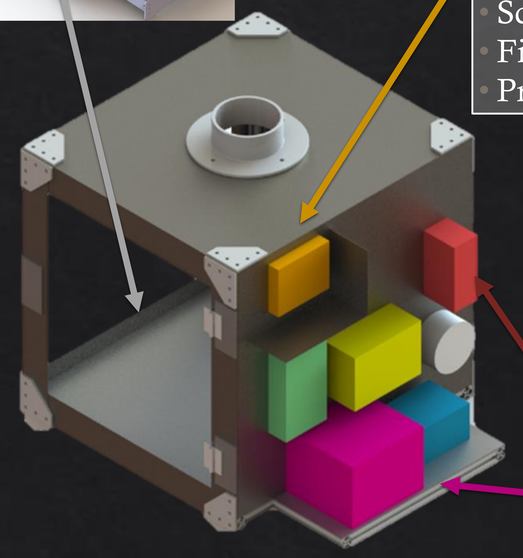
Special thanks to our project sponsor and mentor, Dr. Michael Maughan, and our shop manager Bill Magnie.

3D Printer Frame



Integration
- Wire Cutter Assembly
- Print Bed Assembly

Controller
- Schematics
- Firmware
- Printing Process



Welder Components
Gas Assembly

Wire Feed Assembly

Power Supply

Machined Parts