

OHS 2023 Through the Eyes of Undergraduate Students

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We are four undergraduate students at the University of St. Thomas working at Dr. AnnMarie Thomas's Playful Learning Lab, where students from many different backgrounds work together on various projects with a focus on education and learning. Each of us has different majors and skill sets, making each of our takeaways from the 2023 Open-Source Hardware Summit unique. Each of us will have our own paragraph(s) in different colors denoting our thoughts on the Summit.

Hello! My name is Katie Laxson, and I am a sophomore studying mechanical engineering. The talks that stood out to me the most were the ones about the fabrication or design process. I have little to no background in electronics, but as a student in the engineering program, I have had a lot of experience with rapid prototyping machines. So naturally, the talks that stood out to be for their fabrication processes is Huaishu Peng's How to DIY high-resolution flexible (and kirigami) circuits with a fiber laser engraver, and Jacob Lawaetz & Niklas Buhl's How to Turn Your Ordinary Laser Cutter into a Five-Axis Laser Cutter. These two talks involved my favorite rapid prototyping machine, the laser cutter/ engraver, both using it in extremely creative ways, to produce unique products as a result. For example, I was absolutely enamored by Huaishu Peng's kirigami crane.

The talks that stood out for their design process are Amy Wibowo's Putting the Personal in Personal Computer by Designing & Fabricating My Computer Cases, Manu Prakash's Frugal science: Tackling societal challenges with curiosity, openness & a bit of play, and Carlotta Berry's Robotics for the Streets: Open-source robotics for academics and the community. Each of these talks showed their design process and their implementation in society. Amy Wibowo's talk blurred the line between art and technology, with her computers being both cute and functional, and her message being that anyone can make their own computers to be unique like themselves. The implementation of the technology created in Manu Prakash and Carlotta Berry's talks both stood out as for the Common Good, which is the University of St. Thomas's tagline. In practically every class I have been in so far during my time here at St. Thomas, we talk about what the Common Good means and how one can contribute to it; Those two talks highlight two different but both extremely important ways to contribute to the Common Good in health and education respectively.

The 2023 Open-Source Hardware Summit was a great experience. Even though some of the more technical electronics talks went right over my head, I learned a lot from each and every talk. Even though I have read and written about open-source hardware for a while now, I never understood its true importance of it until coming to the summit. Everyone was passionate about open-source hardware. With us being undergraduate students with a basis in education, I was not expecting to be able to relate and make connections, but everyone welcomed us, with many sharing about themselves and what they do relating to both

open-source hardware and education. It was very nice meeting everyone there and learning from them and their experiences.

Hi! I'm Cameron Doffing, a soon-to-be junior majoring in both computer science and data analytics. I originally got involved with the Playful Learning Lab in Summer 2022 as a computer science consultant for the integration of Scratch programming in the Metro Deaf School in St. Paul, MN. As an undergraduate who has been researching the field since Summer of 2022, hearing talks from pioneers in open-source hardware that I read in scholarly articles was a surreal experience. For example, at the end of Summer 2022, I finished a literature review on open-source science hardware, specifically regarding the implementation of said technology in the K-12 classroom. At the Summit, I attended Manu Prakash's presentation on "Frugal Science," where the devices I had become acquainted with (mainly Foldscope and Paperfuge) were being discussed by their chief contributor. Other talks I enjoyed included "Fibercuit," "Stealing Great Ideas from Software Engineering," and "Ergonomic Bootcamp." The first talk by Huaishu Peng discussed the applications of lasers for rapid prototyping and wowed the audience with a clip of his laser engraver creating origami. The second by Richard Lin appealed to me as a computer science major, bridging electronics (an unfamiliar field to me) with more familiar concepts found in Python programming. The last talk by Bradley Gawthrop was a very engaging presentation that offered advice for keeping proper ergonomics while confined to a desk. We were able to meet Bradley the morning before for breakfast, so I will admit some personal bias in my inclusion of this talk.

I attended one workshop called "The State of Glitch" led by Freyja Van De Boom which discussed the ethicality of enhancing our bodies with devices. The topic interested me because I was already taking a Philosophy course that applied ethics to various sectors of technology. The workshop was hands-on in that I collaborated with other participants in imagining problematic scenarios where human augments could be violated upon (such as a theoretical bloodstream regulator implant that could become obsolete should the owning company choose to discontinue the product/service). The workshop was an interesting experience, one that was unfortunately hindered by the difficulty in hearing the leader due to the placement of the workshops in the same room as the demo tables.

For the Open Hardware Summit, us student researchers from the Playful Learning Lab ran a demo table for Squishy Circuits, a notable product to originate and go beyond the Lab. We set up different colors of the conductive dough that participants could tinker with using battery boxes, LEDs, and small fans. A few of us made example dough sculptures that had circuit features with lights or a fan. I found the demonstration enjoyable as we represented the fusion of open-source hardware and education (driving our research), hopefully inspiring attendees to invest in the same. The other demo tables were also engaging, especially one that focused on fluid dynamics with examples of a levitating water droplet and use of a water droplet as a lens for a camera.

Between the talks, workshops, and demo tables, the Open Hardware Summit provided plenty of stimulus for attendees to actively or passively participate in experiencing the latest in the OSHW world.

Hello! My name's Maria Johnson and I'm an undergraduate entrepreneurship major at the University of St. Thomas. I really enjoyed this year's Open Hardware Summit and highly recommend it (even as an undergrad from a non-STEAM background).

In my experience, entrepreneurship programs focus far more on creating innovative solutions than running and growing profitable businesses. This emphasis on innovation ties in well with everything the Open Source Hardware (OSH) community does. Being able to meet so many members of the OSH community at the Open Hardware Summit was a great way to see the infinite possibilities of OSH products.

Many of the business classes I've taken emphasized profits and shareholder value and all things known to be important to businesses. However, attending the OHS showed me first-hand the benefits of creating a community that can share their work and iterate on each others' innovation, working together to create the best solutions possible for the world's problems – which is what entrepreneurship is really all about.

At the Summit, I had the chance to see everything from open source robotics kits for equitable K-12 STEAM education (Carlotta Berry, "Robotics for the Streets: Open-source robotics for academics and the community") to a high-tech response to the rise of fast fashion (Kitty Yeung, "Can fashion be part of open-source?") to a 3D-printable blood smear tool for malaria testing (Manu Prakash, "Frugal science: Tackling societal challenges with curiosity, openness and a little bit of play"). All of these products strive to solve unique problems and have only been made more effective thanks to the principles of open source hardware. Even as a student pursuing a non-technical degree, I found the Open Hardware Summit to be a fun, playful, and educational (and in some parts mind-blowing) experience.

Hello everyone! My name is Meghan McSherry, and I am the operations manager of AnnMarie Thomas' Playful Learning Lab at the University of St. Thomas. Before the Open Hardware Summit, I felt a pang of imposter syndrome as a biology major and art history minor attending the conference with a limited background in hardware. Despite my initial fears that I would feel on the outs of this community, I quickly learned that this would not be the case that weekend at OHS. The OHS community welcomed my fellow undergraduate researchers and me with open arms, and I felt honored to be included in an environment as supportive and driven as this one. The passion the speakers and audience held for their field was palpable and deeply inspiring. I was fascinated by the breadth of topics ranging from wearable hardware to 3D-printable medical devices, and this proved to me that open source hardware is applicable to numerous fields and can appeal to any interest.

As someone who thoroughly enjoys studying and partaking in the visual arts, one of my favorite aspects of the Open Hardware Summit was the artistic and creative components of each talk, invention, and person that I saw and met that weekend. Some specific talks that stood out to me creatively were discussed in "Making Pretty PCBs for STEAM Outreach" and "Open Hardware for Culture and History." I found it ingenious to use open source hardware

in aesthetically pleasing ways to engage a larger audience. “Pretty PCBs,” like the ones discussed in the first talk I mentioned, would have deeply engaged my female classmates and me in elementary school, so I find this to be a brilliant way to decrease the gap between men and women in the field of PCB design. The “Open Hardware for Culture and History” talk brings the world of hardware into the realms of history and artistic expression. I never expected that open source hardware could be incorporated into museum exhibits, so Rianna Trujillo & Becca Sharp helped me destroy these parameters that I had created of what open-source looks like.

Not only did the Open Hardware Summit appeal to my artistic side, but the conference highlighted numerous ideas, talks, and inventions that coincided with my biology background as well. One talk in particular that I found absolutely profound was Manu Prakash’s talk, “Frugal Science: Tackling Societal Challenges with Curiosity, Openness and a Little Bit of Play.” Prakash’s work combines open source hardware with biological engineering and play to create brilliant methods of “democratising access to science.” From using cotton candy machines to create N95 masks to finding a way to turn a centuries-old toy into a centrifugation method used in diagnosing COVID-19 and malaria, Prakash and his research team are brilliant in their ability to create interdisciplinary, open-source inventions. Another talk that interested my biomedical side was Bradley Gawthrop’s “Ergonomic Bootcamp” talk. As I mentioned earlier, I was happily surprised at the wide variety of talks that the OHS put together, and Gawthrop was a perfect example of this through his emphasis on the importance of a healthy workplace setup. Overall, the Open Hardware Summit was an extraordinary experience that I did not expect to feel so welcomed and engaged in. I would like to thank everyone involved in this conference for creating such a positive and inspiring environment for my fellow undergraduate students and myself!