

**ILICA
MAHAJAN**

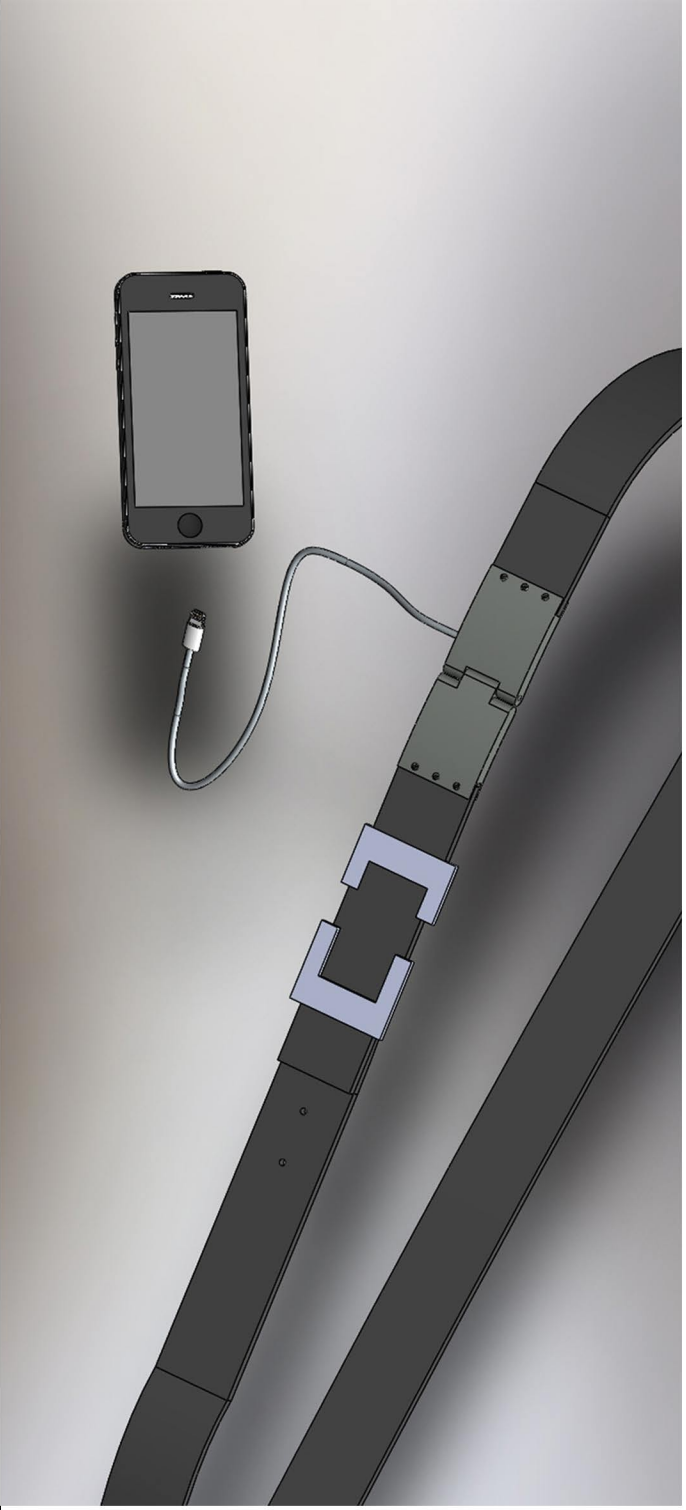
**DESIGN
PORTFOLIO**

MIRRIC WEARABLES

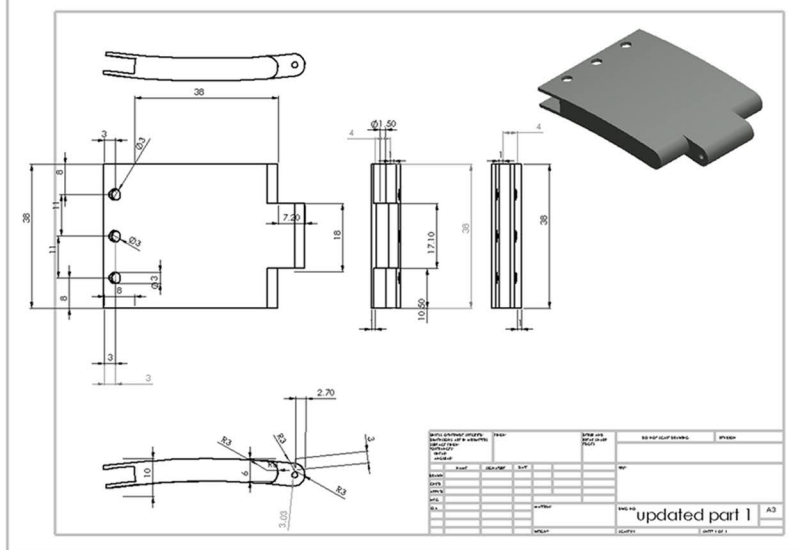
MIRRIC'S VISION WAS TO CREATE products at the intersection of fashionable apparel and smart wearable technology. The M1 is a high-quality leather belt that can charge your phone or other electronics by utilizing layers of thin, flexible batteries. The goal was to provide seamless backup power for people on the go in a form factor that blends into people's daily lives.

As the only employee of the company aside from the CEO and CTO, I had many different types of responsibilities. One of my projects consisted of hiding the deformations created by the batteries underneath the leather exterior. This included surveying many different materials to fill in the gaps

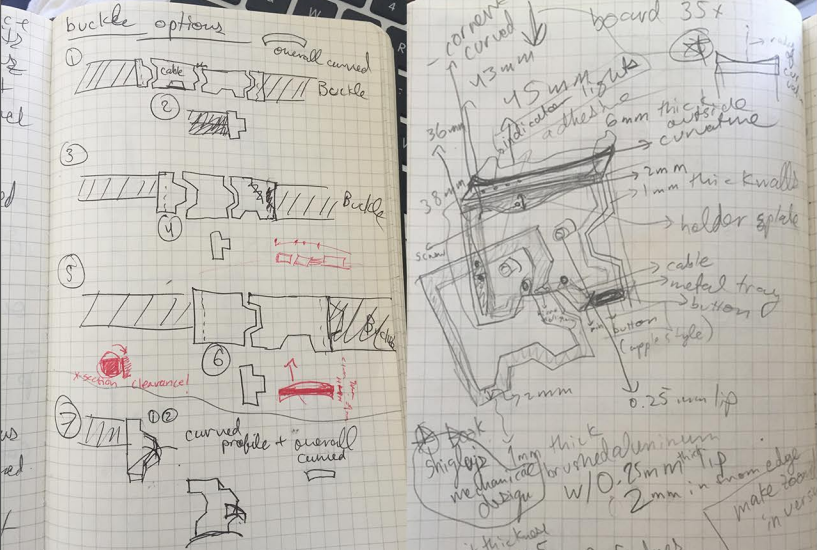
between the batteries and circuit boards, and iterating through different assembling and gluing techniques. I also coded the Mirric website. Additionally, I designed metal links that housed a retractable cable system, the usb port, and charging circuitry. Finally, after the alpha prototypes were distributed to testers, I designed and completed a round of user research, and distilled my key findings into actionables for the next round of prototypes.



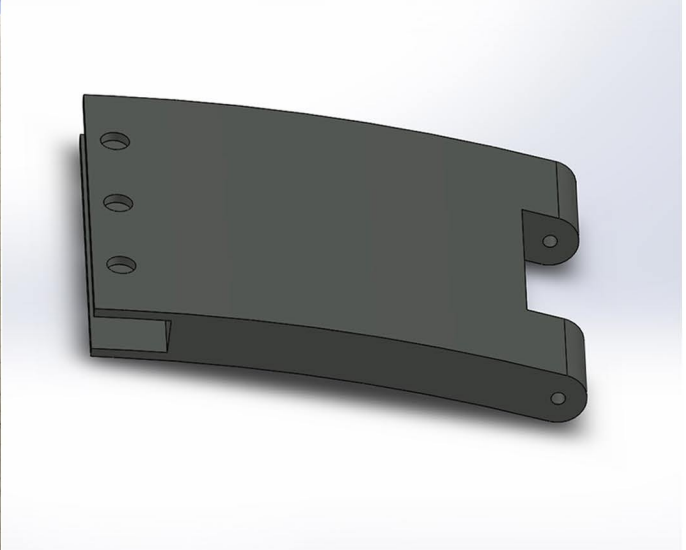
DIMENSIONED DRAWINGS OF FINAL LINK DESIGN



SKETCHES



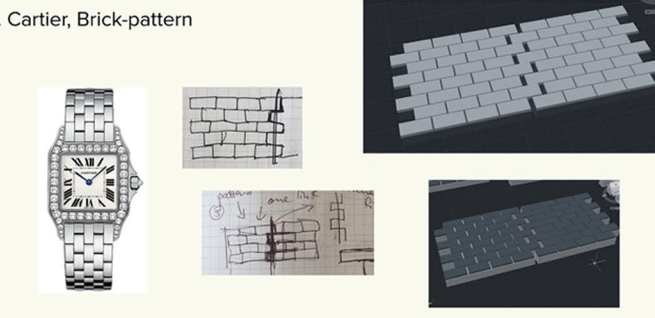
RENDERINGS



PIN UP BOARD WITH INSPIRATION, SKETCHES, AND CAD MODELS FOR METAL HOUSING LINKS

Inspired by Cartier and Tag Huer: New Links

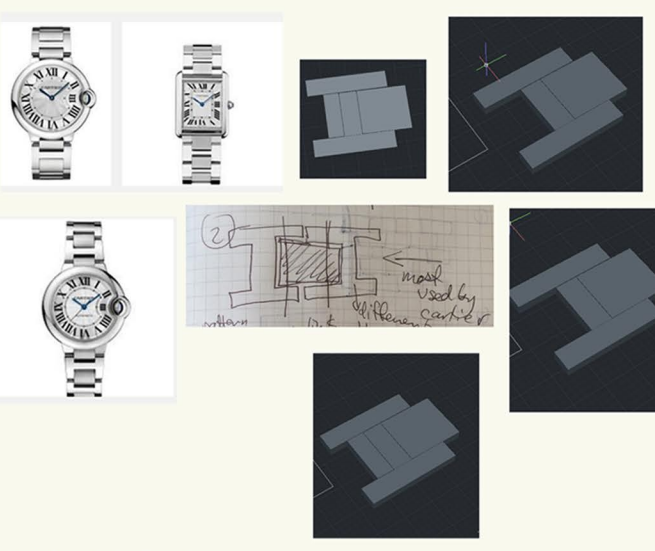
1. Cartier, Brick-pattern



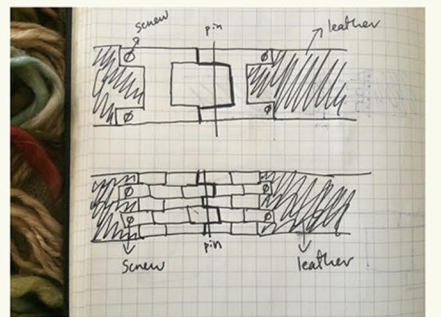
2. Tag Huer, Building Blocks



3. Cartier, The "1"

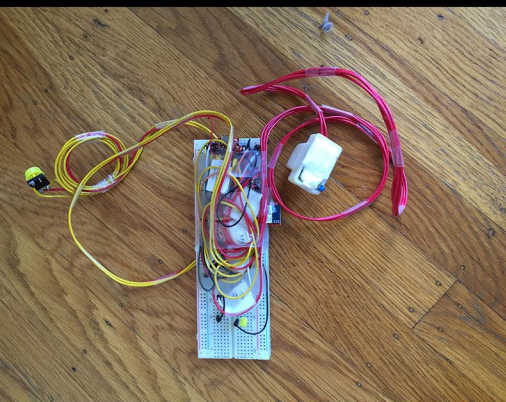


The Metal-Leather Interface

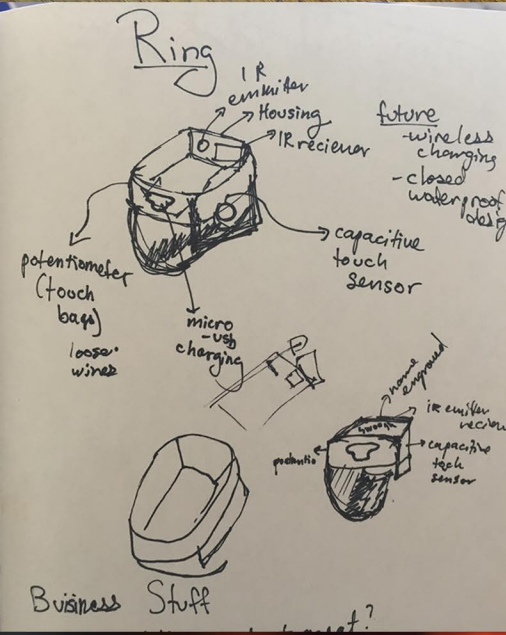


KUBRA

THE BREADBOARD



THE DESIGN SKETCHES



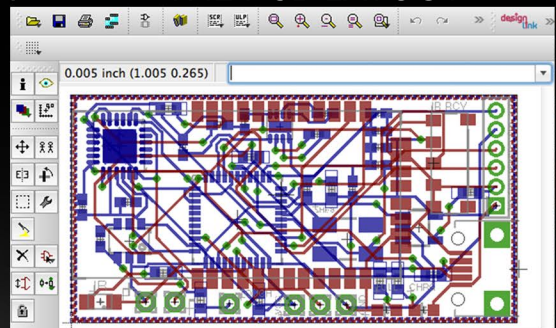
THE PROTOTYPE



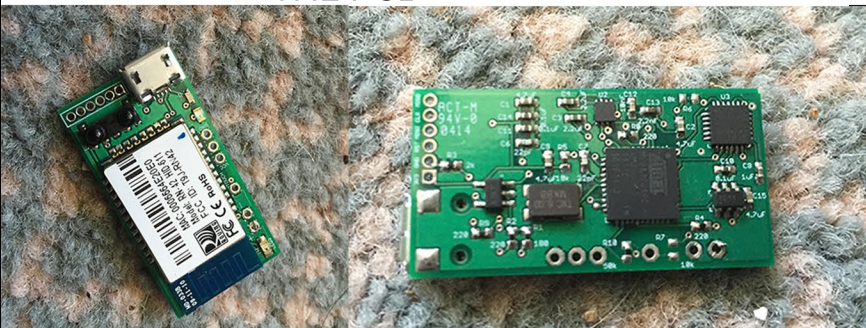
THE ENVISIONED FINAL PRODUCT



THE PCB LAYOUT



THE PCB



THE PRINTED HOUSING



KUBRA IS A GESTURE CONTROL WEARABLE RING. It is meant to be worn on the index finger, and as the user draws gestures in the air, the sensors on board track the movements, classify the gestures, and forward the appropriate commands to any connected Bluetooth device.

There were three main parts to creating this prototype: the mechanical design of the housing, the PCB design and layout, and the software uploaded to the microcontroller on the chip.

The housing was designed in AutoCAD. The prototype's housing has an enclosure for the circuit board and battery and was designed to be 3D printed.

The circuit schematic and layout of the PCB was designed from scratch. First, the sensors and intended microcontroller were breadboarded to ensure the basic schematic was correct. After this was verified, we used Eagle to create the schematic, and board layout. The PCB contains a microcontroller, a 9-axis Inertial Measurement Unit (IMU), a Bluetooth module, and an IR emitter. The data from the accelerometers and gyroscopes in the IMU were used to create and classify gestures.

The software was written in C++ and uploaded to the microcontroller onboard the ring. For prototyping, we used a miniature Arduino variation. Several algorithms were tested for classifying gestures in realtime. We ended up using a time series comparison that used spline interpolation and least squared errors to match sensor data against pre-recorded gestures. After figuring out which gesture was performed, the appropriate action was forwarded to the paired Bluetooth device.

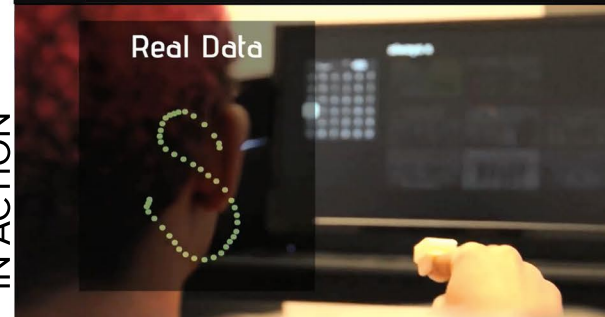
We were a team of three people who all played a part in every aspect of the project. Being the one who conceptualized the idea, I was primarily team lead, wrote the majority of the software, took part in the CAD and PCB design, and worked with fabrication labs to produce our prototypes. My colleague, CK Ong, was in charge of graphic design, CAD iterations for the enclosure, and web design, and my colleague, Trevor Walker, was in charge of the PCB design.

We were a finalist in the MIT 100K Accelerate competition, and won the Audience Choice Award.

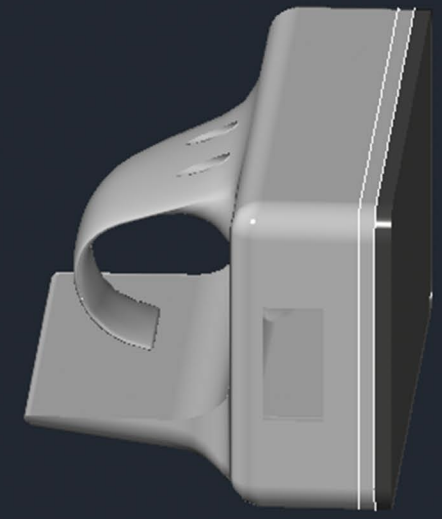
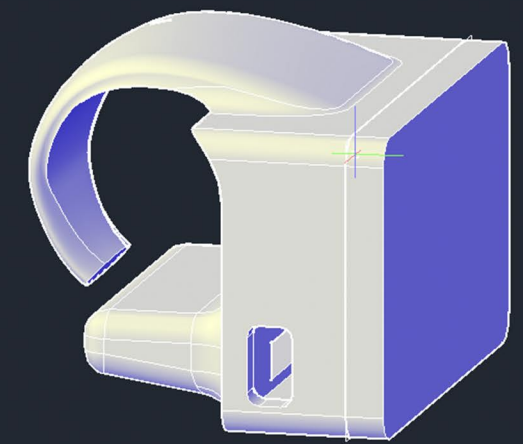
THE LOGO



IN ACTION



THE CAD RENDERINGS



EVOLUTION OF THE 911 TURBO

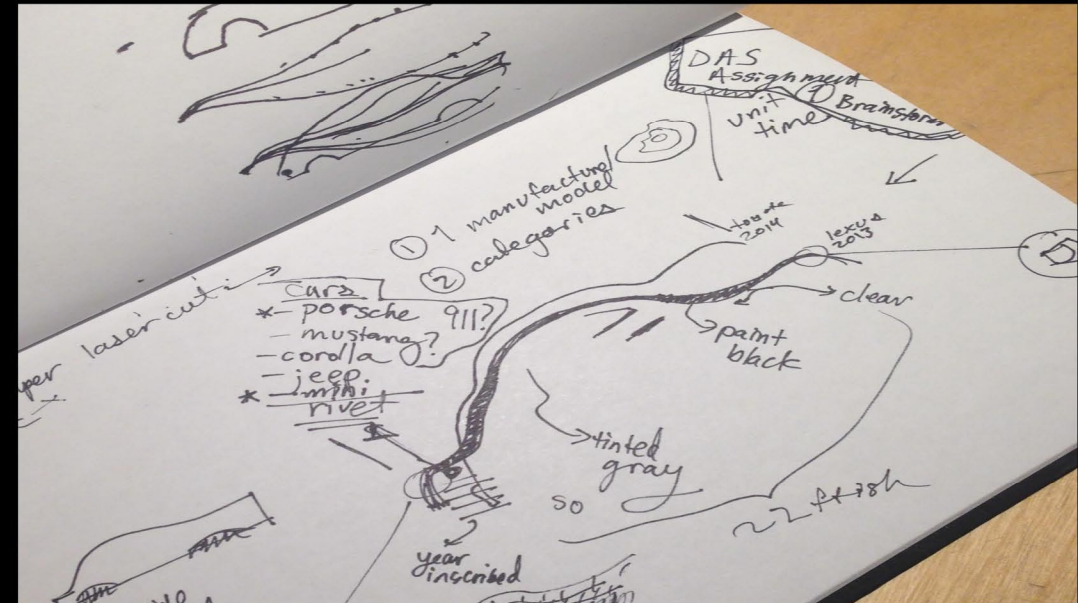
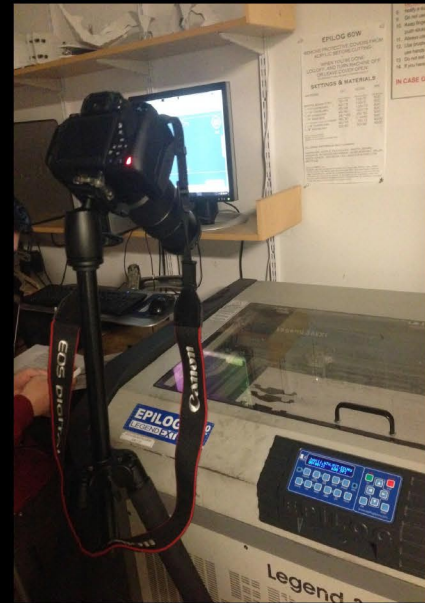
DESIGN ACROSS SCALES, 2014
PROF. NERI OXMAN AND PROF. MEEJIN YOON
PROMPT: DESIGN A REPRESENTATIONAL SYSTEM

THE SILHOUETTE OF SPORTS CARS has long fascinated me, and has often been a subject of my doodles. It is a prime example of how design and engineering must go hand in hand. The progression of the silhouette embodies the engineers' continual desire to decrease the wind resistance and the designers' desire to build an iconic and sleek sports car.

We wanted to capture the evolution of a silhouette.

The lasercut acrylic pieces were stacked and bolted together at a common pivot point. As the viewer swings down each layer of acrylic, the layers before grow darker and show through the top piece, thereby revealing the history and progression of the 911's profile. The year of the model was also etched on the bottom of each acrylic piece.

PROCESS

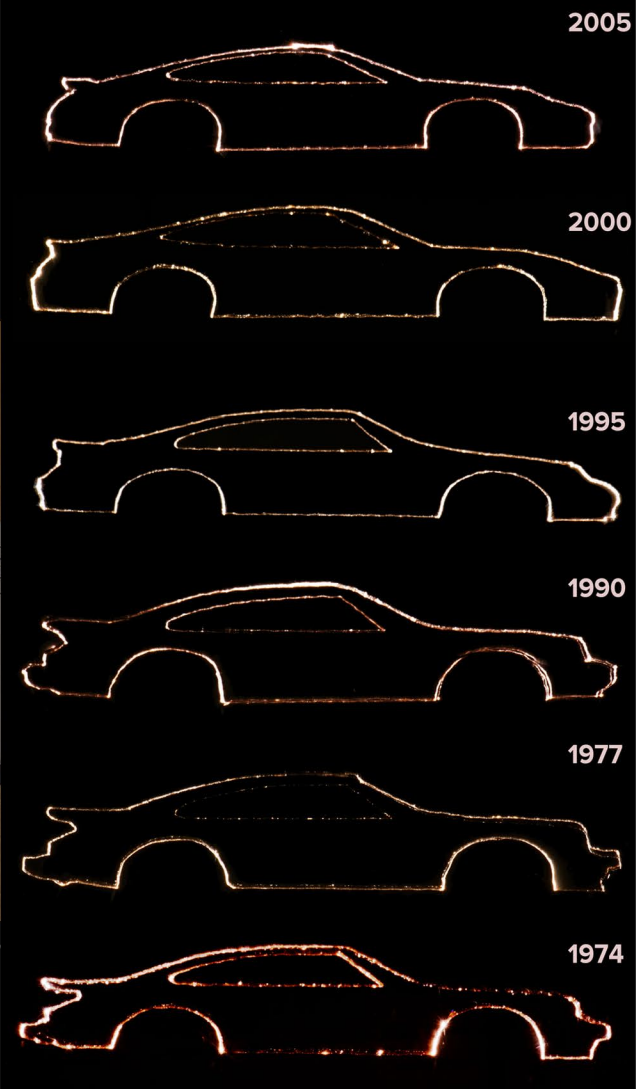


“Good design only exists in concert with engineering.” Ferdinand A. Porsche

We needed a car that had gone through many revisions to capture how advances in engineering had affected its design. We chose the Porsche 911, and then specifically the Turbo: an iconic sports car with a history.

documented distance between the front and back tips of the cars. Laser cutting was an ideal process for showcasing silhouettes, and semi-translucent black acrylic was the perfect material to see the evolution over time.

Six 911 Turbo silhouettes (1974-2006) were pulled from images, traced in Adobe Illustrator, and scaled according to the



LONG EXPOSURE OF LASER CUTTING



FINAL LASER CUT AND BOLTED PIECE

THE FINISHED PRODUCT

We also wanted the process to be a part of the final project. We took long exposure shots as the laser cutter danced back and forth, tracing the outline of the silhouette in a beautiful and fiery way. The trace exemplified the long, smooth strokes, inviting us into the mindset of the designers.

THE AMERICAN SYMPHONY OF SOUL

PHOTOJOURNALISM, 2014

PROF. B. D. COLEN

FINAL PROJECT

I enjoy thinking about my work in two pieces: the process and the final piece. Whenever possible, I like to include the process as a part of the final project; a reason I am drawn to photography is that the final project is literally a series of snapshots of your experience as you create it.

As a final project for a photojournalism class, I followed the American Symphony of Soul, a Boston-based band. I shadowed them as they practiced and performed, interviewed them, and wrote a short piece to accompany the photographs I took during my journey with them.

Below are some quotes and excerpts from the piece, along with a few shots from the series. For the full piece and series, please visit imahajan.carbonmade.com.

“Born as a jazz ensemble three years ago, the group describes itself as, “Boston-based, funkified extraterrestrials.””



THE GRANOFF MUSIC BUILDING is tucked into a corner of the Tufts campus, wedged between the football field and the university’s performance hall. Walk through Granoff’s white and sterile fluorescent-lit halls and you’ll hear anything but sterile music. From each of the open doors pours everything from classical to opera to rock music, as if someone is flipping through radio stations nearby.



“Drawing meaning from her life, her mother, and the world she sees around her, Ford (vocals) breathes life into plain words, and then literally exhales them from her body as she belts powerful melodies.””

Some of the songs are covers with “funkified” twists, others are originals, meticulously crafted from hours of collaboration, argumentation, and experimentation. The songs almost never sound the same; each time a different member will try something new. Compliments and constructive critiques are thrown around during the pauses, and like a faulty record player, the same part of a song is practiced several times before nods of satisfaction and grins of pride are noticed around the room.



IT'S A FRIDAY NIGHT GIG for the American Symphony of Soul at the Middle East, a restaurant and bar perched on a street corner in Central Square. There’s a bouncer outside the purple exterior, who cards you as you enter, but Clawson (keys) is excused for being underage. It’s clear that this is not their first performance and they make it look effortless, hiding the many hours of practice they have spent over the last few years. The setlist is well established; the sound is perfected; their demeanor exudes confidence. When popular covers start, the audience is encouraged to participate, and they do. Every second person is at least mouthing the words they know so well, but many are outright screaming them. Right in front of the band, in the first two rows, include those that are enthusiastic and daring enough to dance at a level more than slightly above swaying. Their drinks slosh around, drips and drops fall about, but no one is concerned.