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Honors Thesis

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An Exploration of the Kidney Through 3D Printed Ceramic Sculpture

My Mom and I both live by a certain saying, "it's not what you know, it's who you know." No one person is truly self-sufficient. I believe that living in the moment is important, and that moment should be used to spend time with loved ones and support one's community. Community outreach is paramount to thriving in life, and in the case of my mother, it was vital to her survival, and ultimately saved her life. Lauren Gitelson, 50, is my mother and inspiration for this project. Despite living with debilitating illnesses for decades, she continues to grow stronger, happier, more confident, and exists as a respected and revered member of every community she is a part of. The largest contributing factor in her story is her ability to make connections, and find a place for herself no matter what she does.

When I was about thirteen years old, Mom was diagnosed with focal segmental glomerular sclerosis (FSGS), with progressive kidney scarring. This required her to sit in a chair, hooked up to a dialysis machine several times a week, for hours at a time. As a child, I thought little of it. It was simply all I knew, and when I would go to school and my peers would tell me they wished my mom would get better, and the teacher's would ask

how she was doing every week I didn't bat an eye. She was my mother, and there's no way that anything bad could happen to mom.

During this time, we found comfort in the local Jewish congregation, Chabad, and would attend weekly services, often sharing meals, prayer, and play. These were incredibly formative experiences for me. During this time, I learned the importance of being a part of a community. Lauren is loved by all members of the congregation, and is well known for being a smiling, friendly face, despite her hardship. When things became difficult in our family, I would look forward to playing with the other children at synagogue, eating the rebbetzin's amazing home cooked shabbat lunches, and listening to the men pray as I would doze off and stare out the window. My parents are resilient people, but if it were not for the congregation, our family experience would have been missing many vital pieces. It was here that I also learned the importance of community service, and assisting those with disabilities. Through Chabad, Mom led a program known as the Friendship Circle in my middle school, which was an organization that partnered neurotypical students with the special education students, and would go on field trips together. Lauren was a special education teacher, as well, before landing on her current career. These are just a handful of examples of her love for others.

The kidney waiting list is long and unforgiving. Young and healthier people are usually put to the front as they are the most likely to receive the transplant with a handleable level of rejection. Lauren, on the other hand, was in her forties with a myriad

of pre-existing conditions and medications that all work against each other. It was at this point that we were connected to Renewal, a Jewish-led organization that specializes in finding donors. Against all odds, we found someone, a kind and selfless woman named Yiffat, who lived with her family in the state of Georgia. She was a perfect match, and she gave my mother one of her kidneys without a second thought. Not only did she save my mother's life, but she made a lifelong friend of our family. Our family regards this experience as a miracle. As I grow older, I often find myself growing more and more secular, and as much as I love Judaism, and identify as Jewish, I do not practice nearly as frequently as I did in my youth. That being said, I will always refer to this event as a miracle. I am so grateful to Yiffat, my mother's doctors, and G-d for allowing me to keep my mother in my life.

My experience with community outreach is very similar to my mother's, and it has inspired me to go in a service field. I want to help people that suffer from mental health issues. I started this journey in college by joining the Oasis organization on campus. For three semesters I learned about providing crisis intervention services for my peers, which was incredibly valuable and interesting to me. Last semester, I also got the opportunity to intern at the New Paltz Youth Program, which was a wonderful experience that allowed me to serve the community of the town I have been living in for four years.

My biggest leap of faith in regards to community outreach was starting this project. My creative process began with meeting Bryan Cziebez, the head of the

ceramic's department and my friend, Althea's, academic advisor, during a ceramics exhibition in fall 2021. I spoke to him about my interest in 3D printing, and my understanding that he was the only person on the New Paltz campus with access to a clay 3D printer. I shared some ideas with him briefly, and he was gracious enough to take me under his wing and serve as an advisor to this undertaking. My thoughts were incredibly scattered at the beginning of this process, I would sketch countless doodles in the weeks leading up to my first advisor meeting, and my initial concepts were far less abstract then. Bryan helped me narrow my focus, and we eventually decided that we were going to put our energy towards a single sculpture with several variations. This allowed me to visualize the end of this project early on, which was incredibly helpful.

The human body is fragile, yet resilient, but ultimately it is finite. I've watched Mom bounce back from countless illnesses and disabilities, becoming a stronger person each time. Almost like breaking and setting a bone. The clay that these pieces are made of is a permanent installation in our world. If taken care of properly, it will outlive both myself and my mother. This project is a testament to her success, and proof that she beat her illness, for all to see. I consider it a trophy of sorts. It was an intimate experience working with the DICOM footage of her transplanted kidney. It rarely occurred to me that the images I was looking at don't originate from her body. Making art with these images made me feel closer to my mother, and it also made me feel closer to my newfound ceramics peers, whom I have been able to share my story with. I felt welcomed by this community immediately, and there are countless people, many of them here, who have had an impact on this project in one way or another.

I have fallen in love with spirographs during this project. I love how a simple shape, in this case, a kidney bean, can be manipulated and distorted into something visually interesting, and then brought into three-dimensional space. I thought I would move past the line-drawn illustration of the kidney later into the creative process, but I couldn't stop myself from using it. The simple line drawing that the sculpture is derived from represents my amateur understanding of ceramics. The spirograph shape is amazing because you can follow it forever and there always seems to be something you've missed. The shape would be incredibly difficult, maybe impossible, to shape by hand. The almost symmetrical nature of the shape is pleasant to the eyes, and brings comfort to those who gaze inside of it. I wanted to make sure that these pieces are a representation of the happy life my mother has led post-surgery.

My mom is the single strongest person I know. Not only has she struggled with a life-threatening kidney disease, but she is also in remission for leukemia and breast cancer. When she received her kidney transplant, she was diagnosed with diabetes as well. Anyone who knows my mother knows that she is a fighter. Even during the worst of the Covid-19 pandemic, when anxieties were at an all time high because of her immunocompromised status, she continued to be an incredible mother and take care of my family. That is why I have decided to focus on her as my subject for this project.

I wanted to make my mother new kidneys. New shiny kidneys, maybe not good for filtering toxins from her body, but unique to her, just like her original ones. During her

transplant, she received a single, viable kidney, while her two existing kidneys lie dormant in her body. I made her these kidneys, three main kidneys that each represent myself, my father, and my brother. This brings her kidney total to six kidneys!

The clay 3D printer utilized for this project was assembled by my advisor, Dr. Cziebez, and consisted of an Arduino project kit, various 3D printed plastic pieces, and a powerful motor. The way the printer works is that it extrudes a heavy tube of soft, wet clay, through a narrow cone using a slowly turning motor. From there, the nozzle is controlled by three free-moving arms that cover the x-y-z axes. This allows for an incredible level of detail. Far more detail than I would ever be able to do by hand, since I am a total ceramics amateur.

The project started simply, with a single line drawing. I didn't think much of it when I drew it initially, but it ended up being the catalyst for the final product. What I had made was a closed curve in the shape of a kidney. I like how simple it was, and I felt like it represented my relationship with art. I took this drawing to Bryan, and he recommended just messing around with it. My creative process consisted of extruding this line drawing and manipulating every aspect of its dimensions. By extruding the curve, I had a bean shaped tube. From there, I took the tube and repeated it on itself, in varying increments of degrees to get different spirograph designs. Afterwards, the spirograph tube was tapered, to give the appearance of a flared vase, and the entire model was twisted in all directions to find the most interesting designs.

It didn't feel right to focus entirely on 3D printed clay, and I wanted to get my hands dirty. That is where the lithophanes came in. Lithophanes are plates with an image imprinted into the material, usually porcelain, and the image is discerned by light passing through at varying thicknesses. I had experience working with and creating lithophanes in my Introduction to Computational Media class, taught by Aaron Nelson. It was one of the final assignments of the class, and we were instructed to write code to turn a regular jpg. image into language that could be translated into a lithophane by the 3D modeling software, Rhino. The code essentially sets a value depending on the "brighthness" and "darkness" of the colors, and converts them into thickness values, meaning the darker colors will be thicker, and the thinnest parts will let the most light through. From there I printed the design in PLA plastic. Last semester, that was the end of the project, but I repurposed the code for this project.

I was given access to DICOM footage of my mother's transplanted kidney. The data was taken from a sonogram from a check up appointment that my mother had in 2020. I focused on presenting the cross-sectional images of her kidney because I love the information presented on it. I chose three specific images that stood out to me out of the sixty-nine I was given access to. To the untrained eye, including my own, the data means nothing. It is simply peaks and valleys, like some snapshot of a topographical map that could lead anywhere. I believe there is value in this data. It sounds strange, but I have felt myself get even closer to my Mom the more I focus on the likeness of her organs. It is beautiful to realize that every cubic milimeter of the person I love is

intrinsically art. I attempt to comprehend just how many images exist of my mother's organs, and how all of it has gone unseen for years.

The images were translated using the G-code I repurposed, and they were printed on the same PLA plastic that I had used prior. The next step included making plaster molds for each of the images. From most of my conversations with the ceramics students in the studio, plaster casting and molding is one of the more tedious aspects of the concentration. However, I quickly became an expert as I had to remake them multiple times to get it just right. I find the process intuitive and meditating, but I have definitely made my fill of plaster molds (pun intended) for the time being. Now that the plaster molds were perfected, it was a matter of casting porcelain in the mold. This particular porcelain slip was recommended by Bryan specifically for its translucent properties. This part of the process, by far, was the most challenging. These lithophanes are only a couple of millimeters thick at their thickest, and close to 0.2 millimeters at their thinnest. Sometimes I would pour the slip and they would fall apart when I would demold it because they were too thin. Countless pieces of porcelain have shattered in my hand while I was simply sanding the edge with little pressure. Sanding these lithophanes pre-kiln is the equivalent of trying to sand a potato chip, and not the thick Costco brand.

This was not my first time attempting a semester-long creative project. In the spring of 2020, I was the director of the Miami Theatre Players' production of *American Idiot: The Musical*, which unfortunately was cut short due to the beginning of the

pandemic. This gave me a new perspective towards my medium of choice at the time, theater performance, and broadened my creative interests. Before this point, I was solely invested in performing on stage, but stepping back and focusing on administrative duties was incredibly satisfying and worthwhile. It made me realize that I could create art that I was proud of without standing on a stage.