



## Giving new hope with revolutionary 3D printed prosthetics

When Michael Fine, lost his arm in a terrible car accident, things seemed very bleak. It looked even worse when he received his first prosthetic arm – it was expensive, heavy and basically unusable. It was his own son’s ingenuity and passion for engineering, together with support from Somos®, that brought a surprising and heartwarming change.

### Prosthetic improvements

Around two million people in the US today are amputees or born with a limb deficiency. The technological development of prosthetics has taken a dramatic leap forward to transform peoples’ lives. Whether it has been advances in material strength and flexibility or robotics, these technologies are helping people lead full, active lives. Unfortunately, these advances are not always accessible to everyone, whether through lack of availability or high cost.

This was the problem that faced Michael Fine when he was in a serious car accident and lost his left arm from the shoulder down. The accident was a huge shock and life changing event for Michael and his family. Michael suffered a lot of pain, had to adjust how he performed daily activities and became quite frustrated and depressed. His frustration grew when he received his first prosthetic arm.

Being the only prosthetic covered under his insurance, the costs were very high. It also weighed 22 pounds and provided little to no functionality. Michael found it uncomfortable and almost useless, so he avoided using it, but all that was about to change and from an unexpected source.

Michael’s son Jacob, a talented designer and engineer, was about to start an internship with DSM Somos® – one of the world’s leading stereolithography material manufacturers. His mentor at Somos® asked if he had an engineering problem he wanted to solve. He saw how his father was suffering and wondered how he could take this opportunity to not only learn but in addition help his father. “I thought about what I wanted to get out of my internship and then it hit me in the face. Now that I had access to sophisticated 3D printing technology and materials at Somos®, why not see if I could help my dad and make a better prosthetic arm,” Jacob said.

## Functioning prosthetic with quick turnaround

In just three weeks, Jacob had designed, manufactured and built a new prosthetic arm. He started by using computer-aided design (CAD) software to create the new arm which is comprised of 26 separate parts. Some parts are original designs created by Jacob, others such as the hand, he obtained from open-source design resources.

Jacob investigated several different materials to create the arm and decided that Somos® 9120 was the best option for the design. Somos® 9120 is a transparent stereolithography resin that is easy-to-use as well as water and temperature resistant. It is also semi-flexible while still enabling fine and intricate details. This makes it ideal for prosthetics because it is light, but can still withstand day-to-day wear and tear. Although usually used for prototyping, the strength and flexibility of Somos® 9120 meant that it could be used to create a final product. Somos® provided the material and their in-house 3D printing equipment for Jacob to print the parts.

As well as the overall structure and parts of the arm, Jacob also developed and incorporated electronics into the design so that his father would be able to move the arm and use the multi-part hand. This project was special for Jacob and he really wanted to make something that was not only better for his father, but also personalized. He was able to incorporate the logo of his father's favorite band, Foo Fighters, on the arm providing a special meaning between father and son.

## A life-changing gift

The result of Jacob's innovation, passion for engineering and compassion has made a huge difference to his father. Michael Fine says, "I was both shocked and amazed by the lightweight, efficient and incredibly useful prosthetic arm that my son designed, created and produced with the help of Somos®." Michael added, "This new arm is light years ahead of the bulky, heavy, functionless one I had before. Thank you from the bottom of my heart for what has become a life-changing gift!"

Michael is now able to perform daily activities that he was not previously able to do as Jacob's design has sensors that detect muscle movements in Michael's shoulder which activates function in the prosthetic arm and hand, including items such as picking up a cup.

Jacob says, "I was really excited to test out my engineering and design skills creating the electronic prosthetic arm for my father. It was very difficult for me to see how he suffered with the original prosthetic that was provided to him. With help and support from Somos® and my mentor on the team, I was able to transform my dad's life. It was truly an amazing experience to be able to create something from my passion for design and robotics to help my dad."

True to Jacob's enterprising and compassionate spirit, the story did not stop there. The success of his father's prosthetic, led Jacob to think how he could use this to help others.

## Giving a helping hand to others

Jacob took his knowledge and compassion to expand it to others in need, like his father. With the support of friends and teachers at Glenbrook South High School, Jacob founded Project Mobility. Project Mobility is a not-for-profit charity that aims to develop light, easy-to-use, advanced prosthetics for amputees who cannot afford the usual high cost prosthetics. Project Mobility is funded through donations and resources from businesses and organizations in the Chicago area. Since it began in 2016, Project Mobility has worked on a number of different projects and provided prosthetic limbs to two people thus far. They are continuing to spread the word to help others.

Jacob has now expanded his interest in design by working towards a degree in mechanical engineering at Vanderbilt University. Others have taken over running Project Mobility, but when time allows he still takes an active interest in developing and expanding the work of the charity.

3D printing technology will continue to improve the functionality of prosthetics in the future. Somos® is looking forward to seeing where Jacob will drive this and where the industry will go.

"I was really excited to test out my engineering and design skills creating the electronic prosthetic arm for my father. It was very difficult for me to see how he suffered with the original prosthetic that was provided to him. With help and support from Somos® and my mentor on the team, I was able to transform my dad's life. It was truly an amazing experience to be able to create something from my passion for design and robotics to help my dad."

Jacob Fine, Designer/Engineer



Fitting the new prosthetic arm made from Somos® 9120

