With DAHB technology, Sol is able to manually operate his prosthetic arm or get assistive power from a motorized pump.

Progressing Prosthetics

A father's solution for his son turns into a breakthrough for prosthetics

"In founding Ambionics, it is my goal to ensure that limb deficient children like my son are not faced with the current constraints and delays of traditional prosthetic manufacturing. 3D printing enabled us to design and print a solution very quickly and cost-effectively."

Ben Ryan
Ambionics

stratasys

Case Study

Progressing Prosthetics

Within days of being born, Sol Ryan had the lower-half of his left-arm amputated. Under current National Health Service (NHS) guidelines, Sol would have to wait one year before a non-functional, cosmetic prosthesis could be fitted and over three years for a functional, myoelectric prosthetic. Infant development studies show children are more likely to reject a prosthetic if they are fitted over the age of two. The earlier a functional prosthetic is fitted, the more likely a child will continue using it into adulthood.

Months after Sol's amputation, Ben Ryan, his father, began researching ways to make a new prosthetic to accelerate this process, and not long after that, he founded Ambionics (Additive Manufactured Bionics). One year later, his infant son Sol was able to enjoy the benefits of a fully-functional, 3D printed prosthetic arm.

Safety Meets Functionality

Before embarking on his journey to create prosthetics for infants in a more efficient way, Ryan first had to discover how to create a mechanism that was both functional and safe. Traditional prosthetics use myoelectric sensors unsuitable for children under 3 or 4, since the devices' powerful batteries present a potential for injury. He had to keep this in mind while also optimizing the production process. With a Connex™ 3D printer, Ryan printed his son's prosthetic in just five days and created a solution that didn't require cables, springs or screws. After practicing with several prototypes, Ryan 3D printed a series of key parts for the double acting helical bellow (DAHB) of the prosthetic. The 3D printed DAHB unit can be connected to a motorized pump to provide assistive power or operated on body-power alone. According to Ryan, compared to traditional manufacturing methods, the time spent on design and production was reduced by 90% with a cost savings of up to 76%.

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Before Ambionics, Sol would've had to wait years before getting a fully-functional prosthetic arm.

Progressing Prosthetics

Limbs Without Limits

Ryan attributes the success of his design to multi-material 3D printing, most notably the rubber-like Agilus30™ material. The flexibility and extreme tear-resistance of Agilus30 allowed for greater design freedom with no compromise on accuracy. “The ability to combine rigid and soft materials in a single print was vital to the success of the design,” explained Ryan. “Only Stratasys’ strong rubber-like 3D printing materials make the production and use of this system possible. The design is extremely lightweight, weighing in far less than a traditional myoelectric alternative, which significantly improves comfort levels for the infant.”

Although Ambionics started as a father’s project to create a better solution for his son, it has the potential to impact an entire industry. Currently, an infant whose arm is amputated in the early weeks of their life, will go almost three years before being fitted with a fully-functional prosthetic. With Ryan’s design and patented DAHB technology, Ambionics accelerates the manufacturing process. Ambionics is currently taking the device into medical device usability trial with the ambition to launch this customized product to the mainstream prosthetics market.

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