Ambionics:
The Story of Sol Smith

Ben Ryan

CEO and Founder of Ambionics

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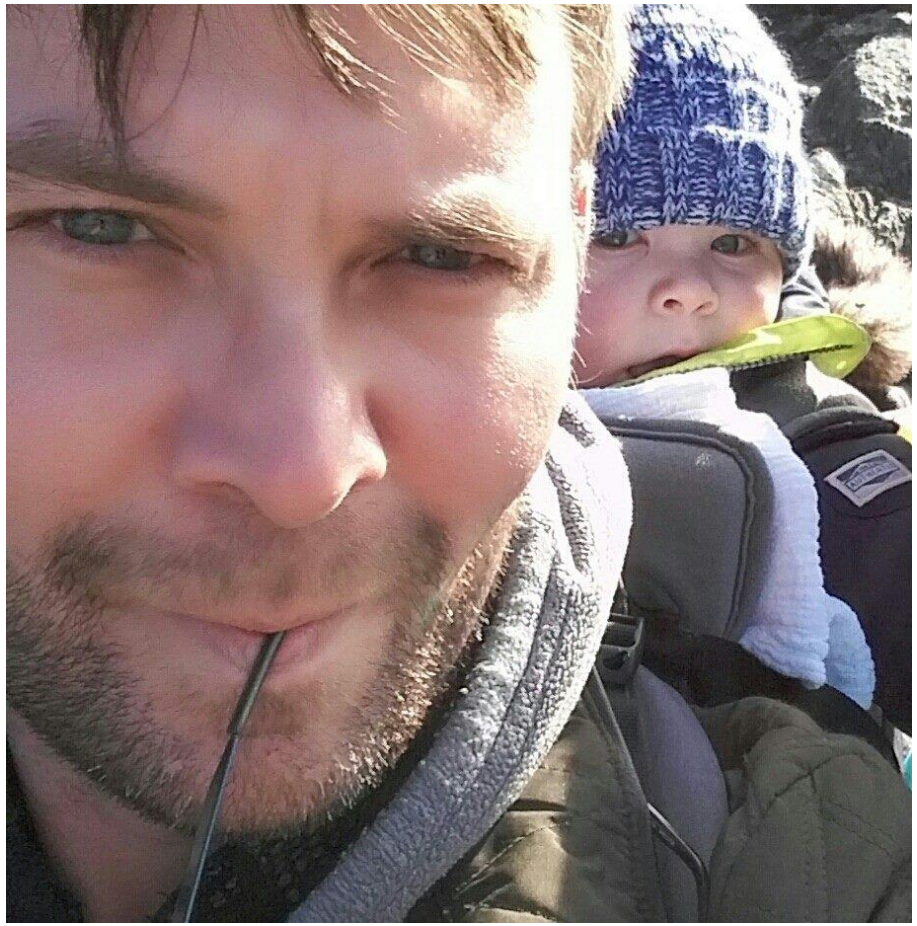
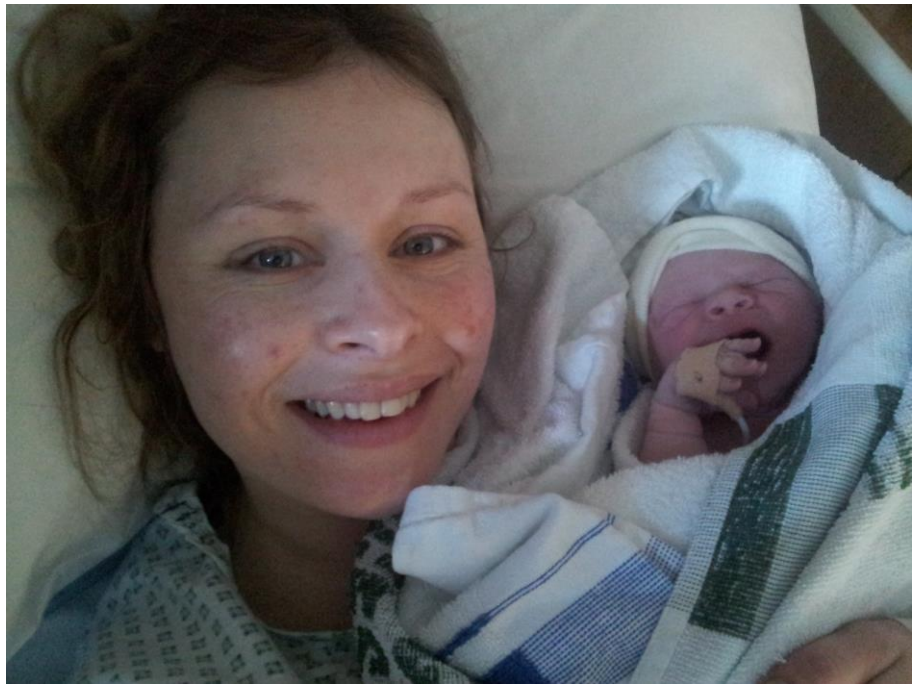


About the speaker

Ben Ryan

- Former A Level Psychology teacher
- No professional experience in engineering or product design
- No clinical qualifications
- Father of two boys



About Sol

Sol Smith Ryan

- Born March 20 2015
- Suspected forceps Injury
- Both arms fully developed at birth
- 7 hours of exploratory surgery on birth day
- Left arm amputated 10 days later

Day 2

- Sol’s side was opened up from the lower rib to the elbow on his affected side
- Placed on clot busting drugs which prevented the wound from closing but saved his life

Day 5

- Nil by mouth until 4pm every day
- Venous blood samples taken every four hours (see forehead)
- Treated at Alder Hey Children’s Hospital

Day 15

- Amputation carried out on Day 10
- Muscle reattached to forearm (1cm) on Day 15
- Dressing changes every 5 days

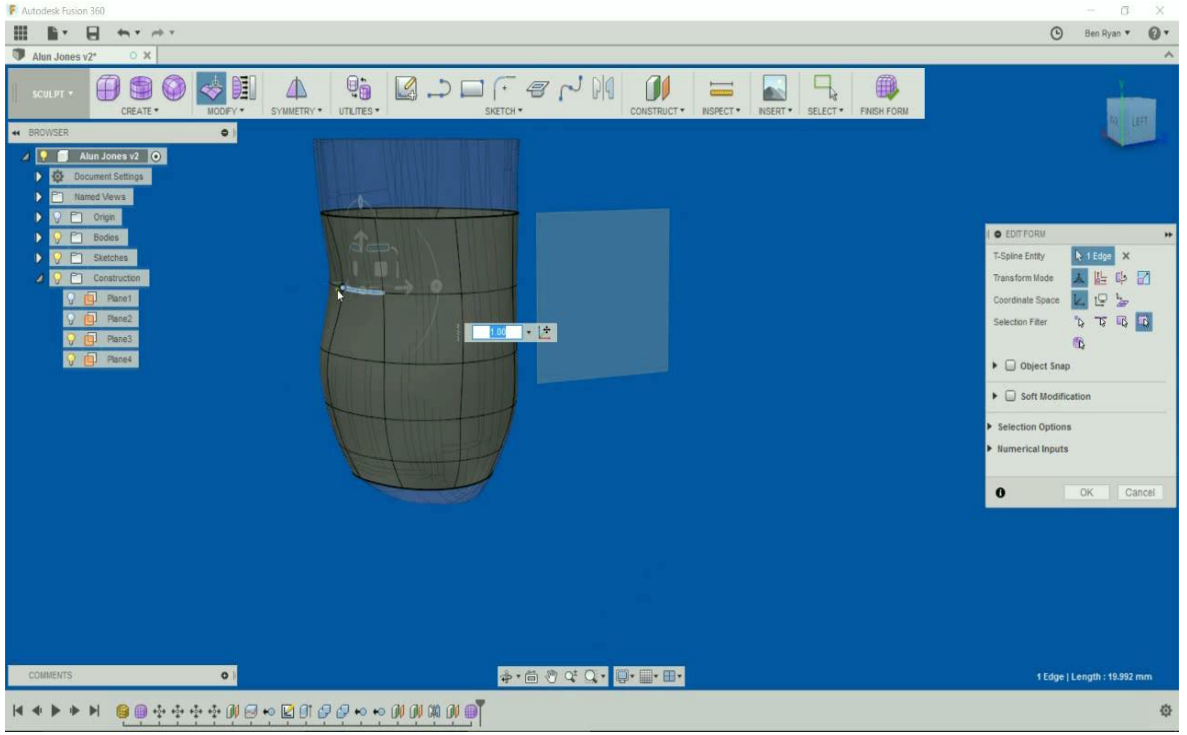
Day 35

- Discharged from Alder Hey on day 28
- No further NHS intervention until 12 months
- Decided to try a new approach
- Created a small limb extender to assist with play and rehabilitation

New Intervention Programme

Expected Benefits

- Increased muscle development
- Proprioception and coordination
- Primes for rigid sockets
- Increased support when sitting up
- Velcro attachment to encourage bi-manual handling from 8 months
- Therapeutic for me!



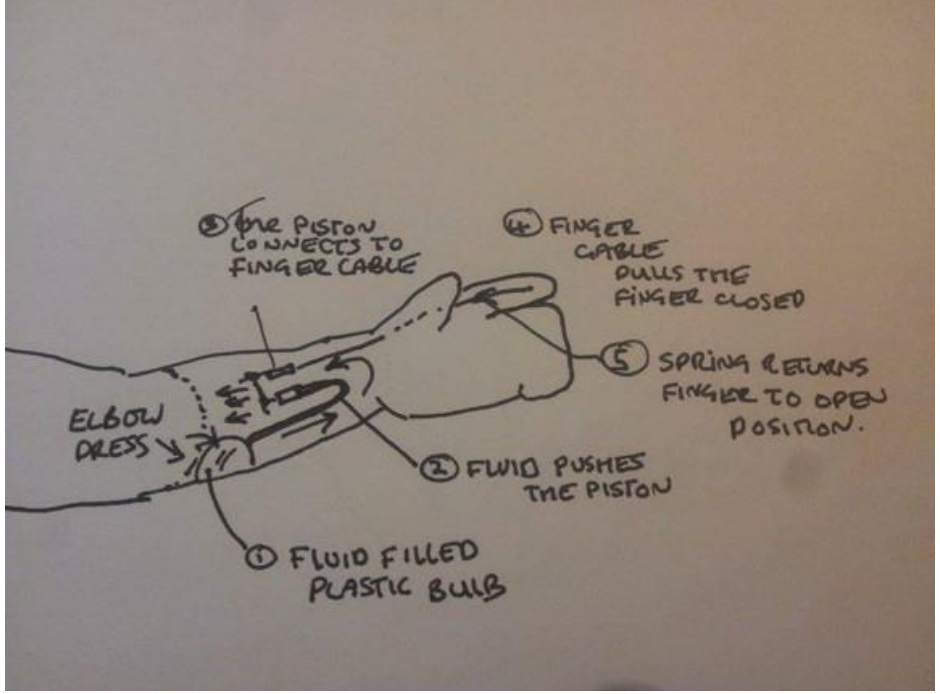
Paul Sohi

- Introduced in November 2016 through Autodesk
- Created the first 3D printed prosthetic leg for Denise Schindler at the Rio Paralympic Games
- Paul has stimulated a paradigm shift in the prosthetics industry

Digital Workflow

- Import .obj(quad) into Fusion 360
- Model test sockets
- Digital scaling
- 3D printable in FDA approved materials
- Digital copy retained

Orthopaedic Research UK Crowd fund teaser: “Digital Prosthetics”

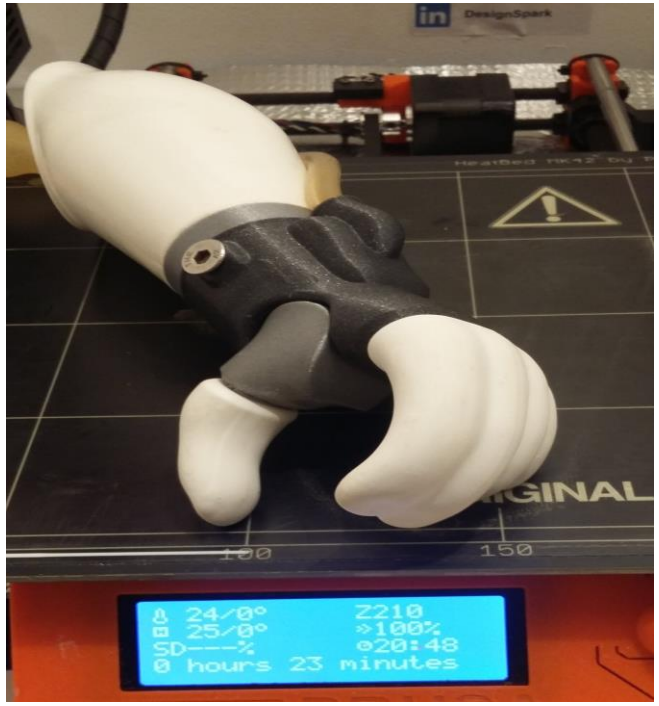


Hydraulic Design

- First sketch for new device August 2015
- Inspired by spiders
- No batteries required
- One working part
- Filed patent application in 2016

First wearable prototype

- Began learning Autodesk Fusion 360 in July 2016
- Proof of concept prototype printed December 2016
- Digital materials (photon beam cured polymers)
- Cost of £900 + VAT
- 14 hours post processing



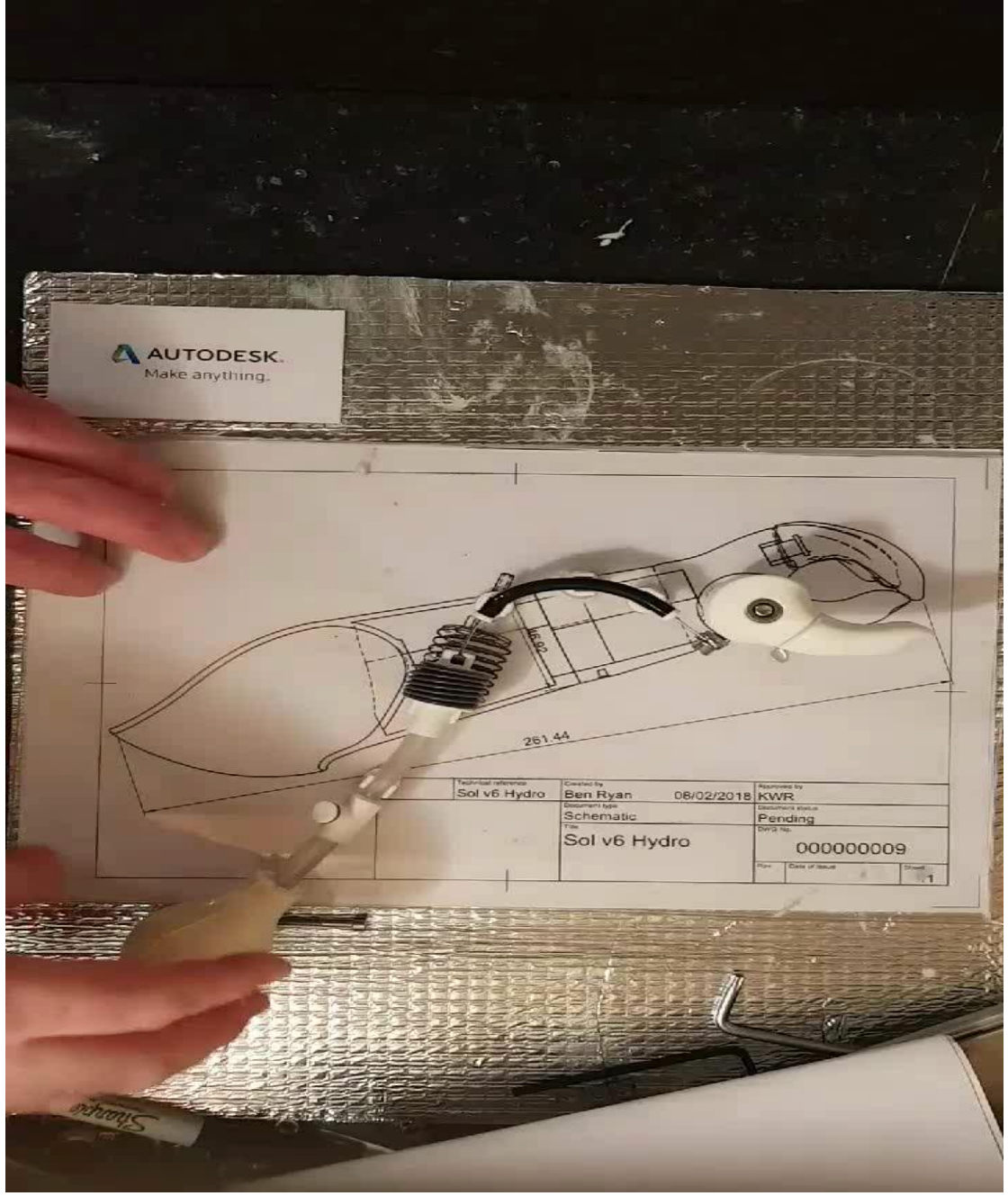
FDM version

- First FDM prototype produced July 2017
- Rubber dipped ABS fingers
- nGen flex hydraulic bellow
- £175 to manufacture

- Socket designed from 3D scan of the arm
- Acetone vapor smoothed ABS socket
- Actuated under the shoulder

Body Powered Hydraulics

- Actuator placed under arm
- Compressing this operates the bellow
- The bellow closes the thumb
- Memory return system
- Prevents eye and neck strain
- Stimulates brain development
- Decreases likelihood of rejecting devices



Current “Inventor Prize” Prototype

Ambionics versus Conventional

Ambionics VEIP	NHS Intervention
Begins at 5 weeks of age	8 – 12 months of age
Home Scanning	Limb Centre Appointments
£300 clinical costs per arm	£1000 per arm
Digital copy retained	Recast required if lost / damaged
4 sockets per year (retain hand)	2 devices per year
Function from 8 months	Elasticated hook at 2 years
Customizable	Creepy

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