

PATRICK KANE

SAMUEL RODRIGUEZ

HUMAN 2.0

THE EVOLUTION OF BIONICS



BIG
PICTURE
PRESS



INTRODUCTION

Imagine a world where all around us are people with bionic limbs, machine-assisted hearts and cameras for eyes. This same world has cyborgs who can hear colours and communicate via their teeth, and even people who use robotic skeletons to walk marathons. In this world, children learn to hear with external ears, and people born without legs can walk using ones made of metal and carbon fibre. Some people use chips inside their bodies to get into their offices, or to pay for their coffees on their way into work. This world is full of incredible people who are using technology to do amazing things... but the most astounding part of it all is that this world is the one we already live in.

Technology has changed all of our lives, and not just with the smartphones or tablets that we use. For some people, particularly those with disabilities, recent technological advances have crossed the realms of the purely imaginable, and reached a place of possibility. We don't notice it all the time, but bionic technology exists and is right in front of our noses. Far from a scene from a science-fiction film, the future is in fact already here.

This book explores the most recent devices that mimic biology, from intricate bionic hands (see pages 32–33) to neural implants (pages 40–41), and includes some of the major milestones that got us here. We will also look forwards at the exciting inventions that lie around the corner, as well as what they mean for us as a species. Our journey to the future has already begun, and it is time to get to know Human 2.0.

THE FIRST PROSTHESES

For as long as humans have been around, we have been losing limbs, or are born without them. Whether due to an injury or congenital impairment (a condition that is present from birth), people have been trying to replace missing arms, legs, fingers and toes for thousands of years. Early prostheses were revolutionary for their time, yet their inventors did not have the technology needed to provide better functionality and comfort. Even so, some of these early prostheses closely resemble those that exist today.

The earliest-known example of a prosthesis (an artificial body part) belonged to an Egyptian noblewoman over 2,600 years ago. This wooden prosthesis replaced the big toe on her right foot, and even had a ridge in the shape of a nail carved into it to make it appear more realistic. It would have been strapped onto her foot with string, and scientists believe that it would have greatly aided her balance.

The earliest-written mention of a prosthesis dates to around 77 CE, and describes the iron hand belonging to the Roman general Marcus Sergius. Sergius was said to be one of the finest generals of his time, especially because of his bravery in battle. Across two campaigns he was wounded 23 times, resulting in the loss of his right hand. Sergius's replacement hand was strapped to his arm, perhaps allowing him to hold a shield for future battles.

Count Götz von Berlichingen

Perhaps the most famous example of an early prosthesis is that belonging to the German knight, Count Götz von Berlichingen, who lost his hand during battle in the early 1500s. Undeterred, Count Götz asked local craftsmen to create an iron hand with digits (fingers and thumbs) that could lock into place, so he could hold a horse's reins or a weapon. His love for warfare became so famous that some people believe it inspired the phrase, 'to rule with an iron fist'.



BIONIC LIMBS AND IMPLANTABLE DEVICES

A prosthesis can be internal or external to the body. The ways in which people can replace parts of their body can largely be broken down into two groups: bionic limbs and implantable devices.



Bionic limbs are artificial body parts, which are intended to replace the function of a human body part, such as an arm or a leg. These are attached to the body, usually via a belt, strap or socket, and can be easily taken on and off by their wearer.

'**Implantable devices**' is a broad term describing anything that is surgically implanted inside the body. Because surgery is required to gain access, these devices cannot easily be removed, and are typically designed to stay inside the body forever. Examples of these include pacemakers and cochlear implants.



If either a bionic limb or an implant has batteries that need to be charged, they are called 'active'. Those that do not are called 'passive'. Some implants, such as cochlear implants, need batteries. These sit outside the body and attach to the implant via a wire, so the user does not need surgery every time the battery runs out (see pages 28–29).