

THE HUMAN MACHINE



EXPLORING THE INCREASINGLY BLURRED LINES
BETWEEN HUMANS AND TECHNOLOGY

COMPILED BY HOWIE BAUM

connection
innovation
design
screen
information
connection
virtual
code
immersive
electronic
phone
tech
augmented
futuristic
cyber
gadget
machine
internet
futuristic
mobile
machine
internet
robot
people
communication
wearable
future
touch
device
design
innovation
businessman
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superhuman
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slavery
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virtual
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people
brain
control
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human

OUR TECHNOLOGY IS AN EXTENSION OF OUR HUMANITY

**Cyborgs:
A Technology of
Augmented Humans**



Almost everyone in the world has a life, dependent on technology.

More than a billion people right now are already dependent on assistive technologies like:

- ❖ Hearing aids
- ❖ Pacemakers
- ❖ Prosthetic limbs
- ❖ Wheelchairs.

1/3 of the world's population will be wearing glasses or contact lenses by the end of this decade.

TYPES OF HUMAN AUGMENTATION

The types of Human Augmentation in order of importance can be divided into 2 categories:

MOST IMPORTANT:

**PHYSICAL AND COGNITIVE
(THINKING)**

LEAST IMPORTANT:

PERSONALITY AND COSMETIC



SIMILAR WORDS ABOUT THE HUMAN MACHINE

BIONIC HUMAN

TRANSHUMAN

AUGMENTED HUMAN

CYBORG

EYEBORG

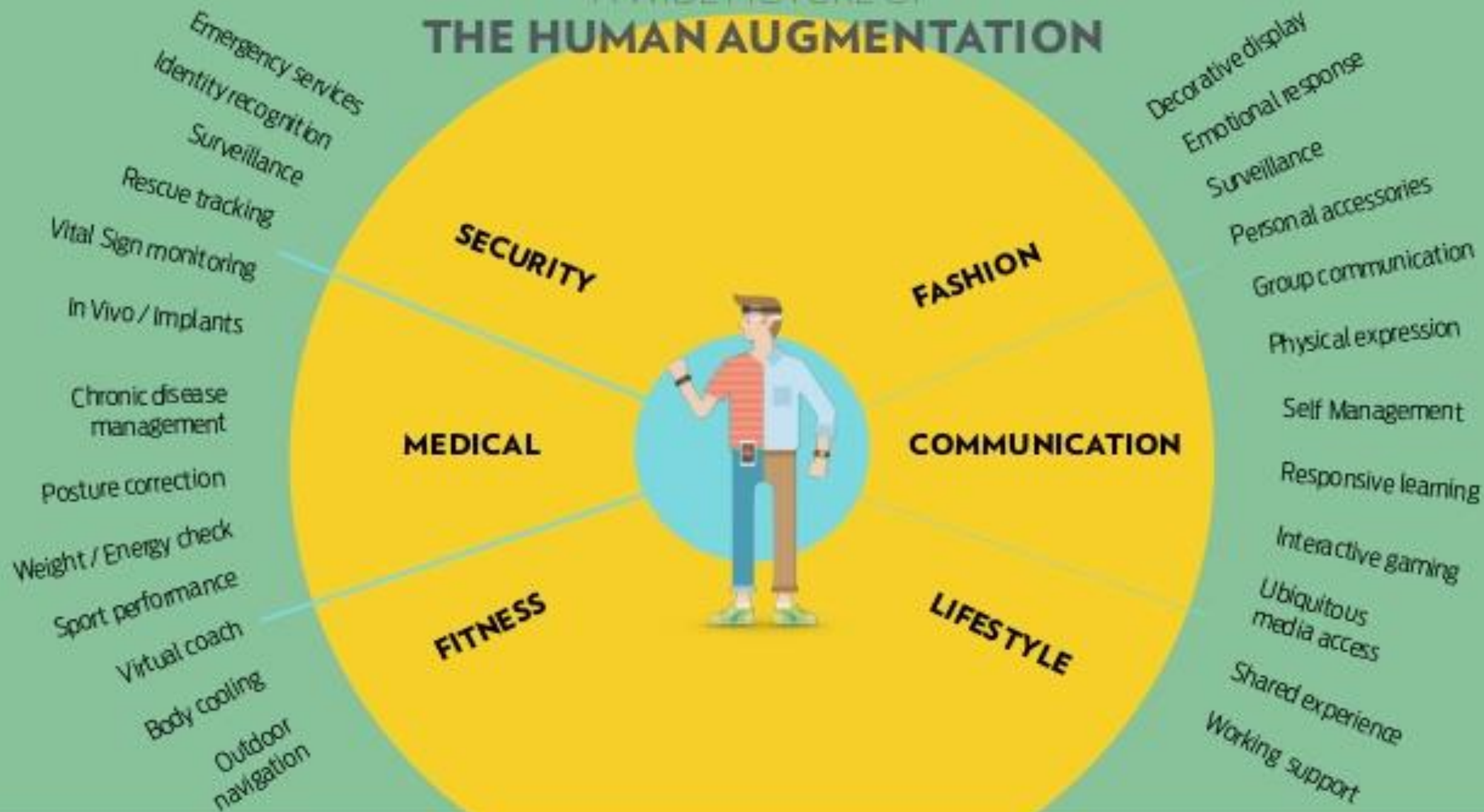
CYBERNETICS

ENHANCED HUMANS

HUMAN AUGMENTICS

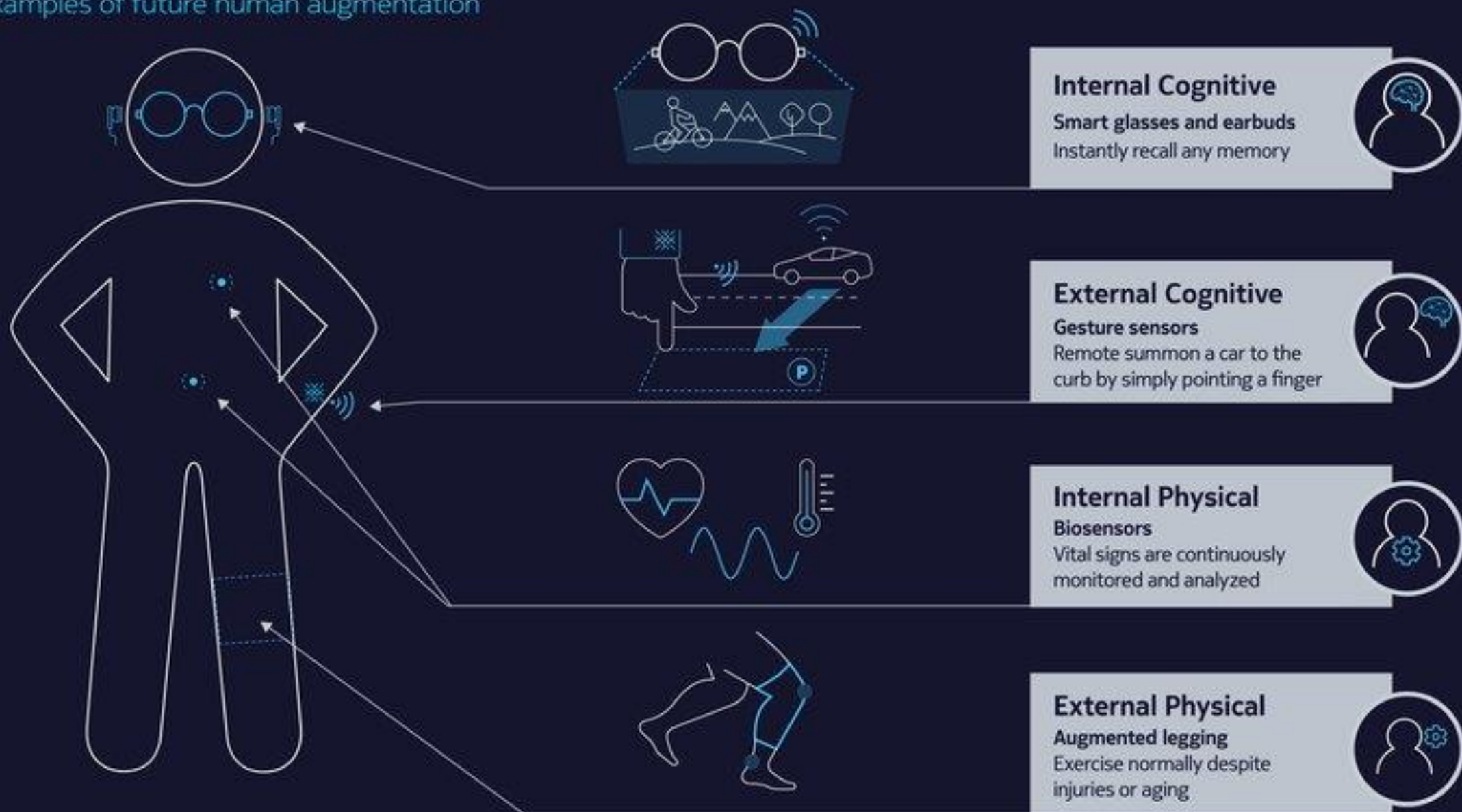


A WIDE PICTURE OF THE HUMAN AUGMENTATION



Homo augmentus

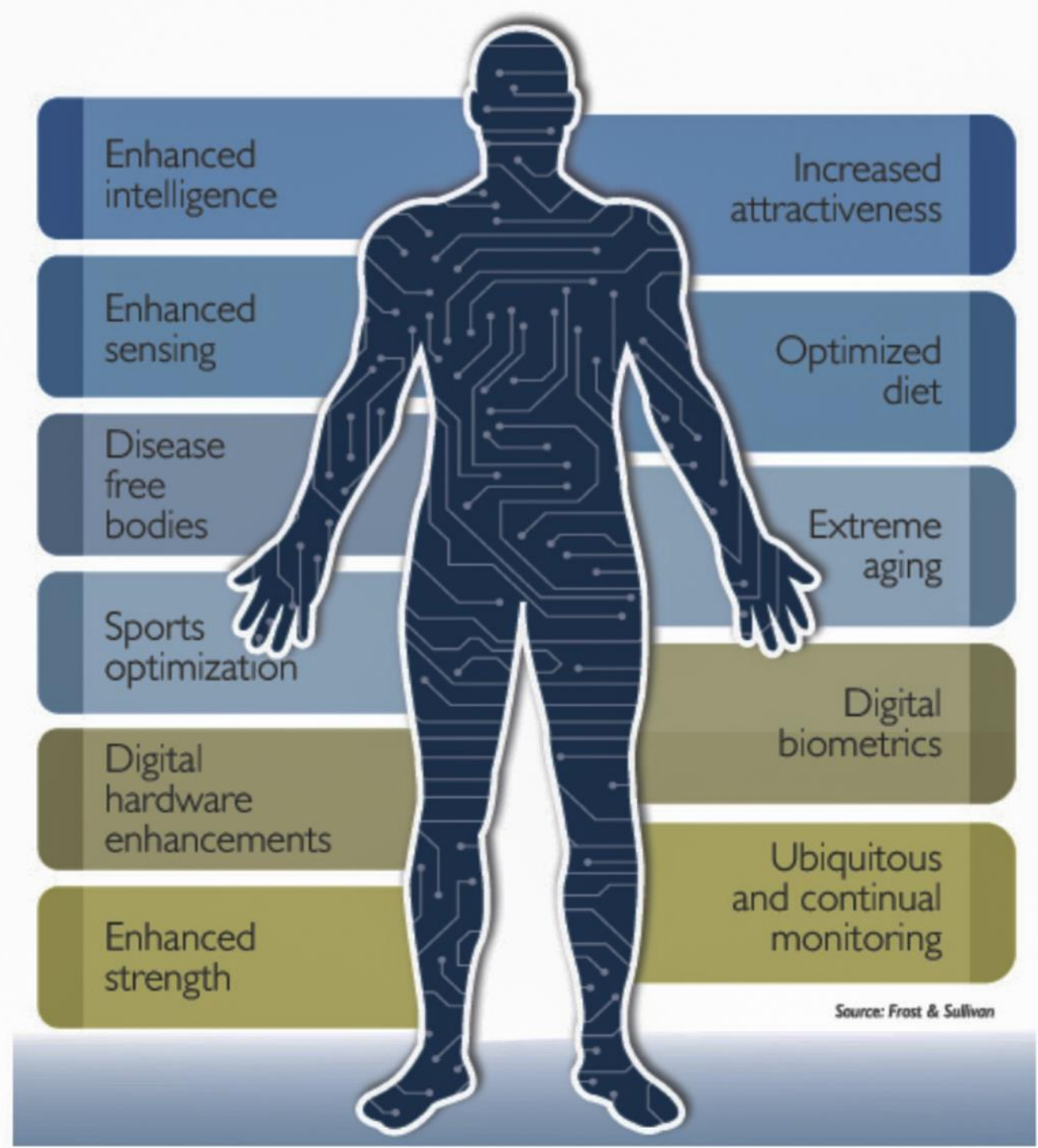
Examples of future human augmentation



Transhumanism is an 'intellectual and cultural movement' that promotes the use of technology in order to advance the human condition.

What this essentially means, is that a transhumanist is someone who believes we should use technology in order to give ourselves:

- Enhanced abilities
- Higher IQ's
- Greater strength
- Longer lifespans
- Sharper senses, etc.





(a)



(b)



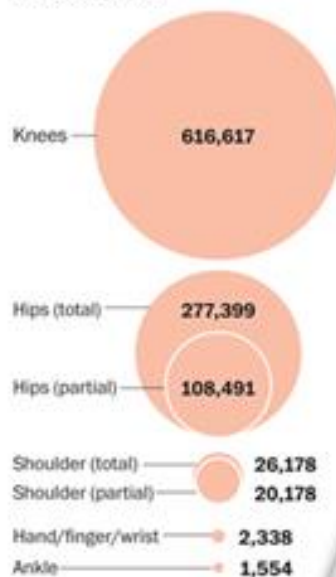
(c)

Bionic leg components: (a) the artificial hip, (b) artificial knee, and (c) "blade runner" prostheses made with carbon fiber "blades".

What's replaceable, and how long it lasts

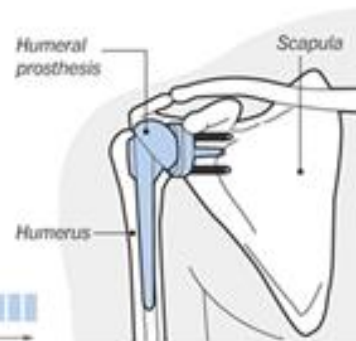
Surgeons performed more than a million hip and knee replacements in the United States in 2008. Because they are becoming increasingly popular with people in their 40s and 50s, many patients will need to repair or replace their replacements 10 to 20 years later. The science of less common joint prosthetics is still evolving, so estimating the life span of a replacement elbow, wrist or ankle is difficult, and outcomes vary greatly.

How common are joint replacements? U.S. totals in 2008



Shoulder

Those most likely to require a replacement have osteo- or rheumatoid arthritis or a severe, complicated fracture. A surgeon may replace only the damaged ball if the socket is healthy.



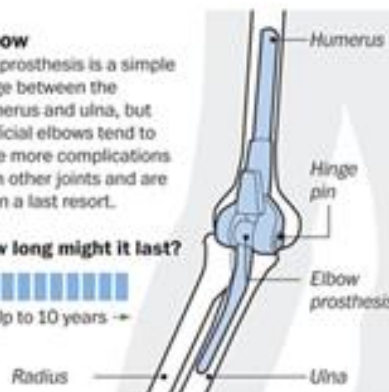
How long should it last?



Elbow

The prosthesis is a simple hinge between the humerus and ulna, but artificial elbows tend to have more complications than other joints and are often a last resort.

How long might it last?



Wrist

Wrist replacements are rare. The joint is so



Hand/finger/wrist — 2,338
Ankle — 1,554

What are they made of?

Replacement joints are typically made of metal (stainless steel, titanium, chrome or cobalt alloys) and ceramic or plastic.



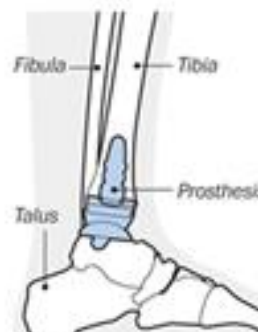
Why replace a joint?



In healthy joints, smooth, rubbery cartilage covers the ends of bones, and a capsule surrounds the joint with lubricating fluid, letting the bones glide easily against each other.



When the cartilage is damaged, usually by arthritis, bones rub against each other, eroding the ends and making the joint stiff and painful. When the pain and immobility become intolerable, replacement is often the answer.



Ankle

Past versions of prosthetic ankles have tended to loosen and fail prematurely, but new devices that require less bone removal and can be aligned more precisely seem to be more sturdy and reliable.

How long might it last?



→ 5 - 8 years →



Hip

The most common age for hip replacement is 60 and older. Younger people tend to put more wear and tear on the prosthesis and require a second procedure later on.

How long should it last?



→ 15 - 20 years →



Knee

The most commonly replaced joint also has the highest success rate. Improved surgical techniques have shortened typical recovery time to weeks rather than months.

How long should it last?



→ 10 - 15 years →



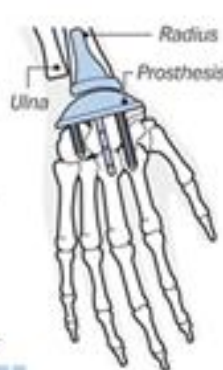
Wrist

Wrist replacements are rare. The joint is so complex that this surgery is considered only after all other options fail. The best candidates need pain relief but don't put heavy demands on their wrists. Finger joints are occasionally replaced as well.

How long might it last?



→ 10 - 15 years →



A MAJORITY OF PEOPLE IN THE WORLD ARE DEPENDENT ON TECHNOLOGY

- ❖ Hearing aids
- ❖ Glasses
- ❖ Medications
- ❖ Prosthetics
- ❖ Smartphones
- ❖ Contraceptives
- ❖ Wheelchairs

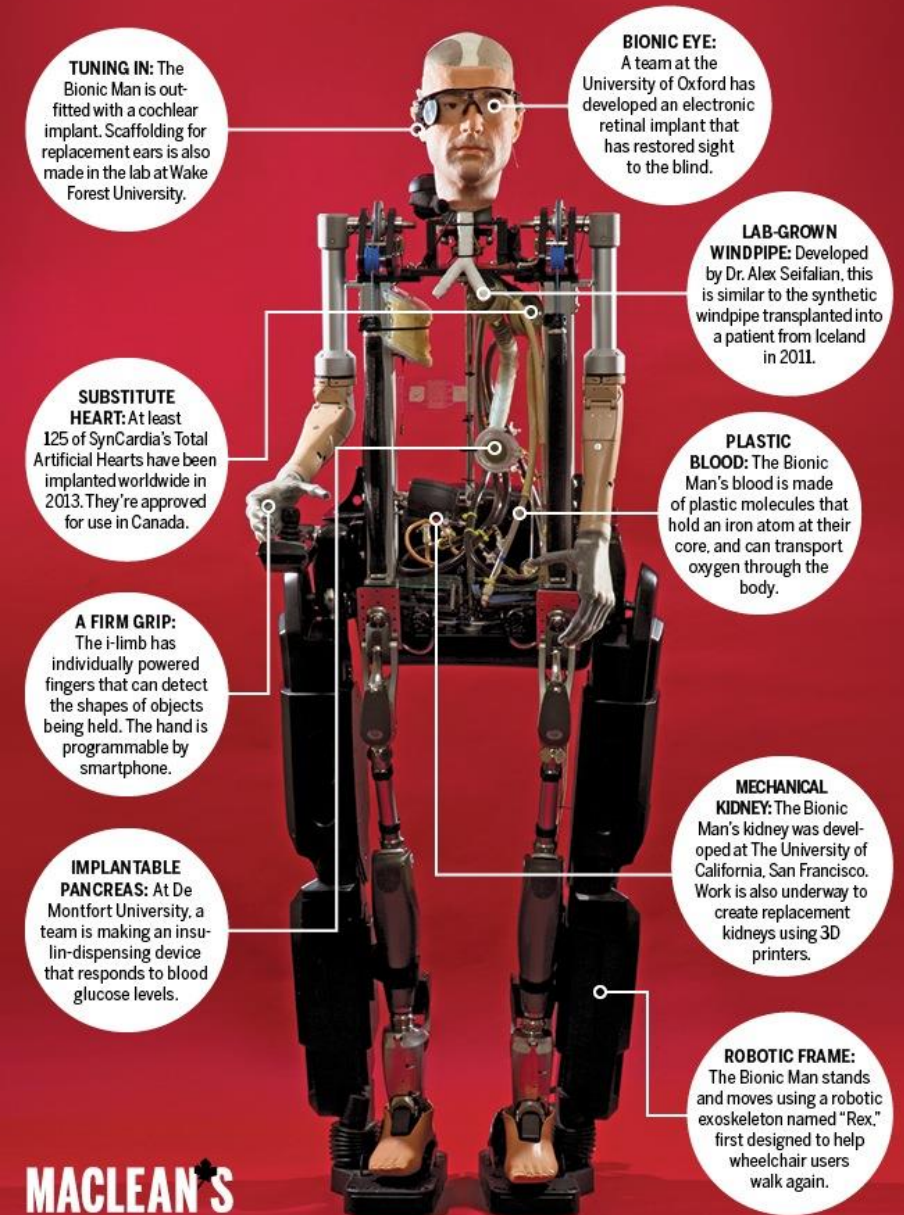
Human existence is a cycle of inventing things to shape life, and in turn, be shaped.

There is no “natural” state for humans, not since we mastered fire.

<https://www.youtube.com/watch?v=xBiOQKonkWs> 4.5 minutes

Building a better human

More and more people will live with these artificial parts integrated into their bodies



CYBORG

It is a word combination of cybernetic and organism—a being with both organic and bio-mechatronic or electronic body parts.

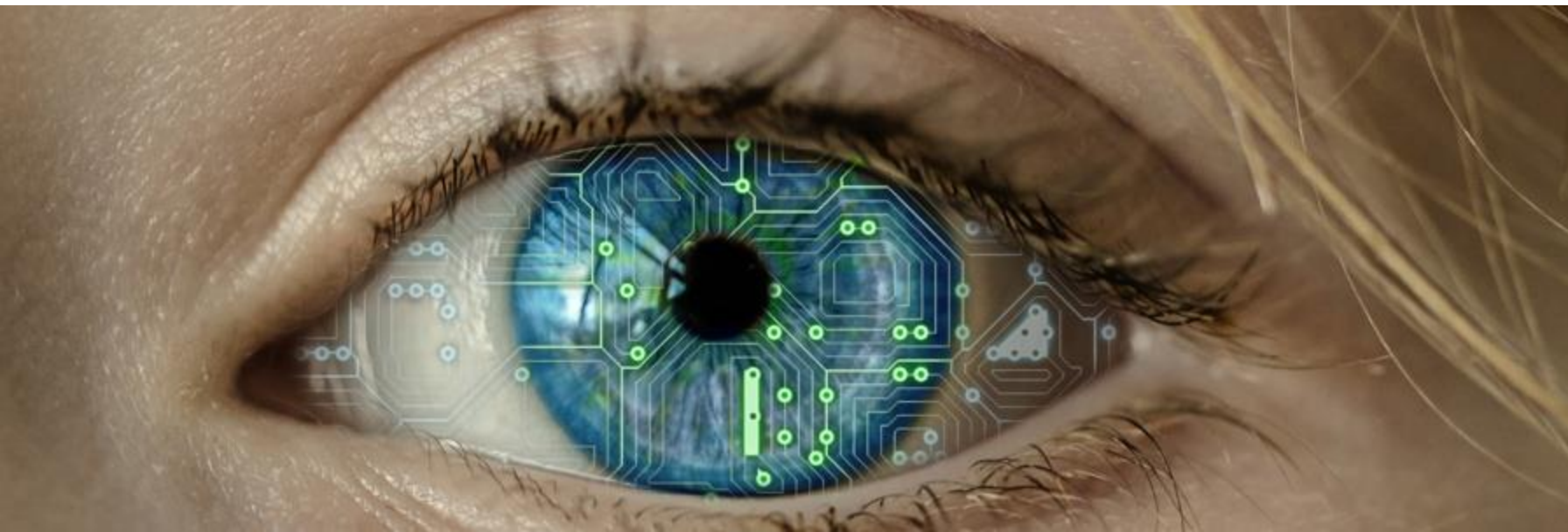
It refers to an augmented human body.

The word applies to an organism that has restored function or enhanced abilities due to the integration of some artificial component or technology.



Actor Ray Fisher is known for his portrayal of the superhero Cyborg in the DC Extended Universe media franchise, appearing first in a cameo in the film *Batman v Superman: Dawn of Justice* and then in a lead role in the film *Justice League*.

Many of humanity's oldest stories are dreams of breaking free of the natural limitations of our bodies.





HEALTH



WORK



FUN



SPORT

The increasingly bionic human

Miniature human brains

Scientists at the Austrian Academy of Sciences have grown miniature human brains, reaching the same level of development as in nine-week old foetus.

Bionic eye

Dr Garth Webb, a Canadian optometrist, has developed an bionic lens that he claims allows users to see three times better than 20/20 vision.

Electronic noses

Robotic noses that can detect toxic gases and hazardous chemicals are being developed for use by security officers.

3-D printed ears

Researchers have been able to produce a life-like human prosthetic ear from a chalk-like powder using a 3-D printer.

Fingers that store digital files

Scientists have developed prosthetic fingers that incorporate USB drives.

Sophisticated prosthetic hands

Robotic hands are now able to "touch" and sense heat.

Artificial pancreas

An artificial pancreas the size of an iPhone and that can automatically inject insulin into a patient when required could be commercially available within two years.

Beating hearts

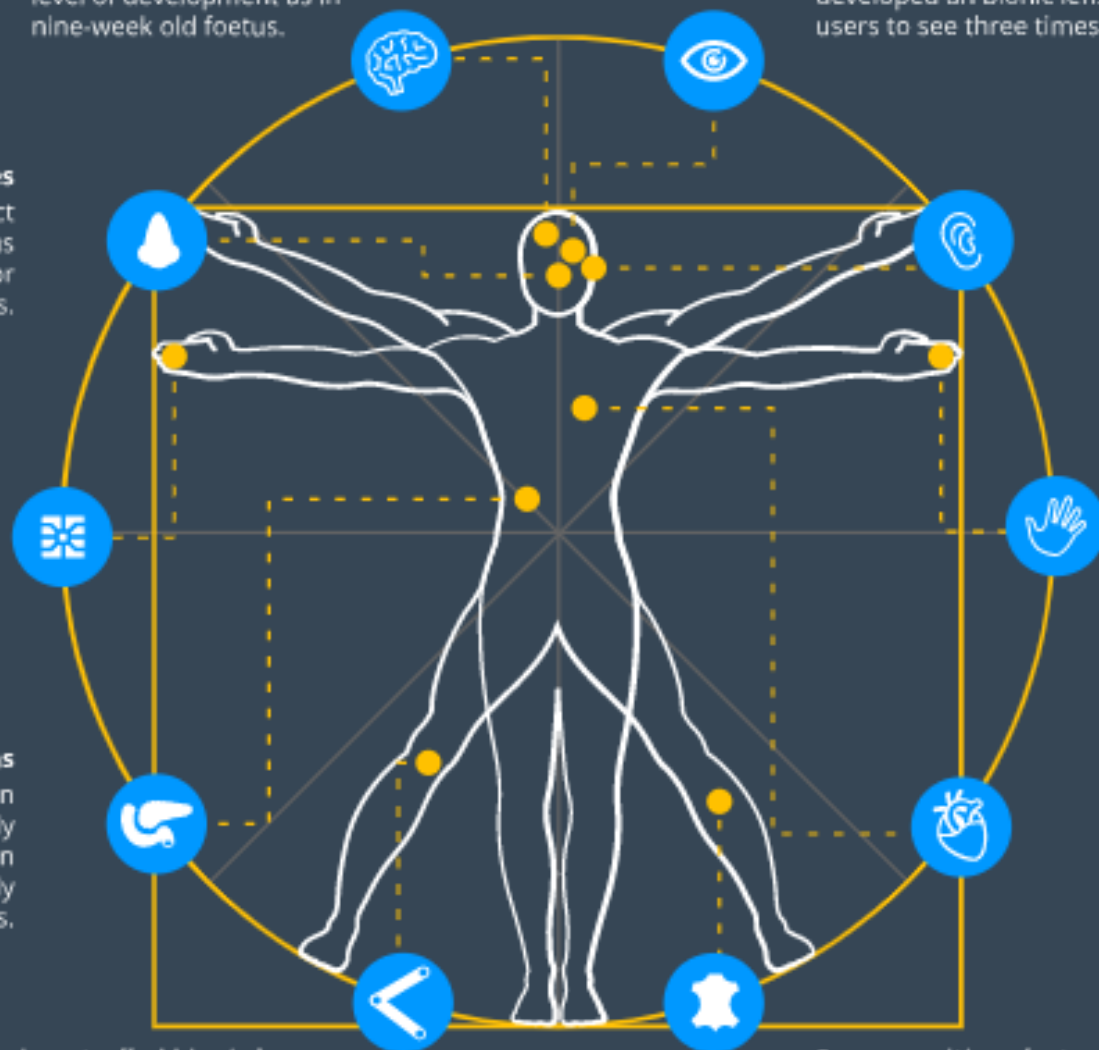
Cells generated from human skin have been used to create primitive heart cells that under certain conditions contract at a rate of 40-50 beats per minute.

Mind-controlled bionic legs

Amputee Zac Vawter became the first person to use a bionic leg controlled entirely by the human brain.

Supersensitive electronic skin

Researchers at Stanford University have created an artificial skin that can detect pressure and send an electric signal to the brain.



EXAMPLES OF MEDICAL DEVICES



Diabetes Test Strips



Wheel Chair



MRI Machine



EKG Machine

Intraocular Lens



Deep Brain Stimulator



Pacemaker



Stent



Hip Replacement



Total Elbow Replacement



Femoropopliteal Arterial Graft



Total Knee Replacement



WIRELESS IMPLANTABLE MEDICAL DEVICES

Deep Brain
Neurostimulators



Cochlear Implants



Gastric
Stimulators



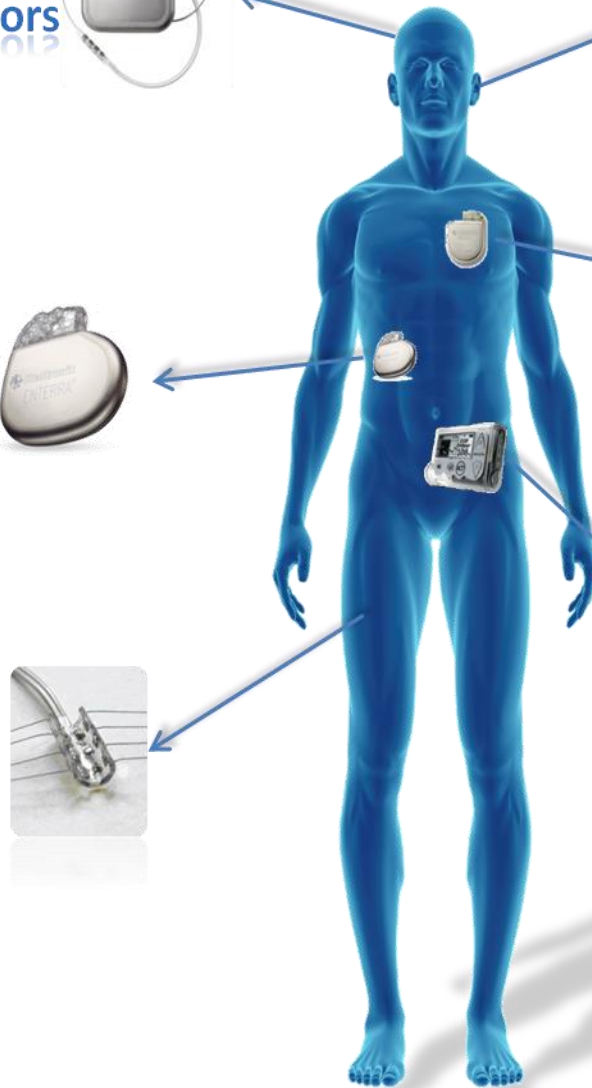
Cardiac Defibrillators/
Pacemakers



Insulin Pumps



Foot Drop
Implants



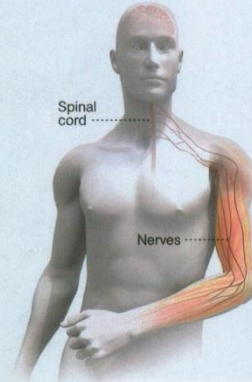
Closing In on a Lifelike Limb

THE ABILITIES OF TODAY'S PROTO 1 BIONIC ARM WILL TRIPLE IN THE NEXT PROTOTYPE.

HUMAN ARM

22+ MOVEMENTS

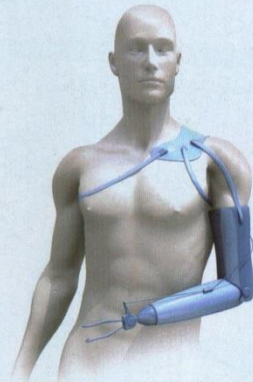
From the shoulder to a finger's last joint, an arm has at least 22 points of movement. Nerves carry the brain's instructions from the spinal cord to the muscles.



TRADITIONAL PROSTHESIS

3 MOVEMENTS

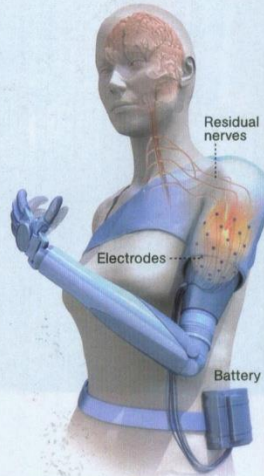
Still the only device available to most amputees, the pincer-hand prosthesis relies on cables moved by pressing levers on a harness with the chin or other arm.



PROTO 1

7 MOVEMENTS

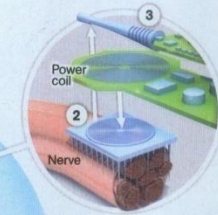
Nerves that once reached the lower arm are rerouted into other muscles. Electrodes placed on those muscles capture the brain's commands and relay them by wires in the prosthesis.



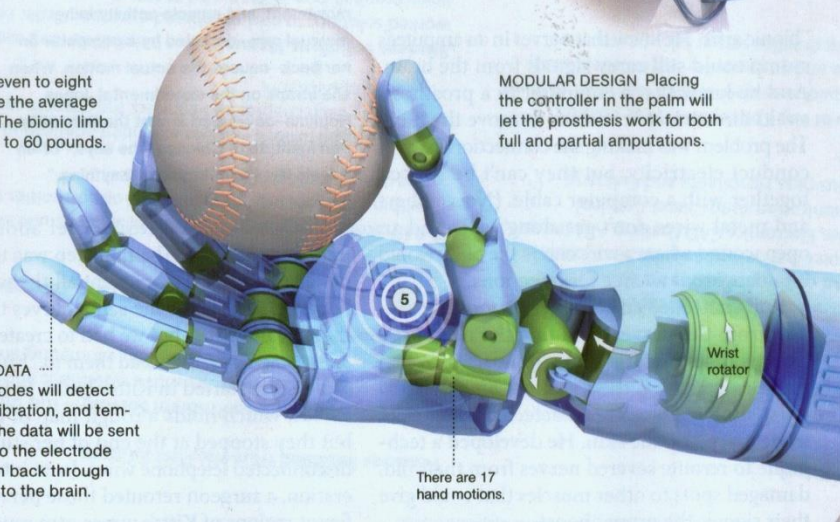
MODULAR PROSTHETIC LIMB

UP TO 22 MOVEMENTS

Nerves running from the spinal cord (1) will send the brain's commands to electrode arrays implanted in the residual nerves (2). A computer chip on each array sends data wirelessly to a receiver on the skin (3). The receiver wires the data to another chip (4) that decodes the command and wires it to the limb controller in the palm (5), which sets the motors in motion.



WEIGHT Seven to eight pounds, like the average adult arm. The bionic limb can curl up to 60 pounds.



SENSORY DATA Fingertip nodes will detect pressure, vibration, and temperature. The data will be sent wirelessly to the electrode arrays, then back through the nerves to the brain.

MODULAR DESIGN Placing the controller in the palm will let the prosthesis work for both full and partial amputations.

CARBON-FIBER HARNESS Molded to the body, the shell is strong but lightweight.

LITHIUM BATTERY Removable for daily recharging.

For amputees with severely damaged residual nerves, electrode arrays could be implanted in the brain. The brain's commands would be received by sensors in a cap and sent by wire to the arm.



MODERN AESTHETIC DESIGNS FOR PROSTHESIS (MANY CAN BE 3D PRINTED)



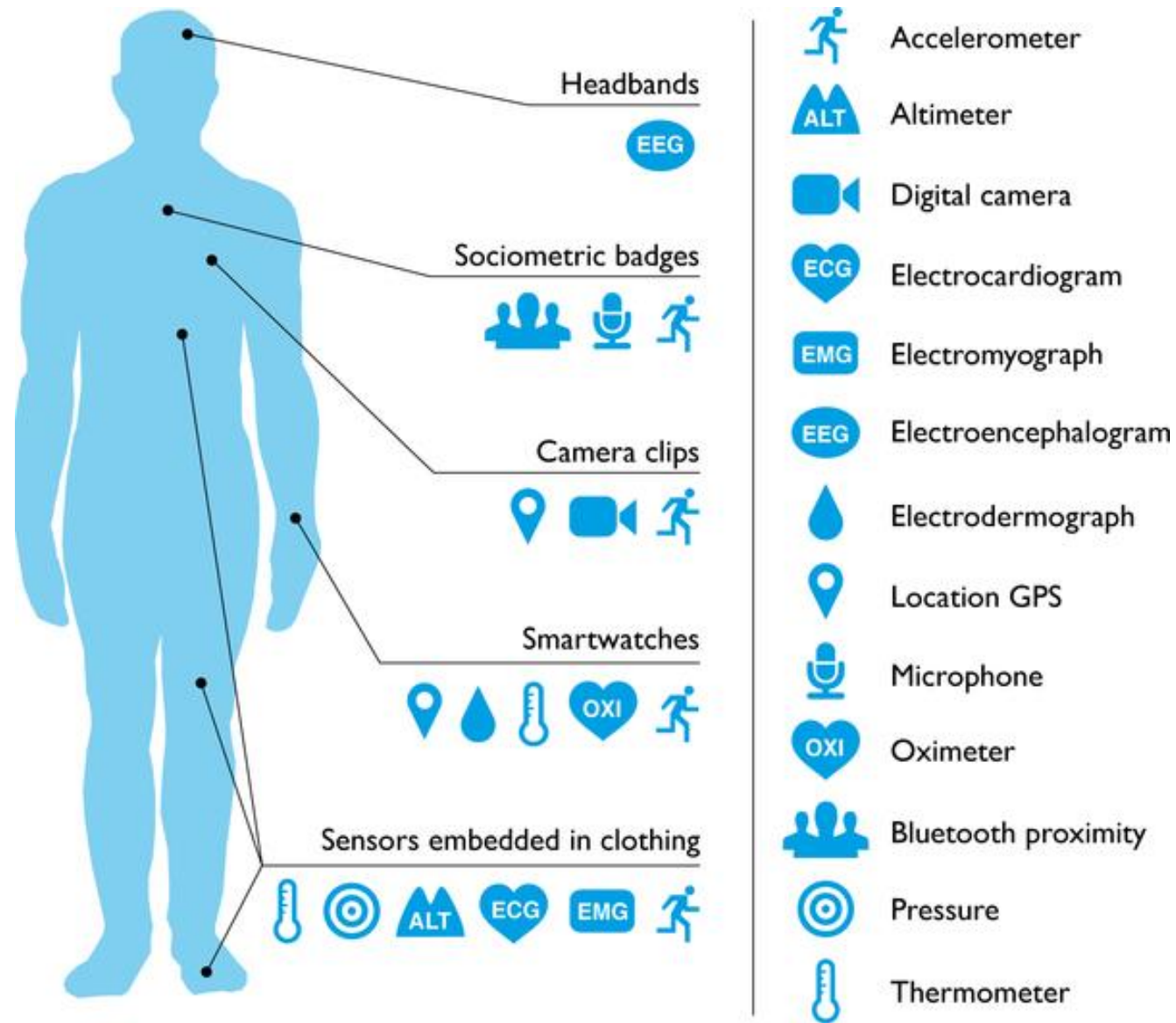
ADIDAS COLLECTION



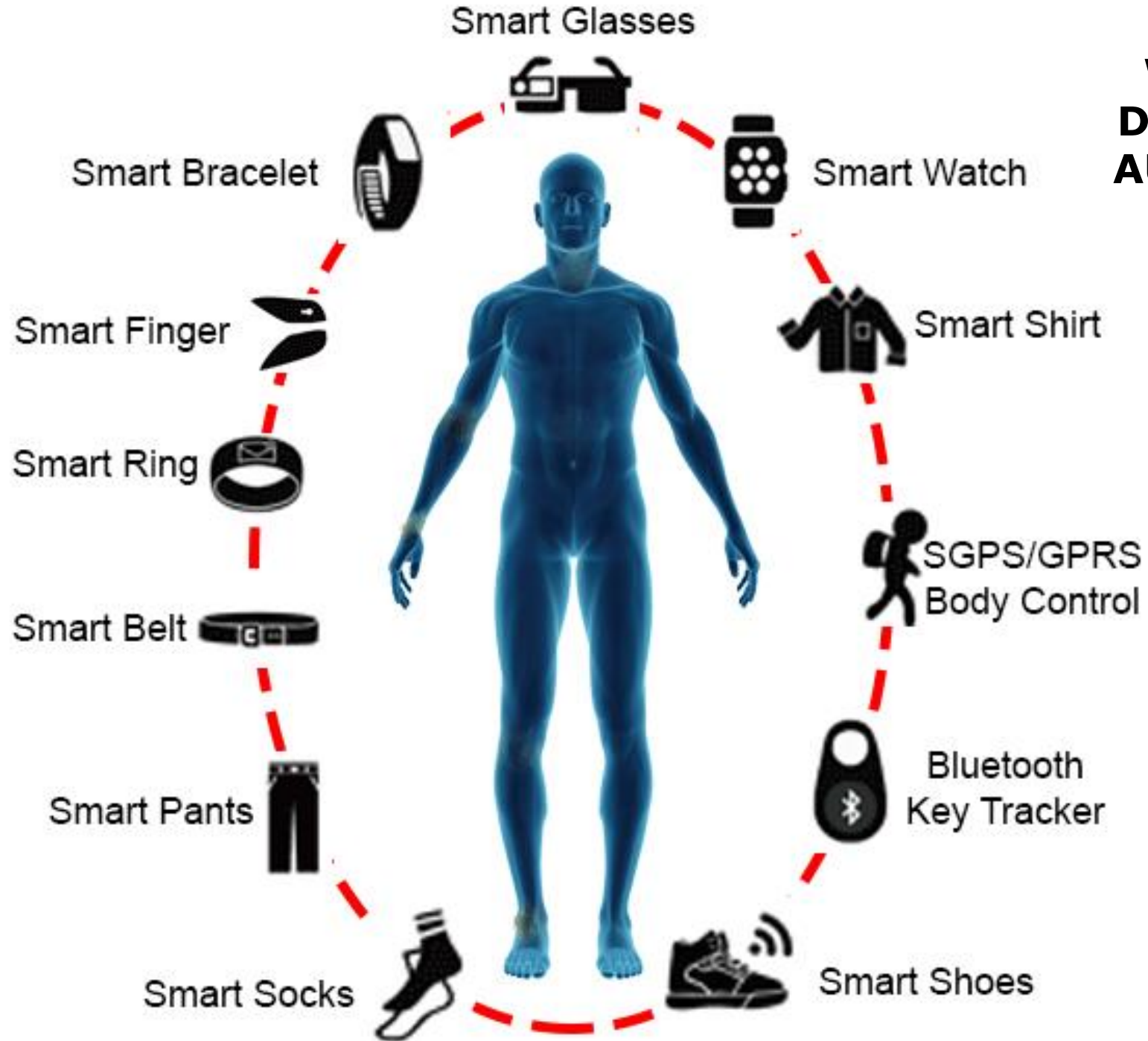




WHAT CAN CONSUMER WEARABLES DO?



WEARABLE DEVICES FOR AUGMENTING HUMANS





Neil Harbisson, who is described as a “cyborg activist”, has attached an electronic antenna, called an “eyeborg”, to his skull to allow him to overcome a severe form of color blindness where everything he sees is gray.

The antenna allows him to perceive visible and invisible colors as sound, via audible vibrations in his skull including infrareds and ultraviolets as well as receive colors from space, images, videos, music or phone calls directly into his head, via an Internet connection.

He is the world’s first legally recognized cyborg.

<https://www.youtube.com/watch?v=NivuCuwZ944> 4.5 minutes

IDEA VISUALIZATION

The sound of colors

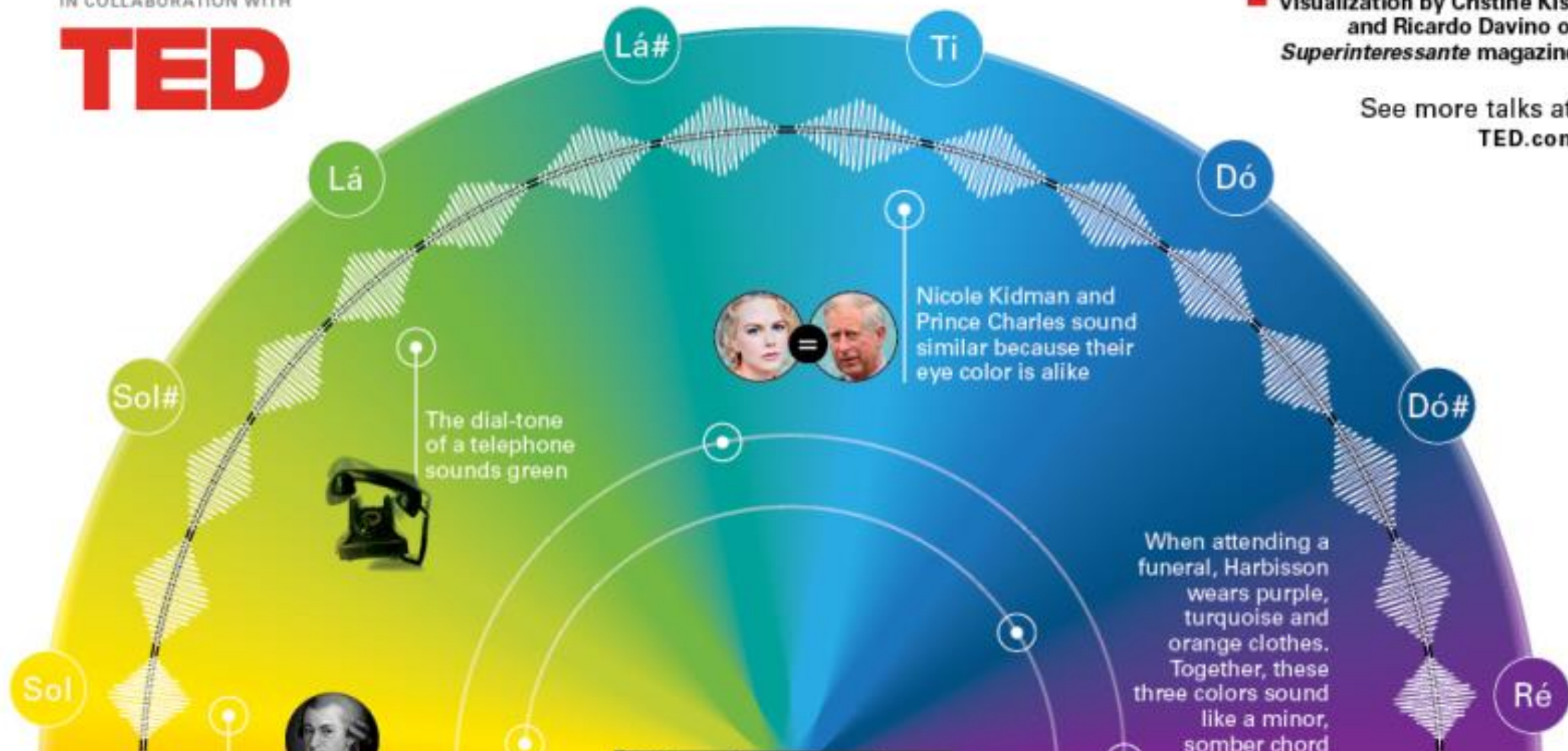
In his talk at TEDGlobal 2012, colorblind artist Neil Harbisson delighted the audience with his brightly colored outfit, his quirky personality, and his eyeborg — a device implanted in Harbisson's head that lets him hear a rainbow of color. Instead of seeing a world in grayscale, he can listen to the audible frequencies transmitted by the colors in faces, paintings, even the weather. Step inside the mind of Neil's symphony of color.

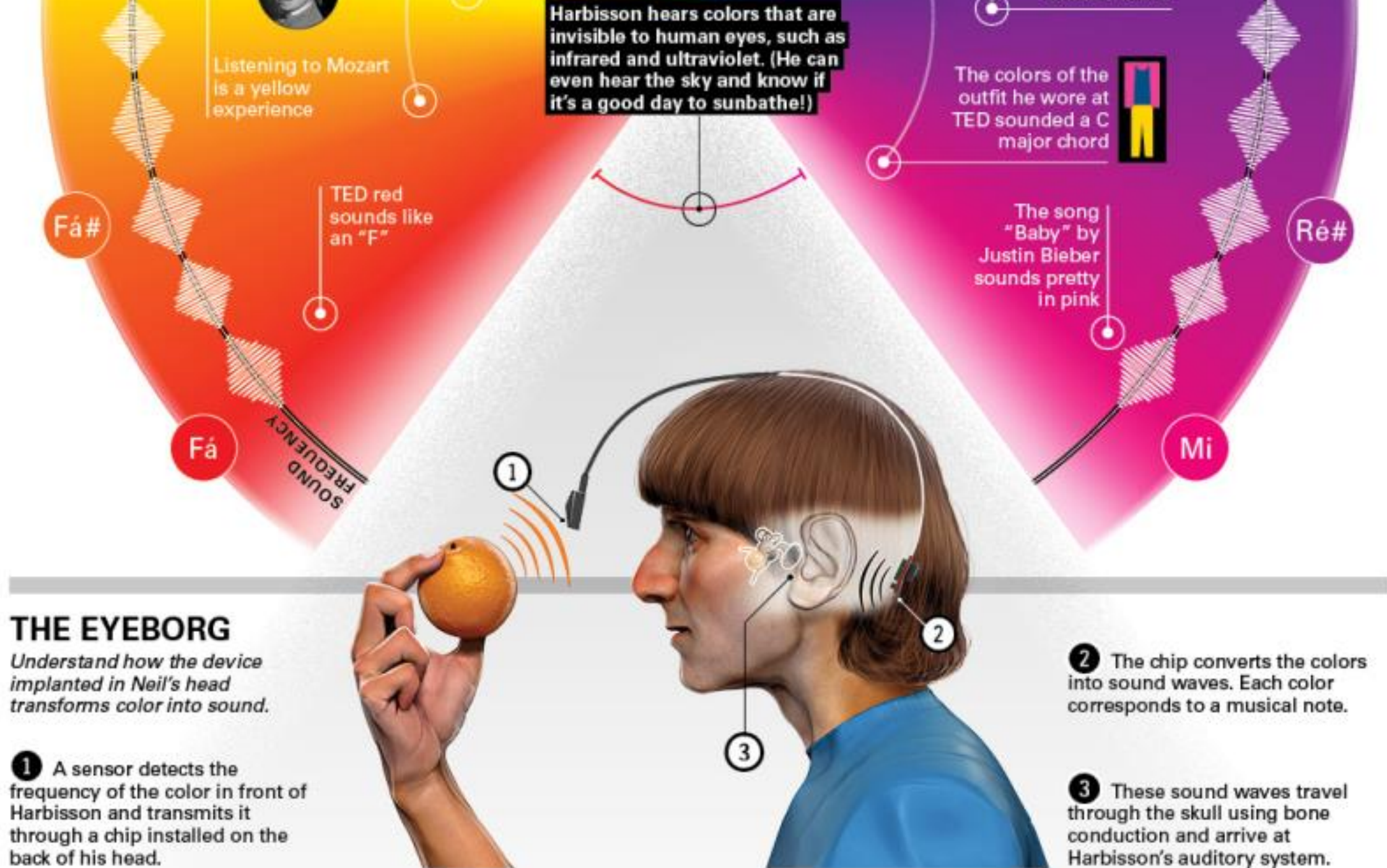
IN COLLABORATION WITH



Visualization by Cristine Kist and Ricardo Davino of *Superinteressante* magazine

See more talks at:
TED.com





THE EYEBORG

Understand how the device implanted in Neil's head transforms color into sound.

1 A sensor detects the frequency of the color in front of Harbisson and transmits it through a chip installed on the back of his head.

2 The chip converts the colors into sound waves. Each color corresponds to a musical note.

3 These sound waves travel through the skull using bone conduction and arrive at Harbisson's auditory system.

MOON RIBAS

She is a Catalan avant-garde artist and cyborg activist best known for developing and implanting online seismic sensors in her feet that allow her to feel earthquakes and even moon quakes, through vibrations.

Since 2007, international media have described her as the world's first cyborg woman or the world's first female cyborg artist.

In 2010, she and Neil Harbisson created **the Cyborg Foundation and an offshoot of it called the Cyborg Arts organization, an international organization that encourages humans to become cyborgs.**

<https://www.youtube.com/watch?v=A8o9ISOgLBc> 2 minutes



THE CYBORG FOUNDATION

It is a nonprofit organization created in 2010 by cyborg activists and artists Moon Ribas and Neil Harbisson.

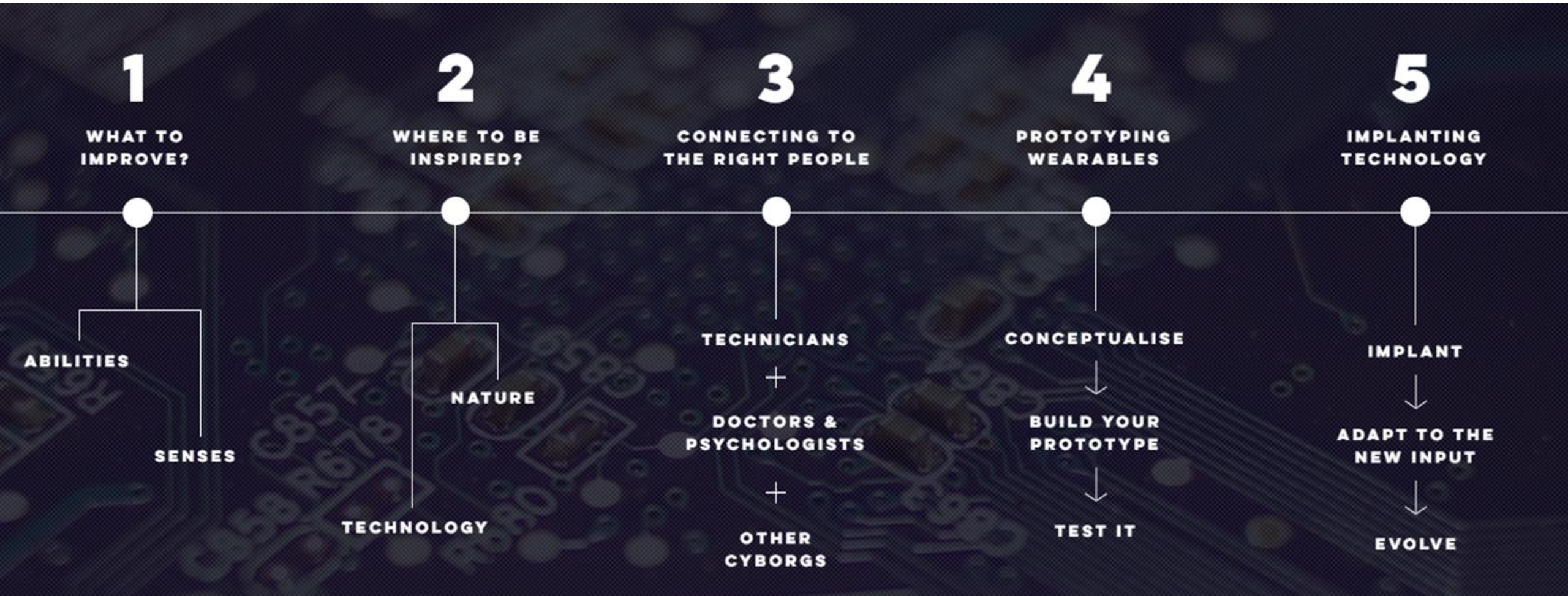
It is an online platform for the research, development and promotion of projects related to the creation of new senses and perceptions by applying technology to the human body.

Their mission is to help people become cyborgs, promote cyborg art, and defend cyborg rights.



There is a difference between the technology that allows you to know things and the technology that allows you to feel things.

The Cyborg Foundation focuses on Artificial Senses (AS) where the stimuli is gathered by the technology, but the intelligence is created by the human - as opposed to Artificial Intelligence (AI) where the intelligence is created by the machine itself.



MANEL MUÑOZ

He is a Spanish cyborg artist and transpecies activist, based in Barcelona.

He is best known for developing and installing weather sensory fins in his head.

The fins, formally known as 'Weather Fins', allow him to hear atmospheric pressure, humidity and temperature changes through implants at each side of his head.

Depending on the changes he feels, he can predict weather changes as well as sense his current altitude.



VIKTORIA MODESTA

She is a Latvian-born, British singer-songwriter, performance artist, and model.

She learned singing at age 6 at a local music school.

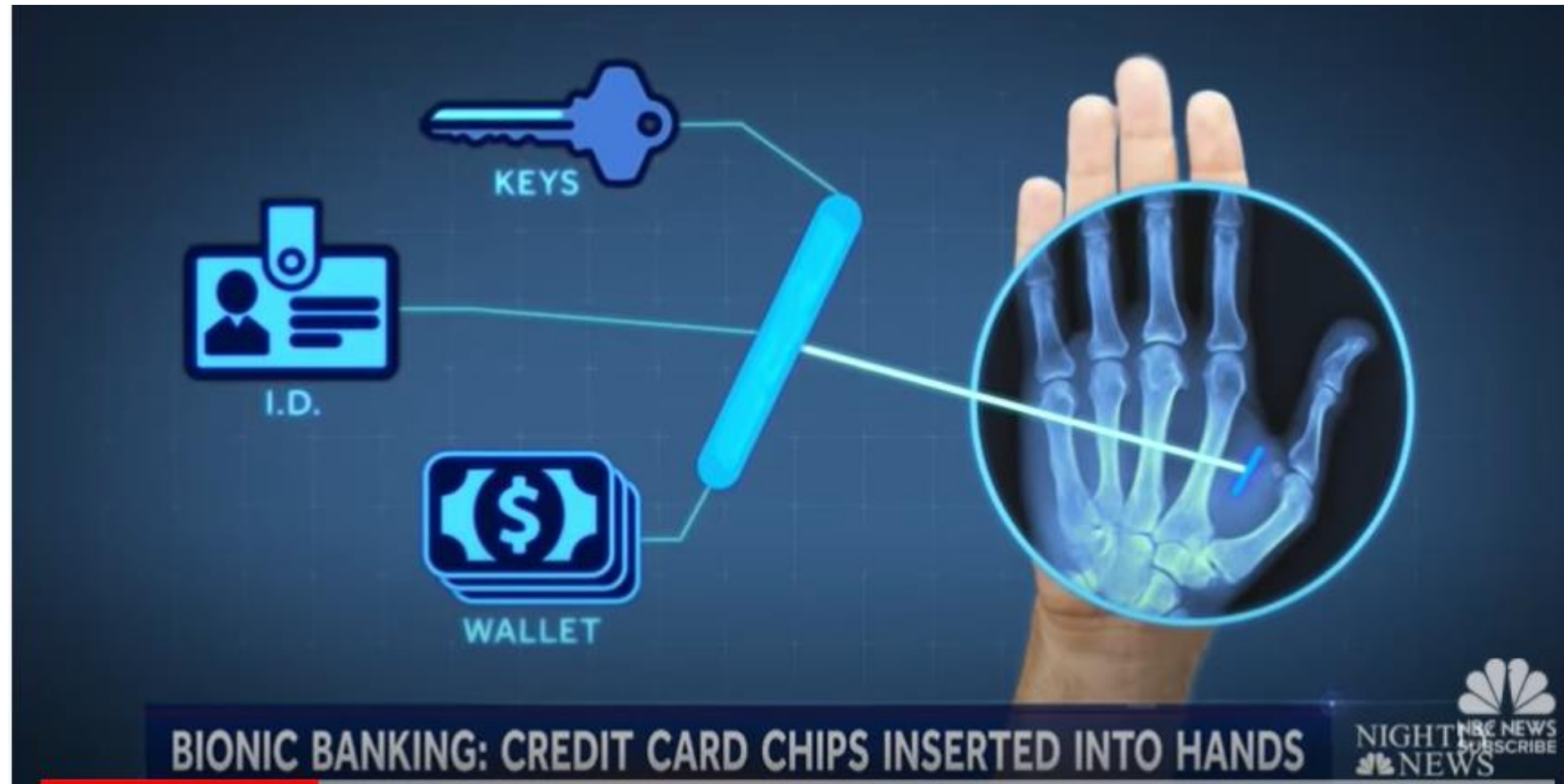
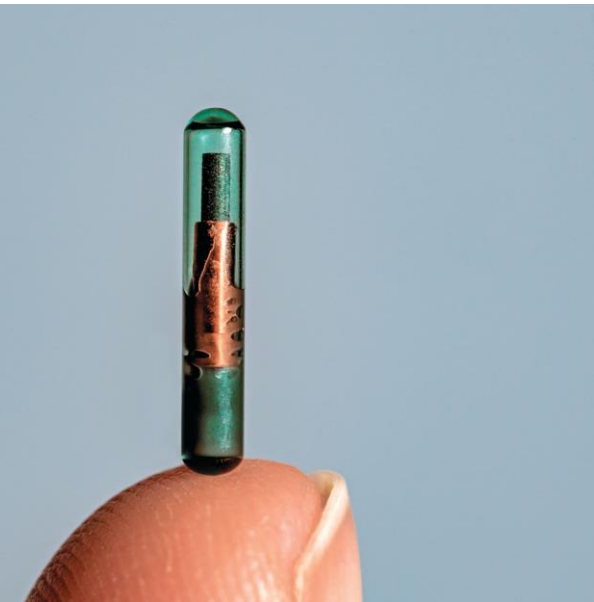
In 2007, she had a voluntary below-the-knee leg amputation to improve her mobility and safeguard her future health.

Her physicality has become known for challenging the modern perception of altered beauty.



Imagine carrying just about everything you need beneath the surface of your hand - your wallet, keys and ID, all in a microchip.

That's reality in Sweden, as some early-adopters implant the tiny devices beneath their skin



<https://www.youtube.com/watch?v=Ksw-arKvMPk> 2.5 minutes

Hugh Herr



He is creating bionic limbs that emulate the function of natural limbs.

Time Magazine coined Dr. Herr the 'Leader of the Bionic Age' because of his revolutionary work in the emerging field of Bio-mechatronics.

It is a technology that marries human physiology with electromechanics.

A double amputee himself, he is responsible for breakthrough advances in bionic limbs that provide greater mobility and new hope to those with physical disabilities.

FUTURE PREDICTIONS ABOUT HUMANITY AND TECHNOLOGY

Ray Kurzweil, Head of Engineering at Apple, predicts that humans will become hybrids in the 2030s.

That means our brains will be able to connect directly to the cloud, where there will be thousands of computers, and those computers will augment our existing intelligence.

"Our thinking then will be a hybrid of biological and non-biological thinking," he said.

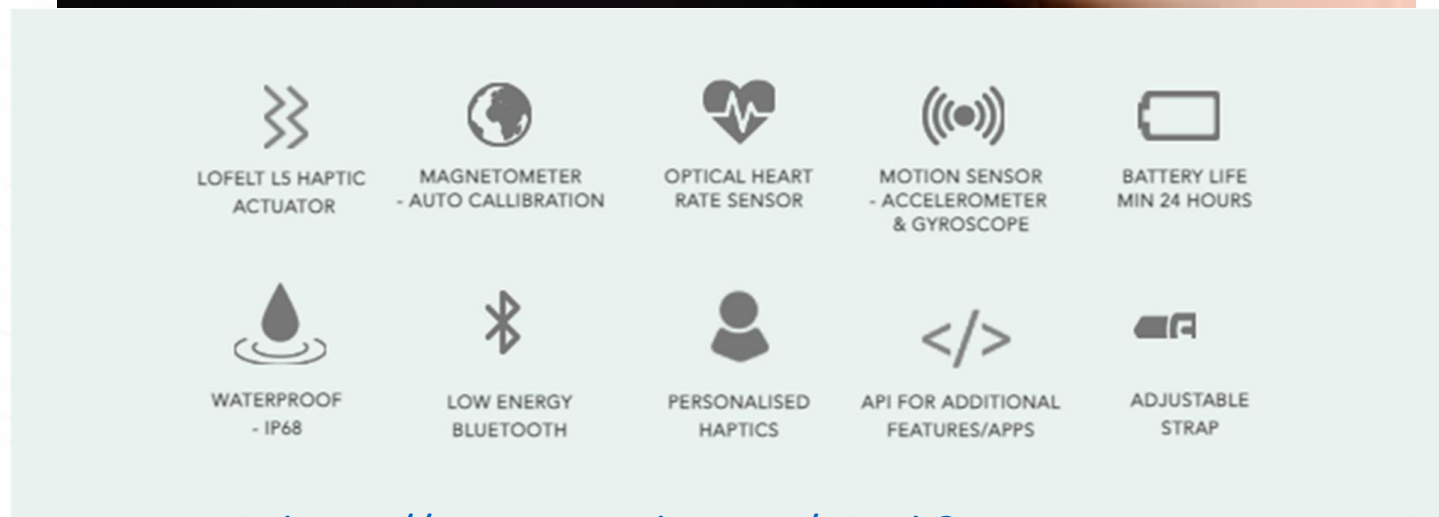
"We're going to gradually merge and enhance ourselves," he said. "In my view, that's the nature of being human -- we transcend our limitations."



Sentero (also called North Star) is a sensory enhancement device which allows people to feel the earth's magnetic field and their loved ones through patterned vibrations on their skin, to connect us to the planet and each other.

FEATURES

It transmits spatial information to the brain via *patterned vibrations* structured in our unique haptic language. [Find out more](#)

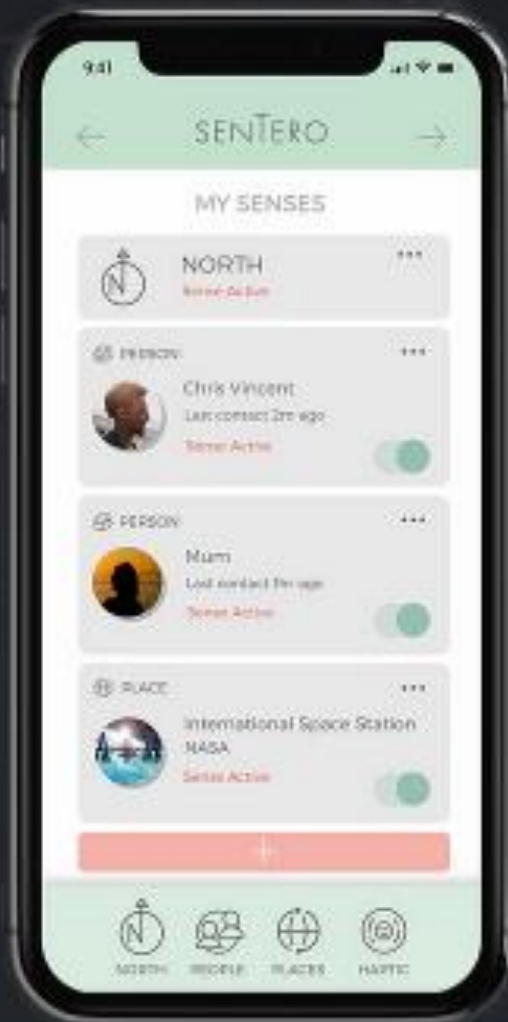


<https://www.youtube.com/watch?v=KVVJCP1q37Y>

2.5 minutes

SENTERO APP

Wearers can sense anyone with the Sentero app...



CHOICE

Choose who or where you are sensing

PERSONALISATION

Personalise the haptic pattern for each person or place

CONSENT & SAFETY

You can only sense/be sensed by those you consent to, ensuring your locational safety

AN OPTIONAL MICROELECTRONIC IMPLANT FROM THE DSRUPTIVE CO.

You can choose to use Sentero in combination with the SiiD implant to enhance your cyborg experience.

Dedicated code can be written on the implant so that when you tap it with your Smart phone, it can trigger a SOCIAL LINK which will activate various extended connectivity actions related to the people or locations you sense, such as a phone call, playing a media file, sending a message and more.



HUMAN ENHANCEMENT

Applications, benefits & concerns of human enhancement

Enhancement technologies include devices and procedures that can alter the human body and boost and/or change the workings of the human mind. Now and in the future.

BODY



PHYSICAL

- Performance-enhancing drugs
 - Advanced prosthetics
 - Wearable devices
- Possibly, in the future:
- Genetic modification



COSMETIC

- Plastic surgery
 - Magnetic fingernails
- Possibly, in the future:
- Biological camouflage



LONGEVITY

- Possibly, in the future:
- Anti-aging drug
 - Common cold vaccine
 - Zero-gravity body modification
 - Synthetic skin replacement

MIND



AFFECTIVE

- Selective-serotonin reuptake inhibitor (SSRI)
- Possibly, in the future:
- Anti-boredom drug
 - Happiness enhancer
 - Fear reducer
 - Empathy enhancer



COGNITIVE

- Memory enhancer
- Focus booster
- Wakefulness booster
- Neurostimulation devices



MORAL

- Methylphenidate (Ritalin®) to curb recidivism
 - Chemical castration
 - Anaphrodisiacs
- Possibly, in the future:
- Cooperation enhancer

IMPACTS



BENEFITS

- Improve human capability
- Mitigate social inequalities
- Reduce unfairness and injustice
- Advance human health and well-being
- Enhance bodily integrity



RISKS

- Potential to harm human health, i.e. addiction or risk of hacking
- Compel individuals to remove or change 'abnormal' or 'unenhanced' traits
- Increase competition
- Increase surveillance
- Homogenise society leading to loss in diversity



PEOPLE AFFECTED

- Children
- Elderly
- Patients
- Soldiers
- Consumers
- Workforce & management
- Individuals with disabilities
- Everyone who is interested in enhancement



THE 3 TYPES OF HUMAN AUGMENTATION

In the modern day, human augmentation has advanced to the point of having 3 different branches.

These include:

- 1) Replicating human abilities
- 2) Supplementing them
- 3) Extending/exceeding them.

On the next set of pages, we'll discuss each of these 3 categories and how they differ in function.



The Artificial Human of Today (below 5mio.\$)



stents



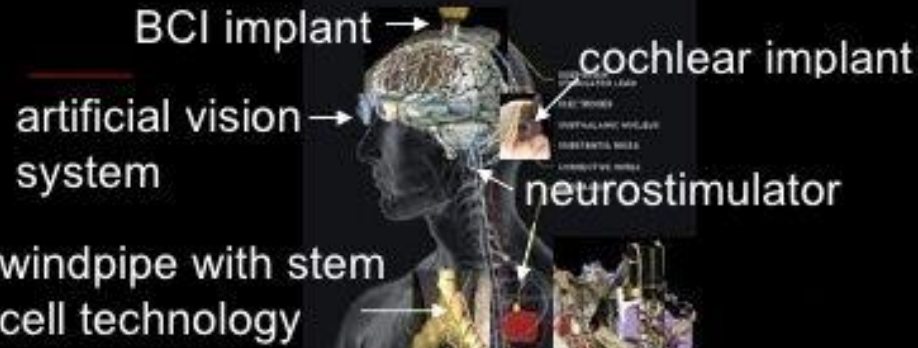
artificial skin



bio engineered ear



artificial blood
(oxyocyte can carry 5 times more oxygen than hemoglobin)



windpipe with stem cell technology



neurostimulator/
implanted drug delivery system



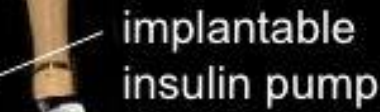
artificial lung



artificial heart



bionic arm



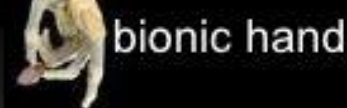
implantable insulin pump



portable dialysis



intelligent leg prosthesis



bionic hand

hip replacement



bionic liver machine



artificial foot

1) HUMAN AUGMENTATION SOMETIMES AIMS TO **REPLICATE** SIMPLE HUMAN ABILITIES.

We can see this kind of human augmentation most obviously through:

- Prosthetic limbs
- Hearing aids
- Pacemakers
- Voice Synthesizers

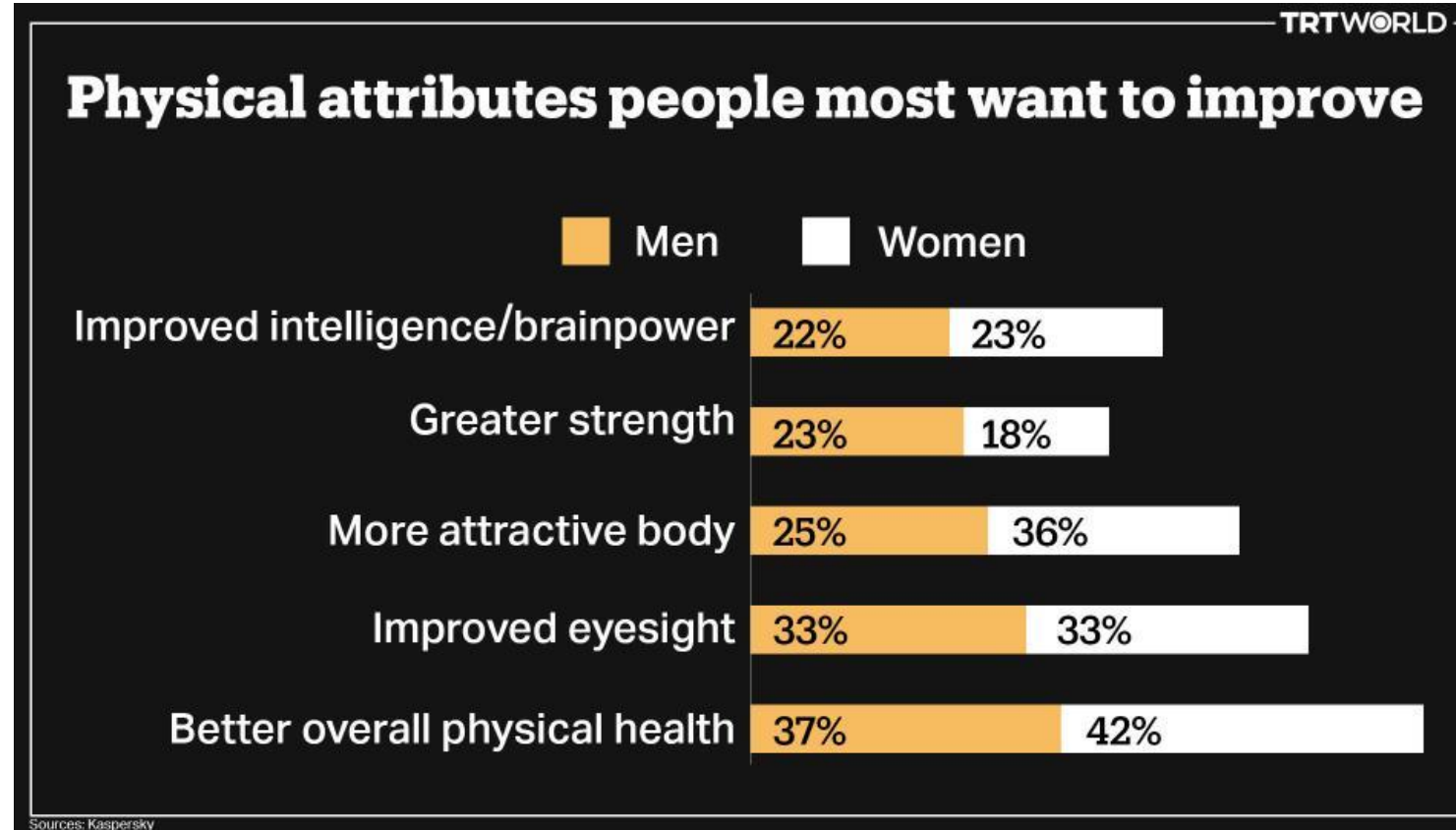
They're mainly used to help the disabled and enhance their human capabilities and help with normal body functions.

2) SUPPLEMENTING HUMAN ABILITY

This is the human augmentation technology which enhances one's ability in doing intellectual and physical things.

For instance, these could be devices that artificially enhance one's strength, improve one's sight, and make them superior to the normal limits or enhance one's intelligence.

Such human augmentation which strengthens our physical or intellectual constraints can revolutionize our culture as well as bolster our prospects.



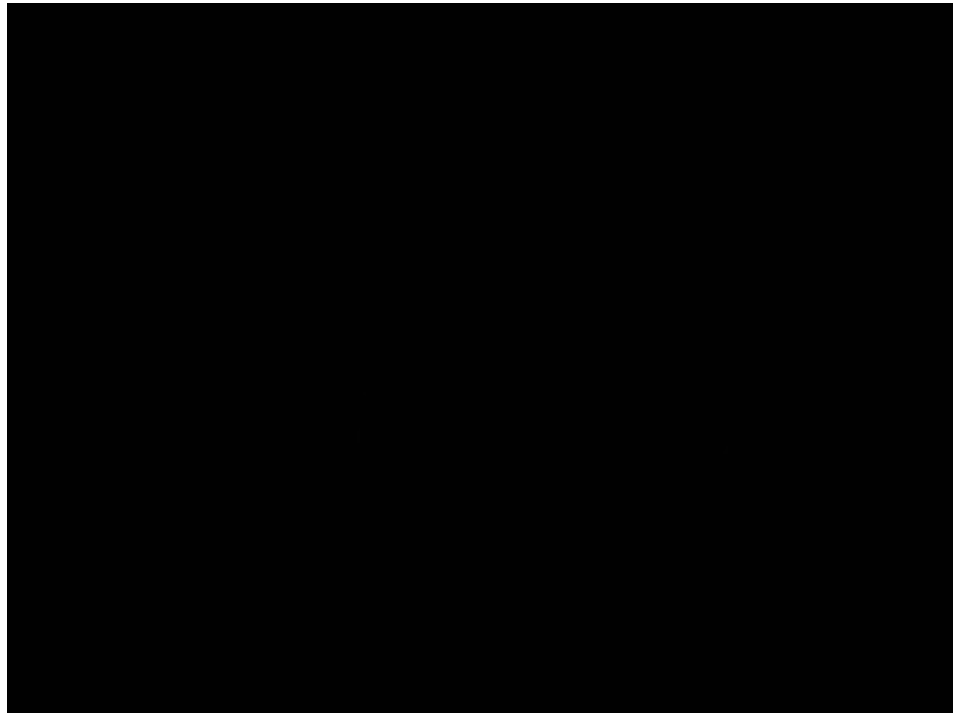


3. EXCEEDING HUMAN ABILITY

This type enables us to carry out any phenomenon that we are physically limited from performing on our own, so we can exceed our abilities.

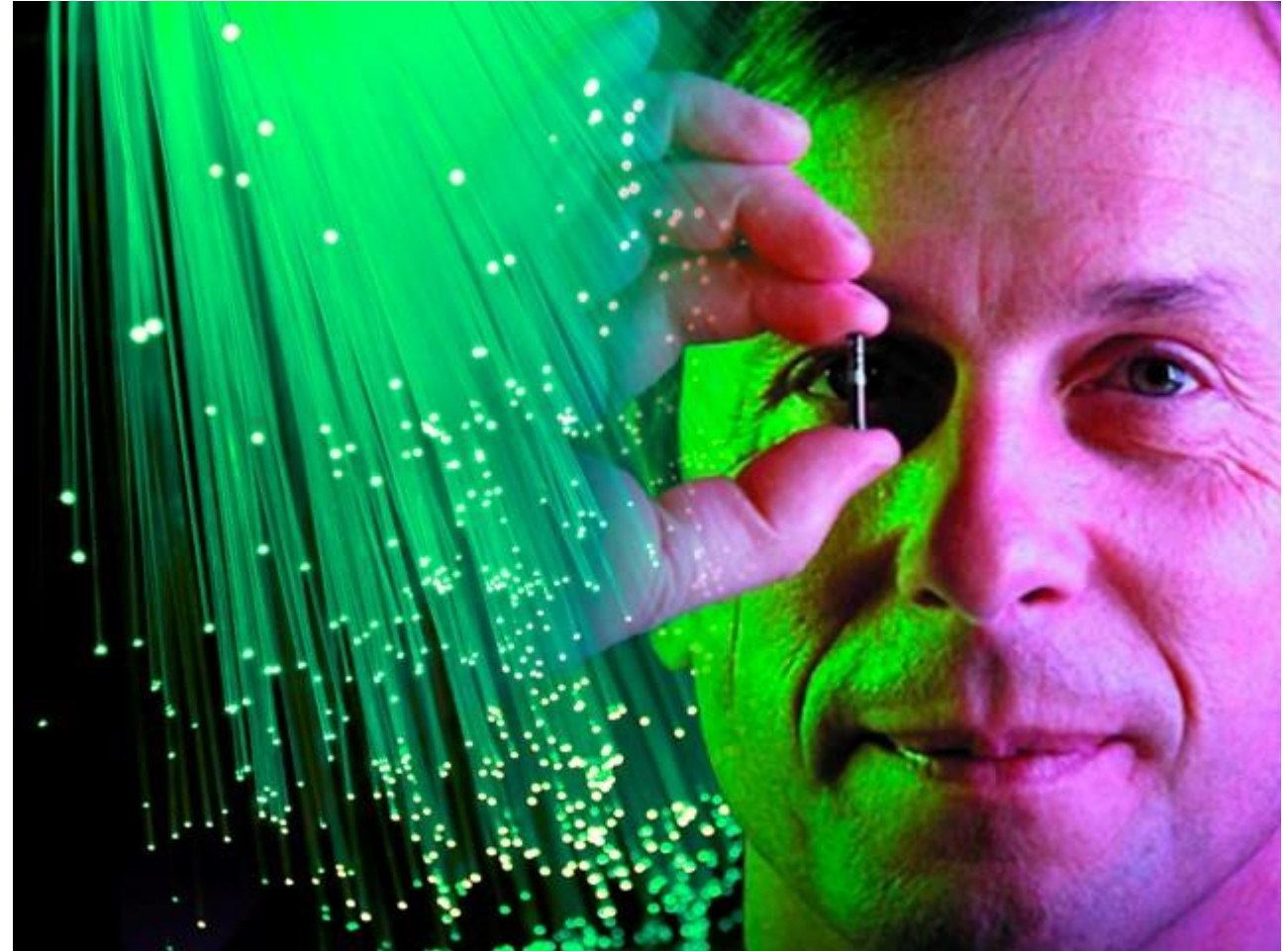
For example, think of those typical superhero skills such as the ability to be able **to fly, the capability to breathe underwater, detect through smell the chemicals that cannot be detected from the normal olfactory sense,** and so on.

Although we may consider this kind of augmentation, the most fascinating, it's also the most far off and will take a much longer time to take shape properly.



BRITISH PROFESSOR KEVIN WARWICK, CALLS HIMSELF THE WORLD'S FIRST CYBORG

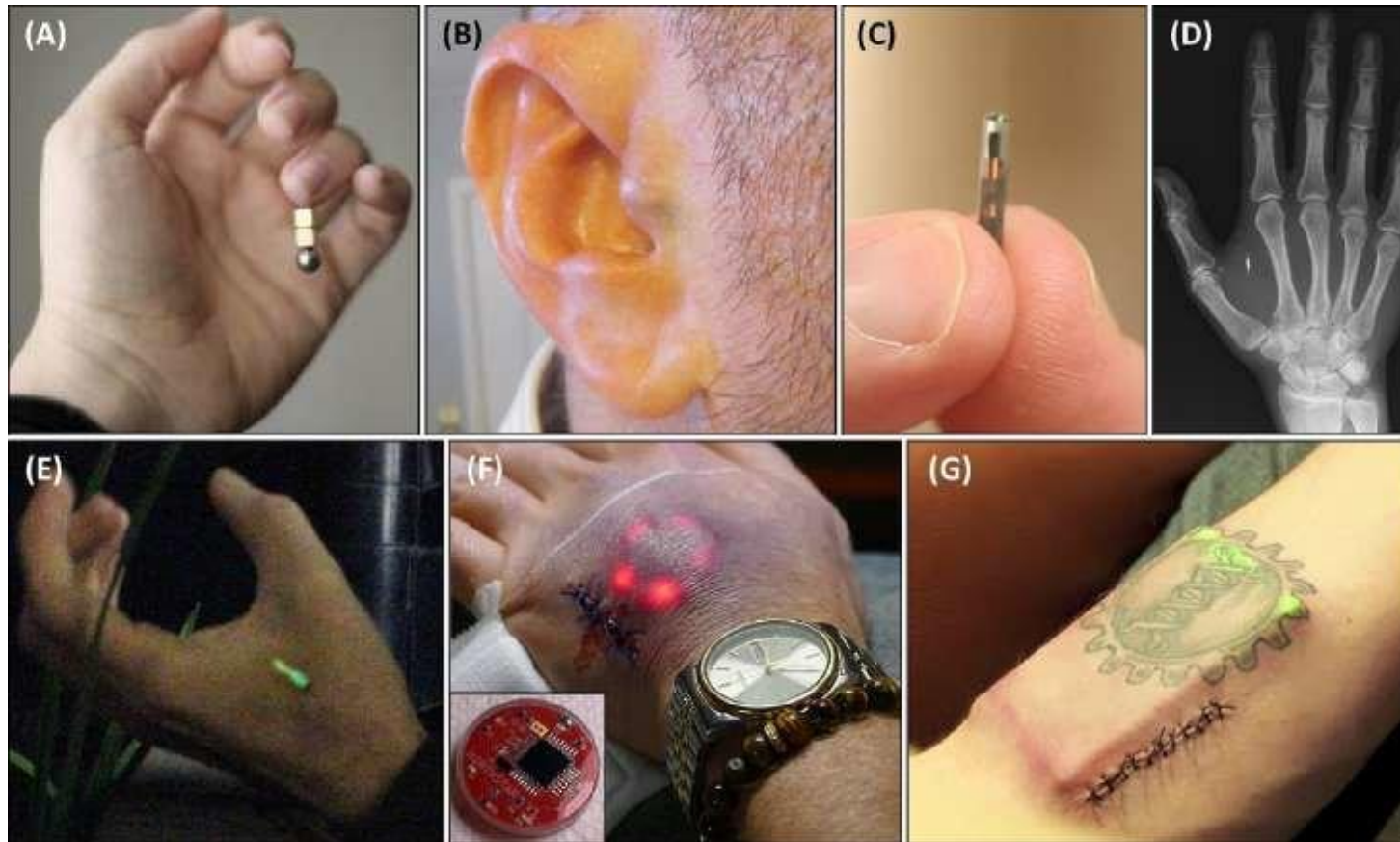
By neuro-surgically implanting a device into his left arm in 1998, he has linked his nervous system to a robotic hand that he controls using brain signals from anywhere in the world.



BIO-HACKERS AND GRINDERS

There is a small but growing subculture of DIY persons who are described with words like **biohackers, body hackers, grinders, and self-made cyborgs**, who are taking advantage of widely available technologies such as tracking chips, RFID implants into a hand, LEDs, magnets, and motion sensors to imbue themselves with a sixth sense of sorts.

Call them “practical transhumanists”—people who would rather become cyborgs right now than think about the hypothetical far-off future.



KEAHI SEYMOUR BIONIC BOOTS



Keahi Seymour needed to get to the airport, but Manhattan traffic was gridlocked.

He ran the two + miles across the island — in 12 minutes.

Seymour isn't a sprinter or a distance runner, but his **five-minute miles** were made possible with help from the Bionic Boots he's invented, which allow him to run up to 25 miles an hour.

Looking like a seven-foot-tall superhero when he wears them, he towers over the average person.

<https://www.youtube.com/watch?v=IzaaAnNJjvg> 1.8 minutes



THE END

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INTRODUCTION TO THE SERIES OF 7 ARTICLES

<https://howwegettonext.com/the-human-machine-23f2d37a98da>

GOOD READING LIST FOR THE 5 SUBJECTS WITH LINKS TO ALL OF THE EPISODES

<https://howwegettonext.com/the-human-machine-reading-list-a17980149d1e>

- Ep. 1: "Introduction"
- Ep. 2: "The Real-Life Cyborgs of the DIY Augmentation Scene"
- Ep. 3: "Your Brain is Your Phone"
- Ep. 4: "The Future of Birth Control Means Facing Up To Its Sexist Past"
- Ep. 5: "Who Gets to Be Perfect?"
- Ep. 6: "Building a Faster, Stronger Human"
- **Ep. 7:** "[The Human Machine of 2037](#)"

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