

CYBORGS

A Leap From Fiction To Reality

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Abstract: Cyborg (cybernetic organism) is a living being including both bio-mechatronic and organic body parts. The term was coined in 1960 by Manfred Clynes and Nathan S. Kline. The term cyborg is not the same thing as bionic, bio-robot or android, it applies to an organism that has restored function or enhanced abilities due to the integration of some artificial component or technology that relies on some sort of feedback. In simple terms a cyborg is a cybernetic organism, a hybrid of machine and organism. Cyborgs shown in movies are no longer just fiction. Cyborgs have introduced themselves with people experimenting by inserting circuits and wires into their body to experience the power of being a cyborg. Cyborg has been a highly debated topic. The basic essence of cyborg is the need to create enhanced humans. This article tries to explain cyborg and the human behind by going through the cyborgs from past to present. In this paper, we intend to analyse the work of the early cybernetician and cyborgs and conclude to the future of cybernetics.

Index Terms- Cyborg, Artificial enhancement, Bionic Person, Bio-robot, Android, Cybernetics, Cyber- humans, Hybrids, Trans- Human

I. INTRODUCTION

People who use cybernetics to overcome the physical and mental constraints of their bodies are Cyborgs. Whereas the ones shown in the television series fictions and movies could become a reality soon.

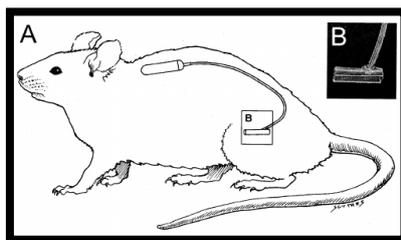
Matrix, Goblin, Rhino, Robocop, Terminator, were just films wherein humans were shown to have exceptional power and abilities. People in these movies were semi humans and semi machines. This exclusive breed is known as "cyborg". Cyborgs are not only in movies but have come a long way from just imagining them on the screens. Of course the kind of super humans shown in the movies has not yet been developed but in other 25 years or so we can expect drastic changes to the species known as Homo sapiens.

According to some definitions, the speculative and physical attachments humanity has with even the most basic technologies have already made them cyborg. In a simple example, we can call a person cyborg if a human with a heart pacemaker or an insulin pump, since these conceptual parts enhance the body's natural mechanisms. Some theorists state that such modifications as contact lenses, hearing aids, or intraocular lenses as examples of fitting humans with technology to enhance their biological capabilities. Whereas, these modifications are no more cybernetics. More accurately, living beings with Cochlear implants that unify mechanical alteration with any kind of feedback and response are cyborg upgrade.

II. FICTION AND REALITY

Cybernetic organisms, combination of humans and machines have already entered everyday life, the military, popular culture, and the other fields since the emergence of cyborg research and studies in the mid 1980s.

In the late 1950s, a white lab rat was the world's first cyborg, it was part of an experimental research at New York's Rockland State Hospital. The rat was inserted with a tiny osmotic pump that injected doses of chemicals, modifying several of its physiological parameters. In 1960, The Rockland rat is mentioned in a paper called "Cyborgs and Space," written by Manfred Clynes and Nathan Kline.



Cyborgs were in talks in mid 1960's, with US Air Force funding into projects to build exoskeletons and cyborg systems. In fact Cyborgs have been part of the Western imagination since early times. Wolfgang von Kempelen a legendary automaton

builder developed a chess-playing tin Turk. Frankenstein was a monster of body parts activated with electricity by Mary Shelley. Also the Indian history poem, the Mahabharat, includes a lion automaton which was wrote back in 300 BC.



In popular fictions, cyborgs were represented as mechanical (Cyborg from DC Comics, The Borg from Star Trek or Darth Vader from Star Wars and the Cybermen in the Doctor Who franchise) or as almost indifferent from normal people (the Human Cylons from the BattlestarGalactica,). Cyborgs usually play a human disrespect for over-dependence on technology, eventually when used for ill intentions, and when used to threaten free will.

Bruce Sterling in his universe of Shaper/Mechanist stated an idea of cyborg called Lobster, which is made not by using internal enhancements, but by using an external shell a Powered Exoskeleton. Unlike human cyborgs that appear human externally while being synthetic internally, Lobster looks inhuman from outside but has a human inside (Elysium, RoboCop). *Deus Ex: Invisible War* a computer game prominently featured cyborgs called Omar.

III. REAL LIFE CYBORGS

Neil Harbisson

Neil Harbisson was born with colour-blindness as he would only see in black-and-white colours, he is now able to experience colours far more precisely than the scope of normal human perception. Harbisson is implanted with a specialized electronic eyeborg, that stimulates colours as sounds on the musical scale. In other words, his device allows him to hear colour. He has become so familiar to this device that neural pathways is established to his brain that make him able to develop an advanced perception.

Harbisson is determined about himself being a cyborg that he has founded the Cyborg Foundation, an international organization to help humans become cyborgs.



Kevin Warwick

Kevin Warwick a professor of cybernetics at the University of Reading in the UK, took his job seriously. That he and his job have become one. Using himself as the testament, he is on a mission to happen to be the world's first most complete cyborg. Warwick worked with multiple electronic implants since 1998, he installed his arm with a microchip that helped him to use doors, lights and other computers remotely.



Jesse Sullivan

Cyborg technology is most immediately useful for disabled people. In the future we might imagine a world where every disabled person is equipped with new robotic limbs that are connected to their nervous systems, useful just like normal limbs.

Jesse Sullivan is a one in this respect. He effectively became one of the world's first cyborgs when he was equipped with a bionic limb, connected through a nerve-muscle graft. He can control his limb with his mind, and also feel hot, cold, and the grip is applying.



Jens Naumann

After an accident, Jens Naumann lost his vision in both eyes, but he never gave up hope on being able to see again. That dream turned to reality in 2002, when Naumann became the first person in the world to be equipped with an artificial vision. His electronic eyes are directly connected to his visual cortex through brain enhancements. Though it has limits as he can only vaguely see lines and shapes, his vision has been technically restored though.

Maybe in the future, it's possible to imagine artificial vision systems that allow users to see beyond normal human perception.



Nigel Ackland

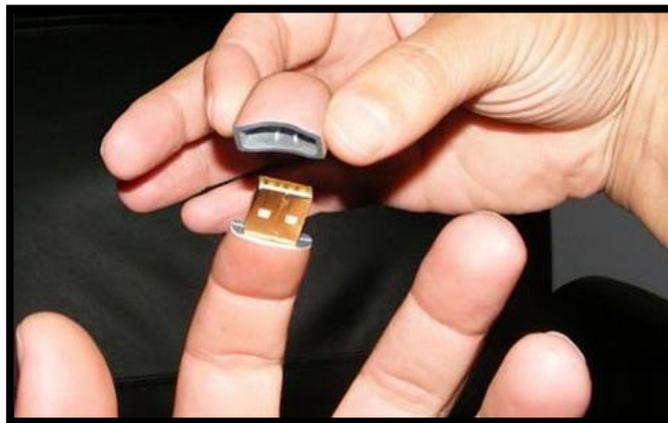
During an accident at work Nigel Ackland lost his partial arm but later got an upgrade. His incredibly advanced prosthetic is the closest thing to “The Terminator” that exists today.

Ackland can control the arm through muscle movements in his remaining forearm. The range of movement is best till date. He can independently move each of his five fingers to grip objects. He is even implanted with a gripping device called the trigger grip.



Jerry Jalava

The perfect example that you don't need to be a robotics mastermind to become a cyborg is Jerry Jalava who lost a finger in a motorcycle accident, Jalava decided to embed a 2GB USB port into his prosthetic finger.



Claudia Mitchell

The first woman to become a cyborg Claudia Mitchell was equipped with a bionic limb. Her robotic arm is same as the one cyborg Jesse Sullivan. The limb is connected to her nervous system, allowing her to control it with her mind. The limb allows her to use it for "cooking, for holding things, and for all kinds of daily tasks.



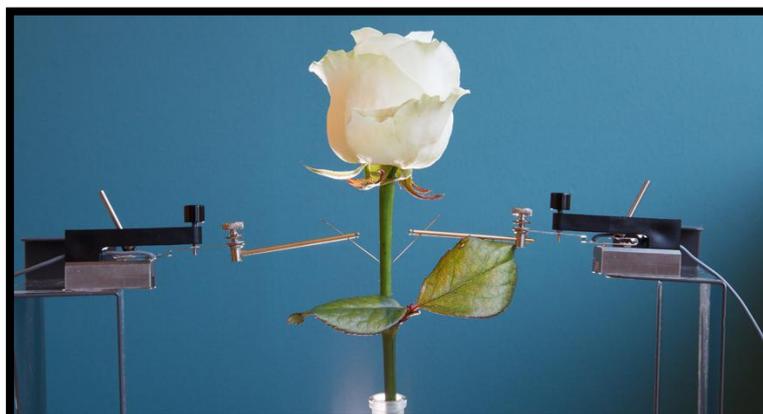
Moon Ribas

A Spanish artist Moon Ribas is a cyborg activist best known for developing and equipping her elbow with an online seismic sensor that allows her to feel earthquakes through vibrations. Since 2007, international media have described her as the world's first female cyborg artist. She is the co-founder of the Cyborg Foundation, an international organisation that encourages humans to become cyborgs and promotes cybernetics as an art movement and the co-founder of the Transpecies Society, an association that gives voice to people with non-human identities and offers the development of new senses and organs in community.



Cyborg plants

Apart from animals scientists seem intent on fitting up plants to machines. In 2015, Swedish researchers filled the veins of a garden rose with conductive polymer to develop an "e-plant". They showed the subsequent wires could carry a current, and the leaves even slightly changed color in response to the voltage.



IV. FUTURE OF CYBERNETICS

In Medicine

There are two important types of cyborgs, the restorative and the enhanced. Restorative technologies restore lost organs and limbs. The main aspect of restorative cyborgization is to repair of broken or missing part to get back to a healthy or average level of ability.

Retinal implants are form of cyborgization in medicine. The idea behind retinal function is to reinstate vision to people suffering from vision loss due to aging so that the retinal implant and electrical stimulation would act as a substitute for the missing cells which connect the eye to the brain.

A similar process has been developed to treat people who have lost their vocal abilities. The transmission of sound would start with a surgery to controls the voice and sound production to a muscle in the neck. The signals would then move to a processor which would control the timing and pitch of a voice simulator. That simulator would then vibrate developing a sound which could be shaped into words by the mouth.

An article published in Nature Materials in 2012 reported a research on cyborg tissues, with possible medical implications. The device utilizes a spider-web like mesh of sensors to monitor and maintain a normal heart-rate. Unlike traditional pacemakers that are similar from patient to patient, the elastic heart glove is made differently for every patient by using high-resolution imaging technology. The first prototype was created to fit a rabbit's heart. The stretchable material and circuits of the system were first developed by Professor John A. Rogers which bend without breaking. Although the device is only currently used as a research tool to study changes in heart rate, in the future the membrane may serve to save from heart attacks.

In 2014, researchers had developed a device that could keep a heart beating endlessly at the University of Illinois at Urbana-Champaign and Washington University in St. Louis. By using 3D printing scientist produced an electronic membrane that could successfully replace pacemakers.

In Military

Military research has aimed on the utilization of cyborg animals for the advance warfare. DARPA has announced its interest in developing cyborg insects to transmit data from sensors implanted into the. The insect's movements would be controlled from a Micro-Electro-Mechanical System (MEMS) and could survey an environment. Similarly, DARPA is developing a neural implant todistantly control the motion of sharks.

In 2009, the first wireless flying-beetle cyborg was shown at the Institute of Electrical and Electronics Engineers (IEEE) Micro-electronic mechanical systems (MEMS) conference in Italy,.

Certainly, the military has already considered the possibility of the super-soldier so that he has faster reflexes, accuracy, greater resistance to fatigue, and integrated weaponry.. Such soldiers could be created through combinations of cybernetics and bioelectronics which is already a great success.

In Sports

In 2016 in Zurich Switzerland the first cyborg Olympics were arranged. Cybathlon 2016 were the first Olympics for cyborgs. In this event, 16 teams of people with disabilities used technological enhancements to turn themselves into cyborg athletes. There were six different events and its competitors used and controlled advanced cybernetics such as powered prosthetic legs and arms, bikes and motorized wheelchair.

In space

Sending humans in space is a dangerous task in which the implementation of various cyborg technologies could be used in the future for lowering risk. Stephen Hawking stated "Life on Earth is at the ever-increasing risk of being wiped out by a disaster such as sudden global warming, or nuclear war. And the human race has no future if it doesn't go into space." There are many effect of spaceflight on the human body. One major issue of space exploration is the biological need for oxygen. If this need was taken out of the equation, space missions would be revolutionized.

Cyborg Foundation

In 2010, the Cyborg Foundation became the world's first international organization serving to help humans become cyborgs. The foundation was created by cyborg Neil Harbisson and Moon Ribas to the growing number of letters and emails received from people around the world interested in becoming a cyborg. The foundation's main aims are to extend human abilities by developing and applying cybernetic implants to the body, to evaluate the use of cybernetics in cultural events and to stand for cyborg rights. In 2010, the foundation, based in Mataro (Barcelona), was the overall winner of the Creatic Awards. In 2012, Spanish film director Rafel Duran Torrent, presented a short film about the Cyborg Foundation. In 2013, the film won the Grand Jury Prize at the Sundance Film Festival's Focus Forward Filmmakers Competition and was awarded with \$100,000 USD.

V. PROSPECTS AND CONCLUSION:

Given the scope of present and future implantable devices, these devices will be greatly functional, and will have connections to commercial, medical, and governmental networks. Though bioelectronics has many advantages it may lead to negative side with the Invention of biological machines called "Cyborgs". As many scientists have argued, once a technology is out there, we cannot make it end. When human beings are offered the chance to utilize computers and electronic technologies within their bodies to achieve upgrades, it is almost certain they will require them regardless of the risks. Based on this, it would be unrealistic to try and ban such technologies. A ban would only probably force them into a large, criminal black market, as illegal drugs and weapons already have been. It is probably crucial for society to assert that the scientists and engineers charged with creating this new technology carry the proper amount of social responsibility.

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