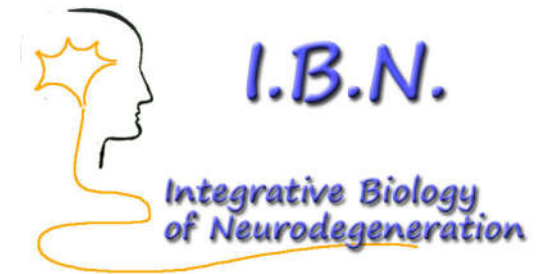




institut
universitaire
de France



HAV919V

Integrated Physiopathology/Pathophysiologie intégrée

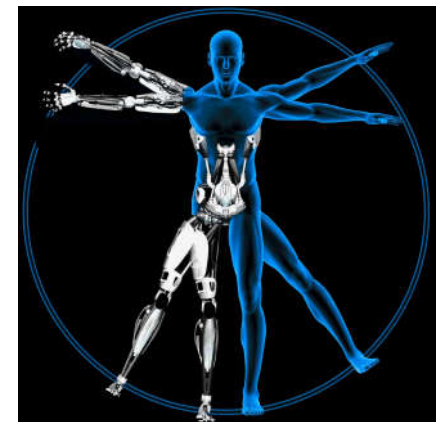
Augmented human

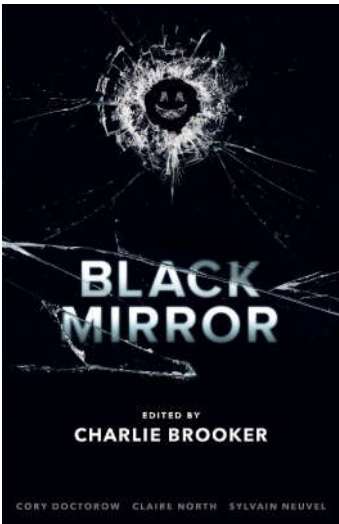
Florence PERRIN

UM, INSERM MMDN

Septembre 2021

florence.perrin@umontpellier.fr





2011



2018



2021



Statement : facts presented within this course do not necessarily reflect my opinions and beliefs.

Augmented human: development of technologies that repair/increase human sensory reception, physical ability or even cognitive capacity.

Not transmittable to the next generation.

Transhumanism, social and philosophical movement devoted to promoting the research and development of robust human-enhancement technologies.

Transmittable or not to the next generation.

Posthuman transhumanism: a transhuman ideology and movement which seeks to develop and make available technologies that eliminate aging, enable immortality and greatly enhance human intellectual, physical, and psychological capacities, in order to achieve a "posthuman future".

Human augmentation : taboo to many butwe have been trying to repair/augment ourselves for centuries.

Hearing aids (repair but may also enhance)

Glasses (repair but may also enhance)

Vaccine (protect through enhancement)

Prosthesis (repair but may also enhance). Some plastic surgery

Nootropic substances or cognitive enhancers (caffeine, nicotine, amphetamine, medication used in narcolepsy, “smart drugs”.....)

Kevin Warwick, Institute for Cybernetics, University of Reading, UK

First implant 1998 : RFID, domotics (open door, switch on lights,...)



Then electrodes implanted in his harm nerve, directly connected to a computer

Ultrasonic signals given to his nervous system (electrodes).

Pulses of currents as f (distance of the object)

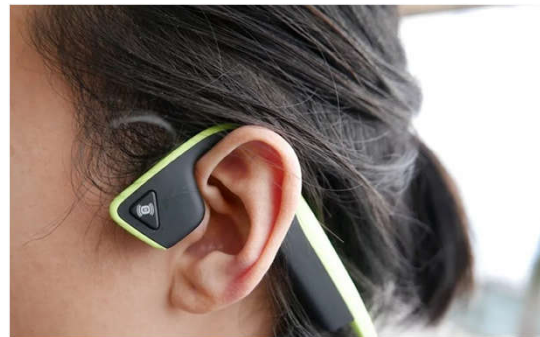
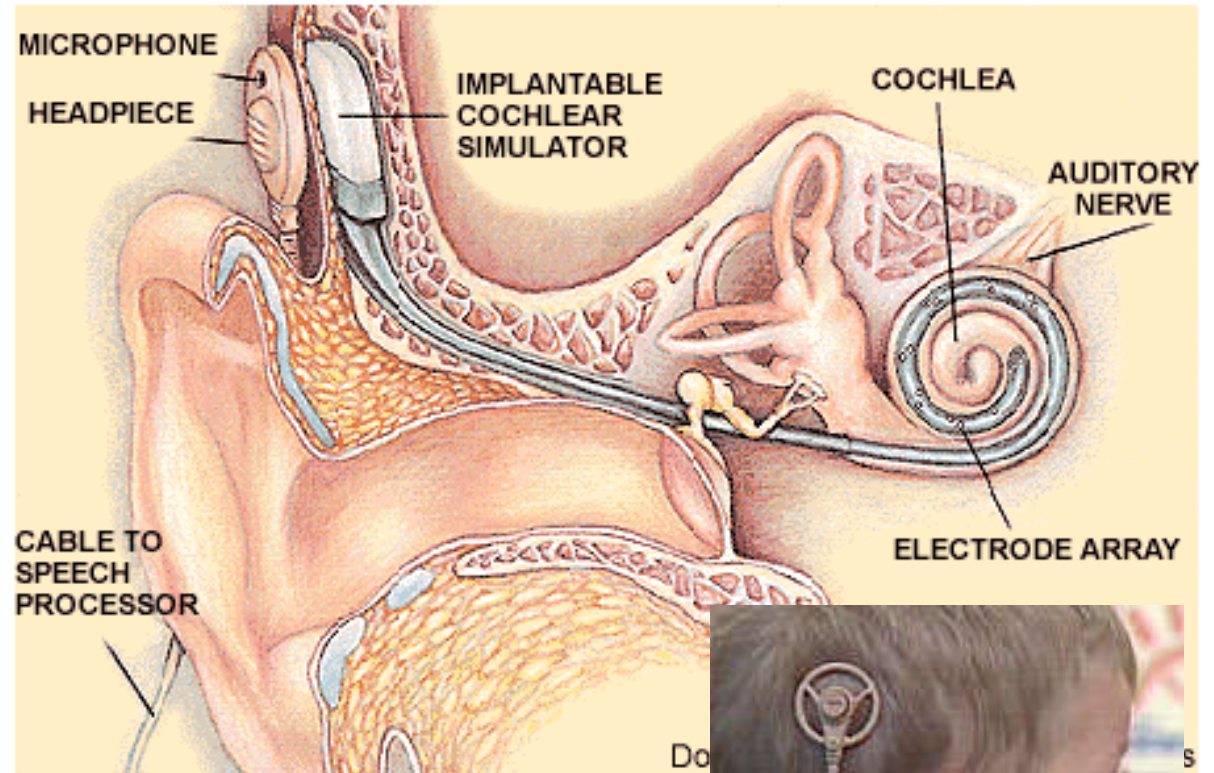
Experienced an extra sense.



Infra red, magnetic field

Cochlear implant: 1978

- microphone
- microprocessor (encodes sounds)
- Electrodes implanted in the cochlea



Earphone : transfers sound by bone vibration directly to the cochlea



<https://www.youtube.com/watch?v=mc2fOI9vLzo>



Neil Harbisson wears an antenna that allows him to "hear" color through vibrations in his skull.

Bionic Eyes With Thermal Infrared Vision In Development



<https://youtu.be/h7tYd7hHHUU>

Military

Exoskeleton



<https://youtu.be/RWnXOh4r6Dw>

Exoskeleton



https://www.youtube.com/watch?v=ypSyff-_Bfw



Oscar Pistorius, in 2007 was faster than persons without disabilities at the Golden League, Roma

Aimee Mullins



Transhumanism



Ray Kurzweil, engineer specialist in artificial intelligence and digital brain and machine learning. Predictions : “Singularity is near” (event with unpredictable consequences). 2045



Hired by Google in 2013

“To work on new projects involving machine learning and language processing”

Homo sapiens to “Homo Novus”

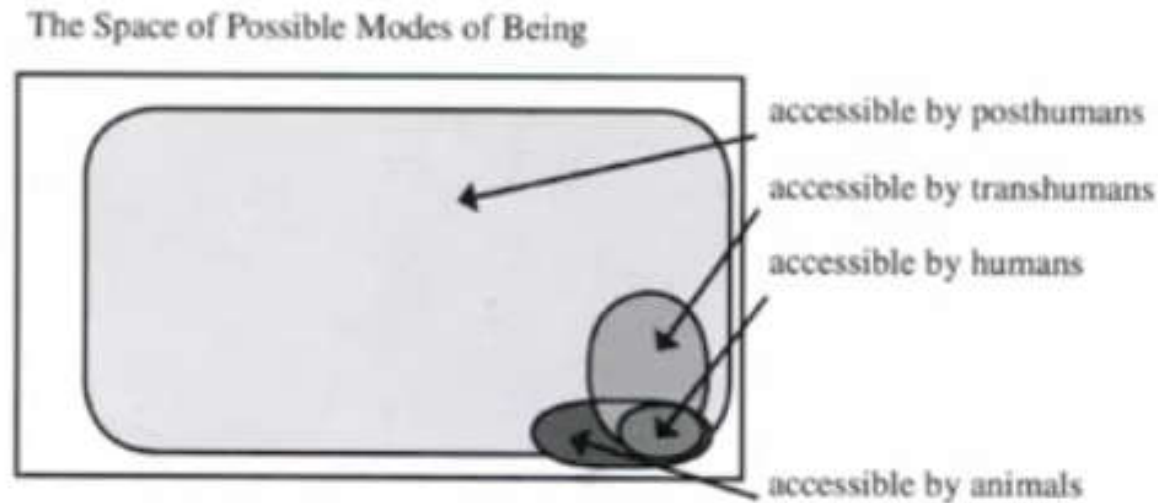
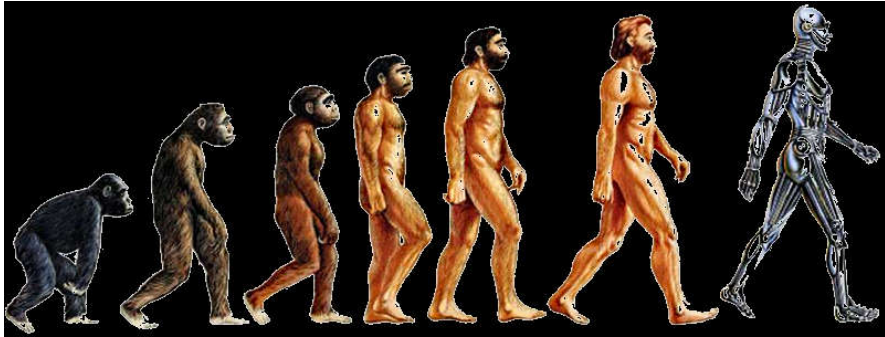


Figure 1. We ain't seen nothin' yet (not drawn to scale). The term “transhuman” denotes transitional beings, or moderately enhanced humans, whose capacities would be somewhere between those of unaugmented humans and full-blown posthumans. (A transhumanist, by contrast, is simply somebody who accepts transhumanism.)

Transhumanism : enhanced human condition



Homo sapiens to "Homo Novus"

WHAT FOR?

- Increase healthy lifespan (abolish death)
- Increases sensory and physical capabilities
- Increase intelligence
- Eliminate diseases

HOW?

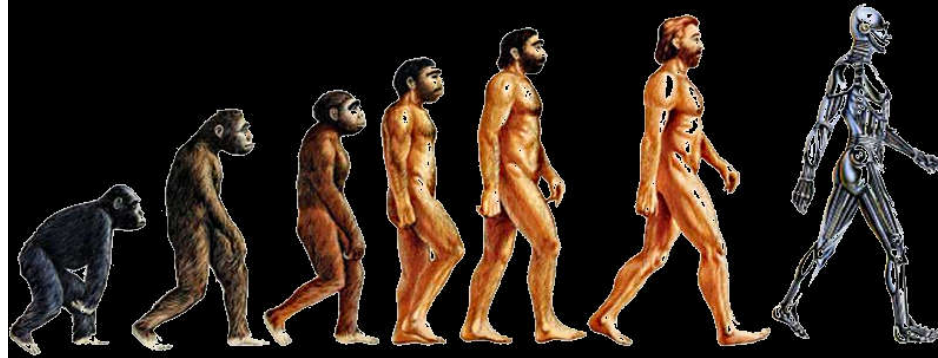
- Genetic
- Artificial intelligence
- Nanotechnology
- Sensors

BUT ALSO

Adapt human to new living condition (climate change, space...)

Denis Duboule, EPFL, Laboratory of Developmental Genomics
Séminaire Académie Royale de Belgique, Collège France; Mai 2020.
<https://www.youtube.com/watch?v=kgzfJvkXXUs>

Transhumanism : enhanced human condition



Augmented human : equipped at birth

with camera sensors, computer

Not transmittable to the next generation

Modified human : genetic (human reproduction)

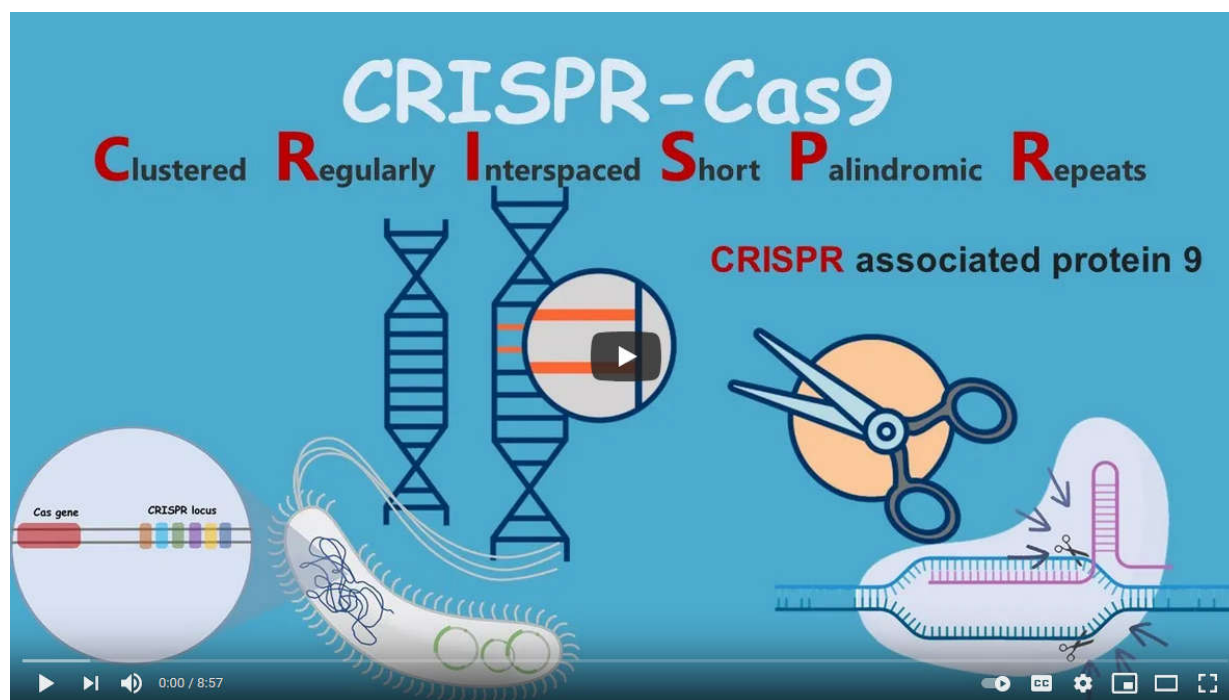
Embryo

From stem cells, germ cells, *in vitro* fecundation

Transmittable to the next generation

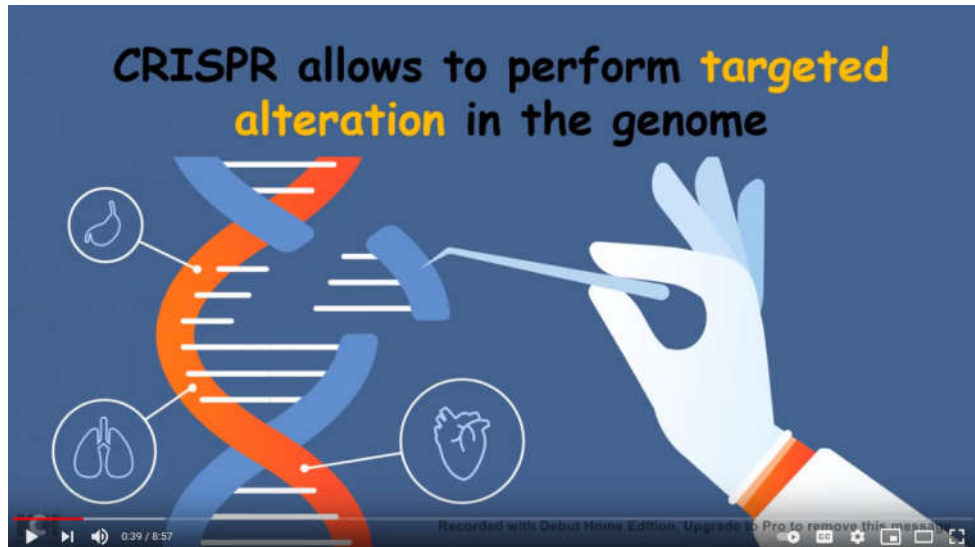


Genome editing



<https://www.youtube.com/watch?v=qc6xgb4VXI0>

Full seminar on CRISPR <https://www.youtube.com/watch?v=47pkFey3CZ0>



Mice, rats, human cell culture,.....

Leukemia : bone marrow
(edited allograft)

To correct a deficit.

To “enhance” performances (enzymes,....)



Molecular Therapy

In Vivo Excision of HIV-1 Provirus by saCas9 and Multiplex Single-Guide RNAs in Animal Models

3 May 2017

Yin et al. use multiplex CRISPR/Cas9 genome editing technology to excise the HIV-1 provirus in a precise manner in three different HIV-1 animal models via *in vivo* AAV gene delivery. The feasibility of HIV excision in infected cells *in vivo* paves the way toward human clinical trials to cure HIV-1 infection.



Dr. He Jiankui

Human embryos

Lulu et Nana, 2018 HIV.
In fact not corrective editing

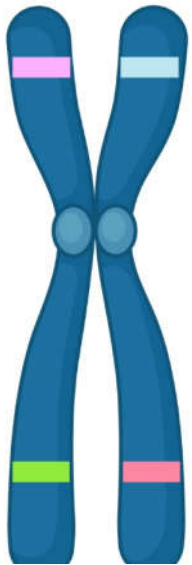
CONDEMNED

Condemned to 3 years
in jail and 380 000€

Scientists
University of Shenzhen
Chinese authority
Justice

Somatic cells and germ cells

<https://www.technologyreview.com/2019/12/03/131752/chinas-crispr-babies-read-exclusive-excerpts-he-jiankui-paper/>



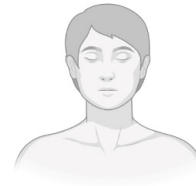
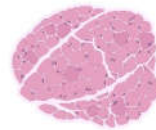
Gene 1

Protein



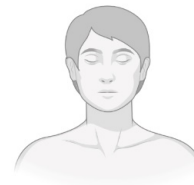
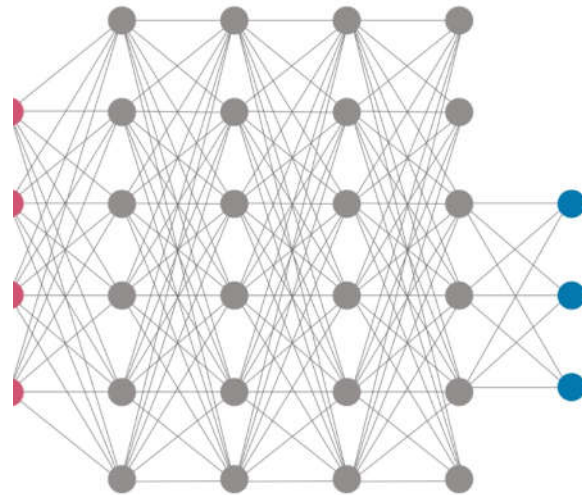
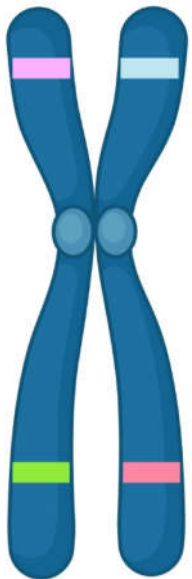
Gene 2

Protein 2



Direct determinism

1 gene 1 parameter



Indirect determinism

Several genes 1 parameter
1 gene several parameters

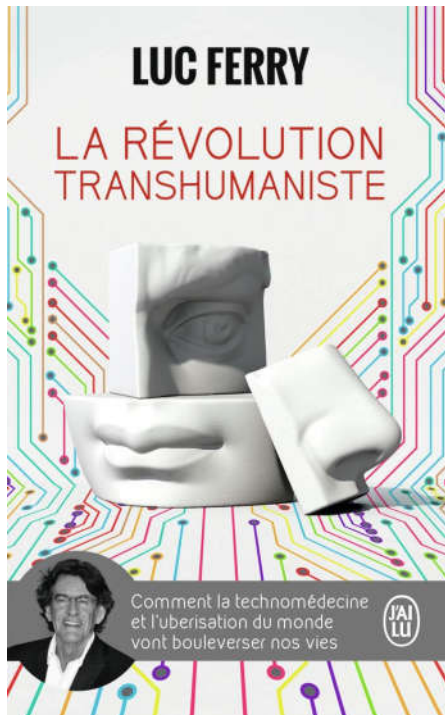
Transhumanism

Major modification : requires the full understanding of mechanisms that lead to organization of the human embryo.

Not yet there. (3-4 %)

Genetic equilibrium and not an assembly of parameters that can be separately modified

<https://www.forbes.com/sites/cathyhackl/2020/07/05/augmented-human-5-times-ive-used-technology-to-augment-myself/>



Luc Ferry, La révolution transhumaniste. The death of death ? « La mort de la mort »

Luc Ferry: Philosopher, Minister of education and research