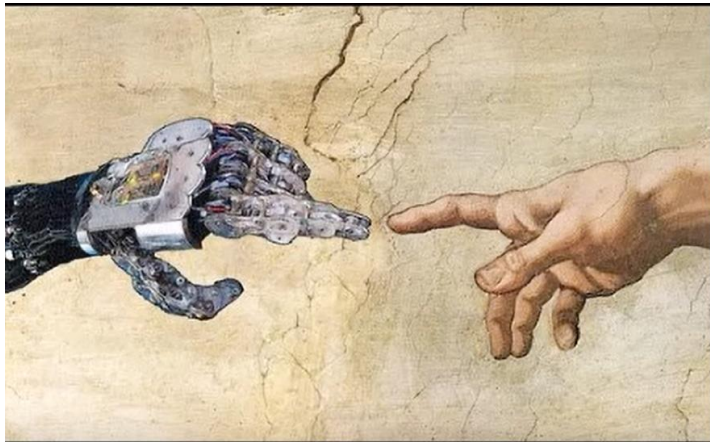


HAV919V

Integrated Physiopathology/Pathophysiologie intégrée

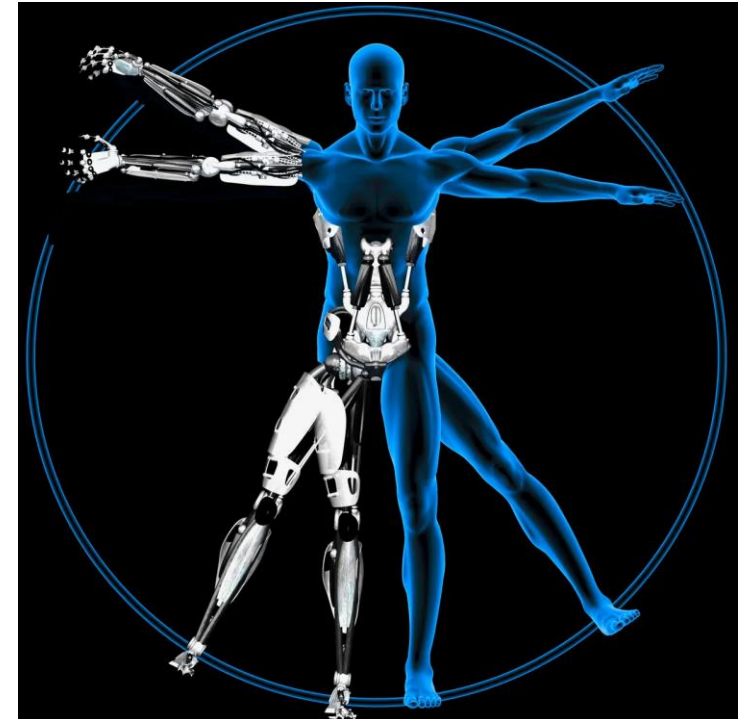
Augmented human



Florence PERRIN
UM, INSERM MMDN

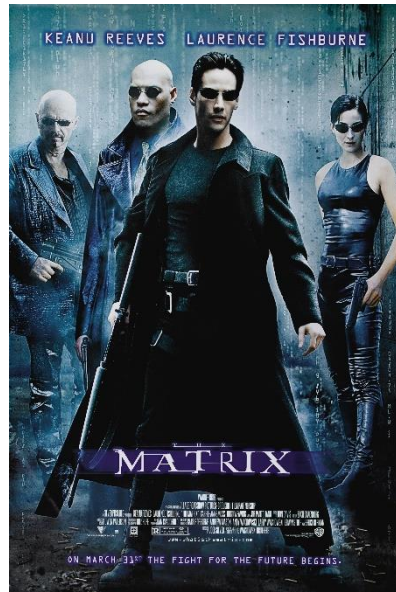
October 2023

florence.perrin@umontpellier.fr

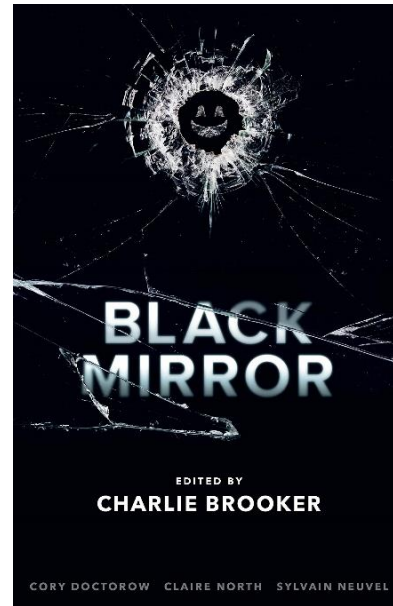




1979



1999



2011



2013



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.

Therapy versus augmented?

ACCEPTABILITY

1781

Luigi Galvani
Electric stimulation
Muscle contraction

1791

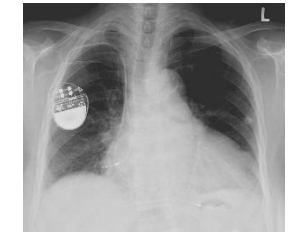
Luigi Galvani
Electric stimulation
Heart contraction

1818



Mary Shelley

1958



Dr. Åke Senning

4 M

60 000/an, France

Therapy versus augmented?



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 but ...we have been trying to repair/augment ourselves for centuries.

NBIC technosciences

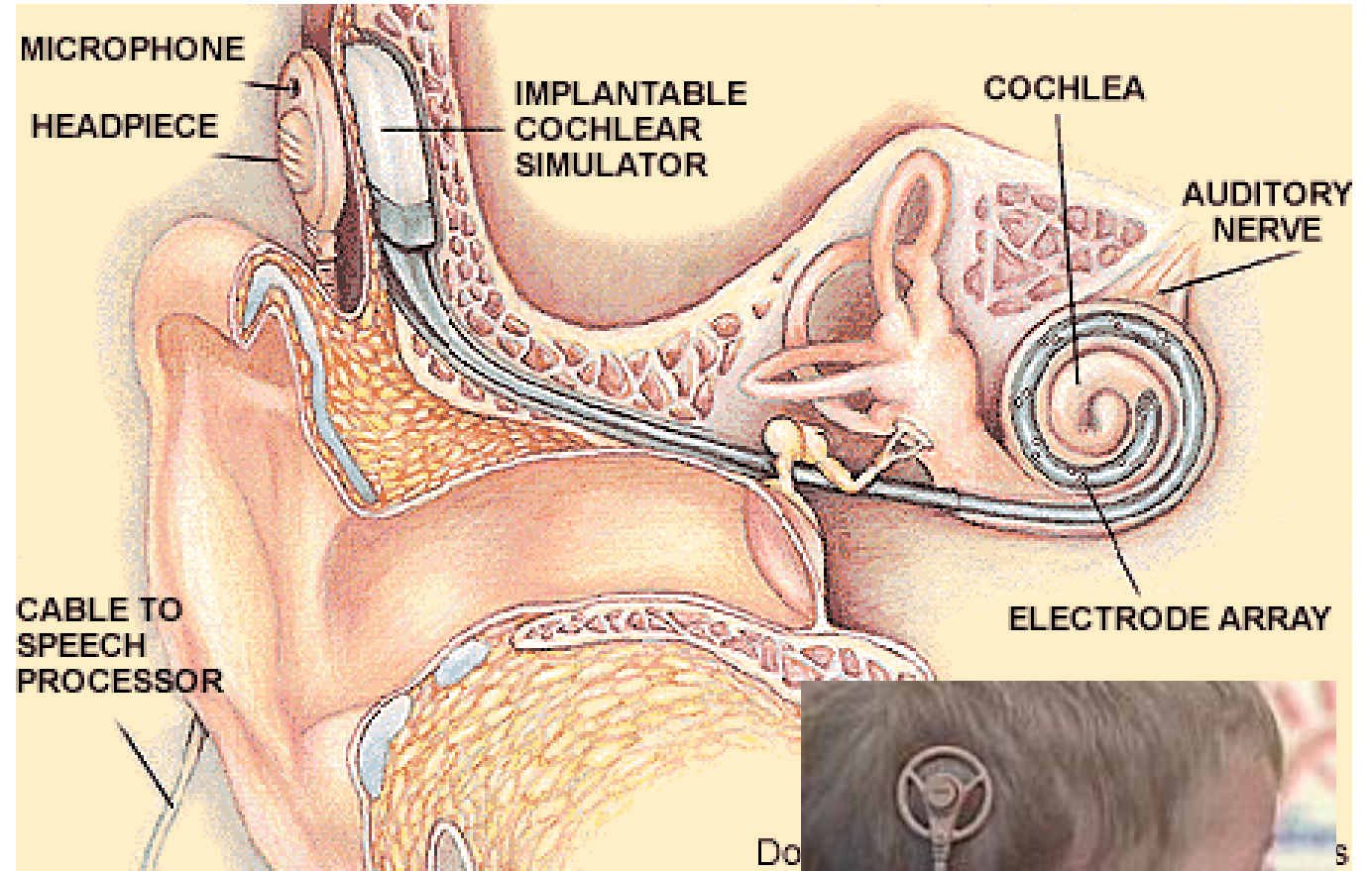
- nanotechnologie N
- biotechnologies B
- information I
- cognitives and neurosciences C

Hearing aids (repair but may also enhance)

Glasses (repair but may also enhance)

Cochlear implant: 1978

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



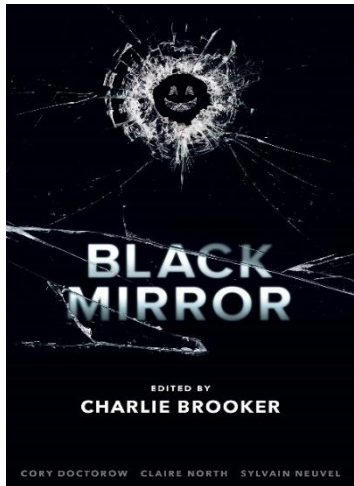
Earphone : transfers sound by bone vibration directly to the cochlea



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

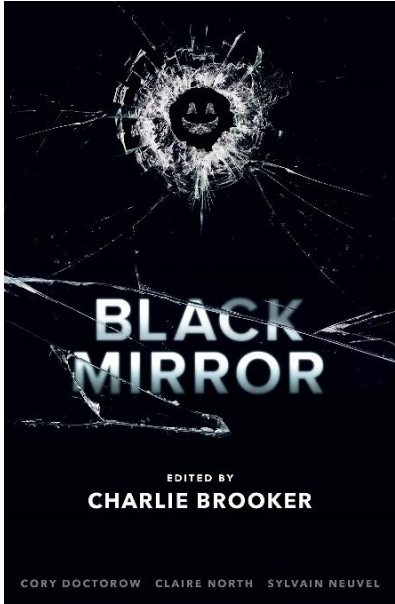


Neil Harbisson wears an antenna that allows him to "hear" color through vibrations in his skull.



2011

Bionic Eyes With Thermal Infrared Vision In Development



2011



2013



<https://youtu.be/h7tYd7hHHUU>

Military

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

NBIC technosciences

- nanotechnologie N
- biotechnologies B
- information I
- cognitives and neurosciences C

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”

Plastic surgery : reconstructive surgery and cosmetic surgery



[https://en.wikipedia.org/wiki/File:US_Navy_090704-A-0566T-023_Operation_Smile_staff_member_is_Dr._Hal_Rosenfeild_begins_reconstructive_surgery_for_a_cleft_lip_on_a_three-month-old_infant_ aboard_the_Military_Sealift_Command_hospital_ship_USNS_Comfort_\(T-AH_20\).jpg](https://en.wikipedia.org/wiki/File:US_Navy_090704-A-0566T-023_Operation_Smile_staff_member_is_Dr._Hal_Rosenfeild_begins_reconstructive_surgery_for_a_cleft_lip_on_a_three-month-old_infant_ aboard_the_Military_Sealift_Command_hospital_ship_USNS_Comfort_(T-AH_20).jpg)



A Miami plastic surgeon reveals the top plastic surgery trends for men, including 'fake ab' surgery and buccal fat removal

Exoskeleton



Alien
1979



2013

<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



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



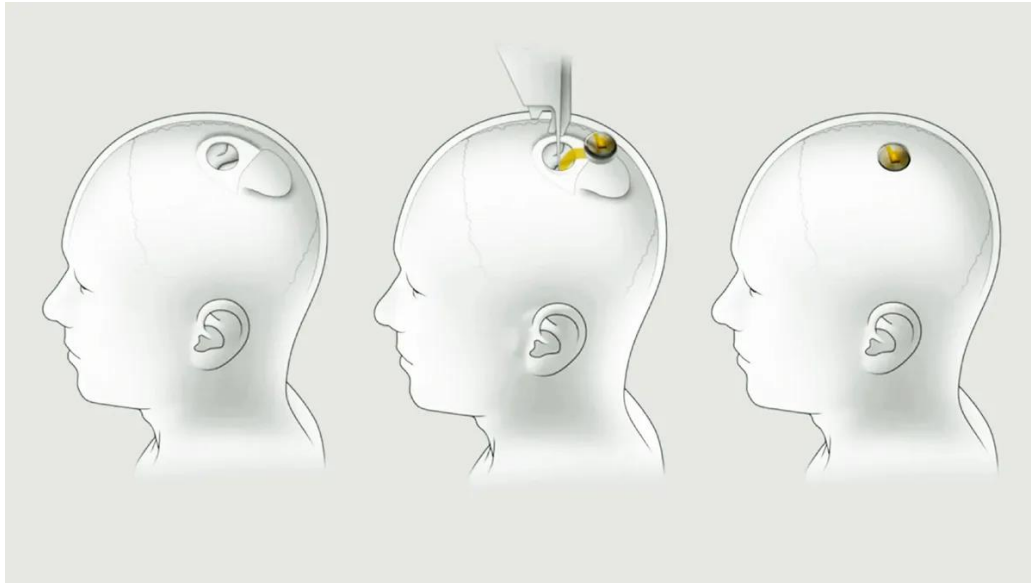
Human brain talk to computer



May 2023

Neuralink's brain-machine interface technology sinks electrodes into the brain then uses a chip to communicate with computers outside your skull. Gertrude.

Screenshot by Stephen Shankland/CNET



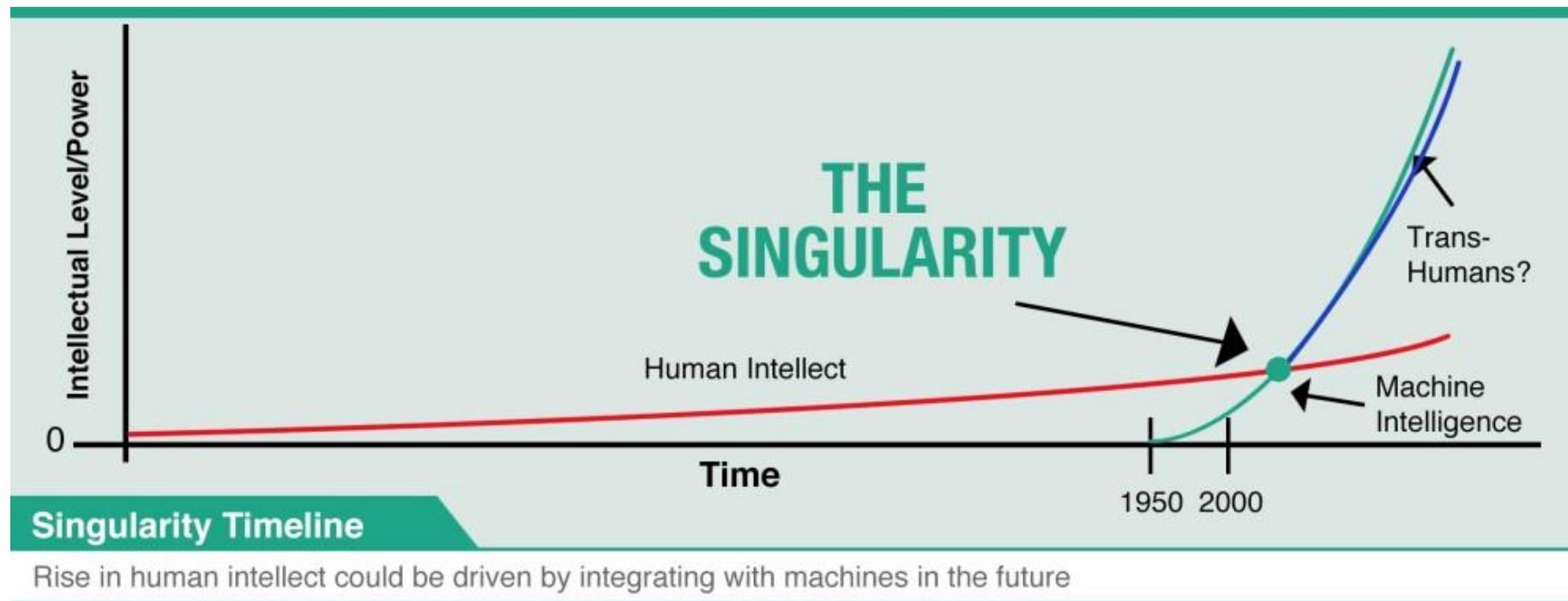
<https://www.cnet.com/science/elon-musk-shows-neuralink-brain-implant-working-in-a-pig/>

Transhumanism



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

Singularity: hypothetical point in time when technological growth becomes uncontrollable and irreversible, resulting in unforeseeable changes to human civilization



Homo sapiens to “Homo Novus”

The Space of Possible Modes of Being

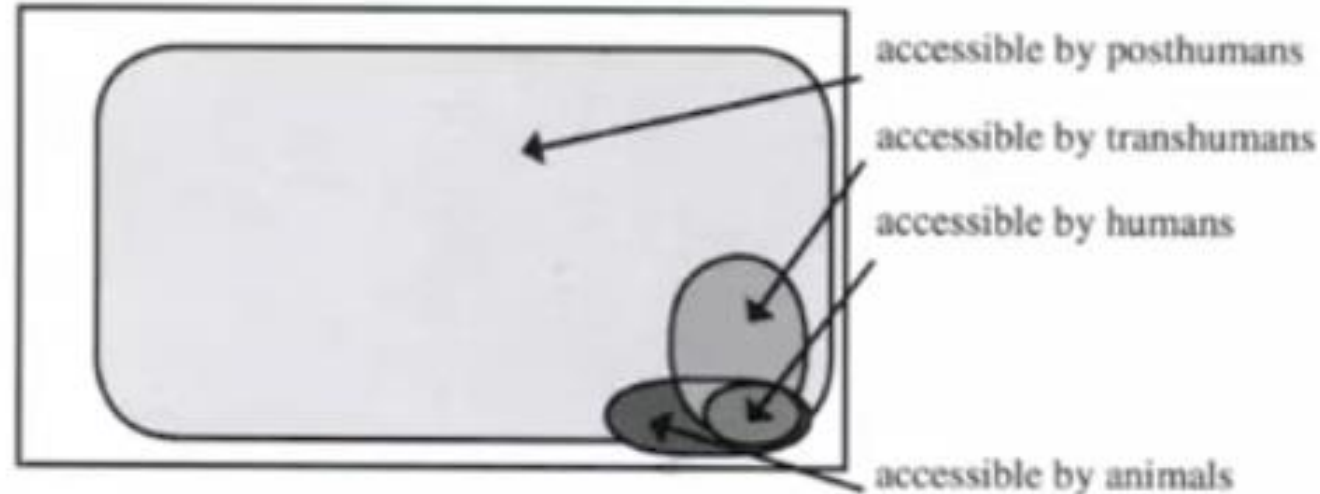


Figure 1. We ain't seen nothin' yet (not drawn to scale). The term “transhuman” denotes transitional beings, or moderately enhanced humans, whose capacities would be somewhere between those of unaugmented humans and full-blown posthumans. (A transhumanist, by contrast, is simply somebody who accepts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

Transhumanism



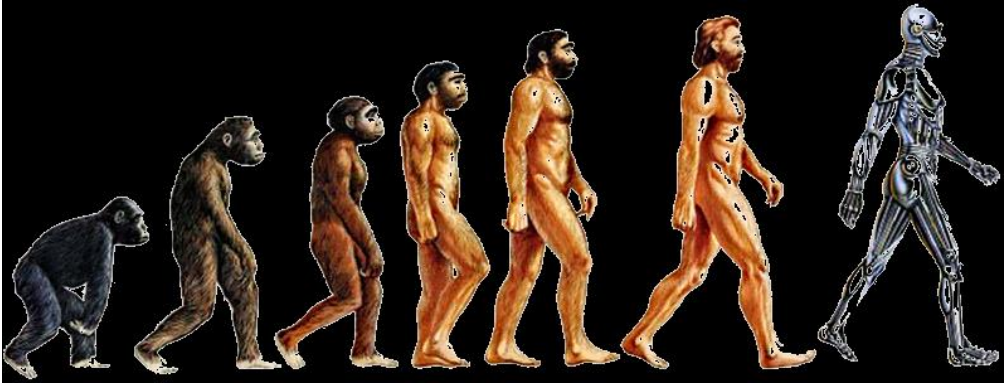
Ray Kurzweil, engineer specialist in artificial intelligence and digital brain and machine learning. Predictions : “Singularity is near” (event with unpredictable consequences). 2045



Hired by Google in 2013

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

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?

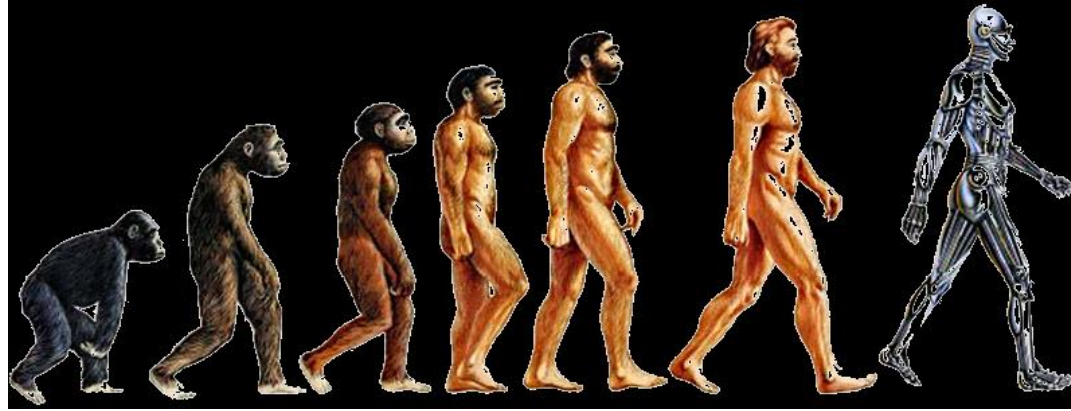
- Genetic
- Artificial intelligence
- Nanotechnology
- Sensors

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

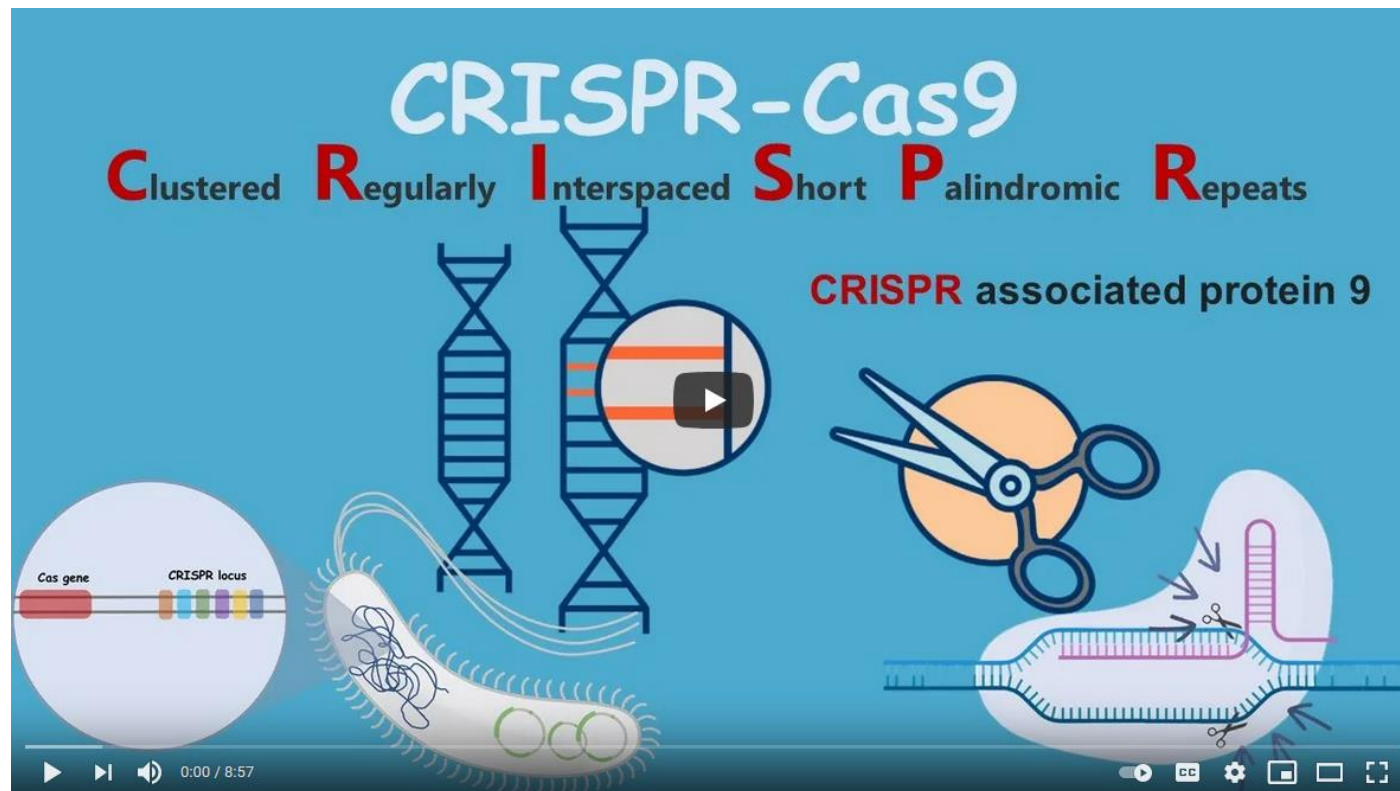
Modified human : genetic (human reproduction)
Embryo

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

Transmittable to the next generation



Genome editing

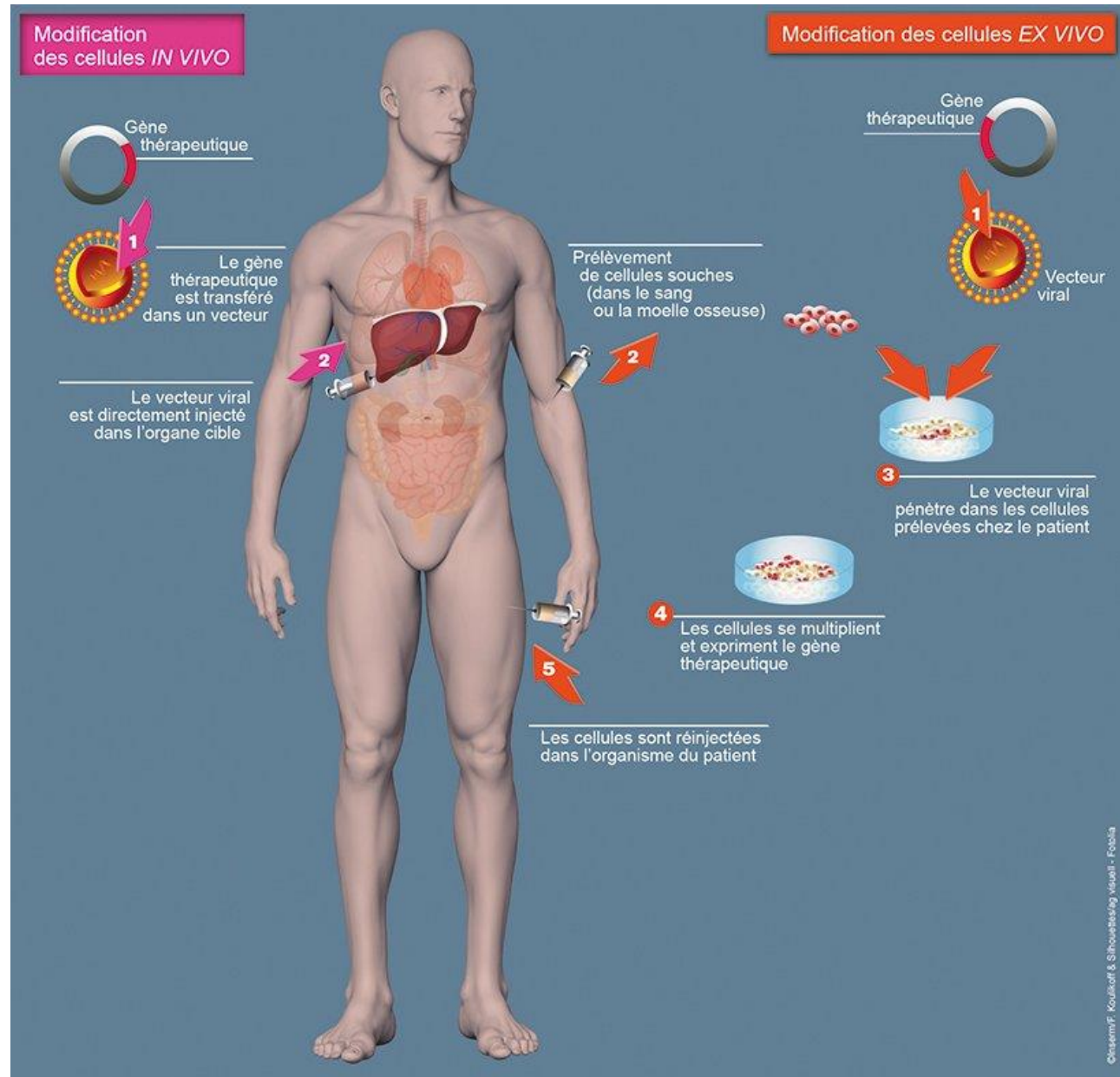


<https://www.inserm.fr/dossier/therapie-genique/>

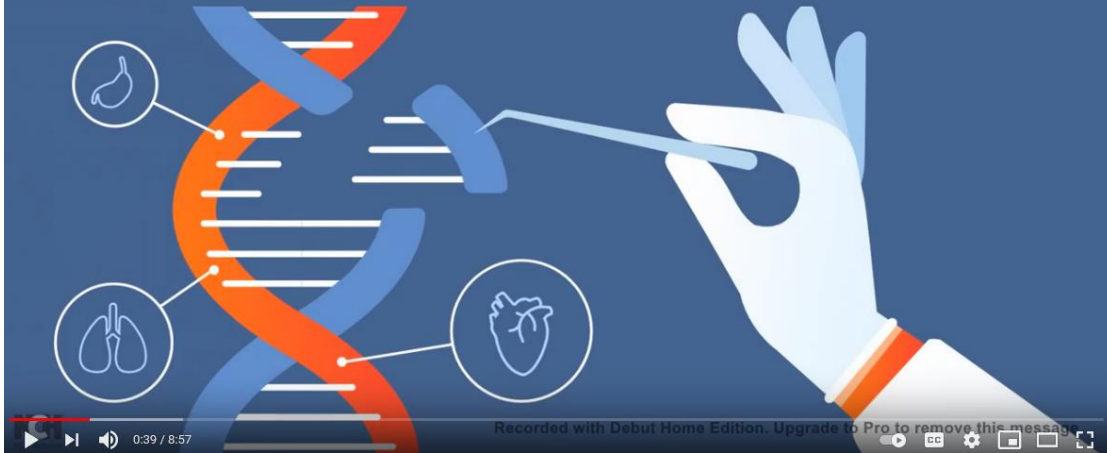
<https://www.youtube.com/watch?v=qc6xgb4VXI0>

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

<https://www.inserm.fr/dossier/therapie-genique/>



CRISPR allows to perform **targeted alteration** in the genome



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

Leukemia : bone marrow
(edited allograft)

To correct a deficit.

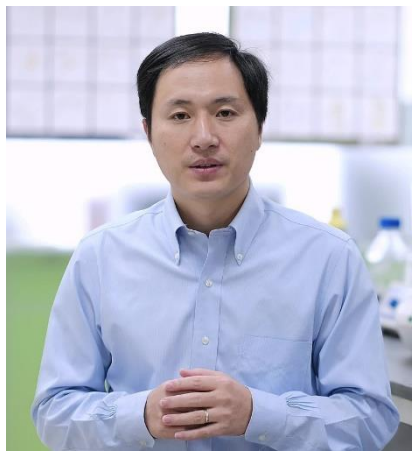
To “enhance” performances (enzymes,....)



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

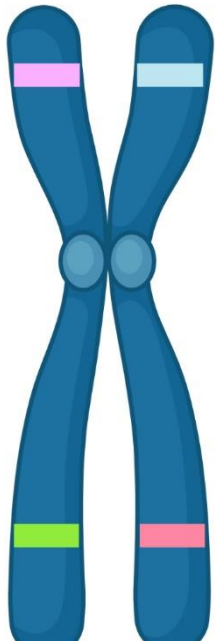
Lulu et Nana, 2018 HIV.
In fact not corrective editing

Somatic cells and germ cells

CONDEMNED

Condemned to 3 years
in jail and 380 000€

Scientists
University of Shenzhen
Chinese authority
Justice



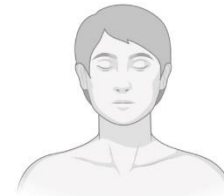
Gene 1

Protein



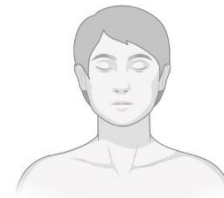
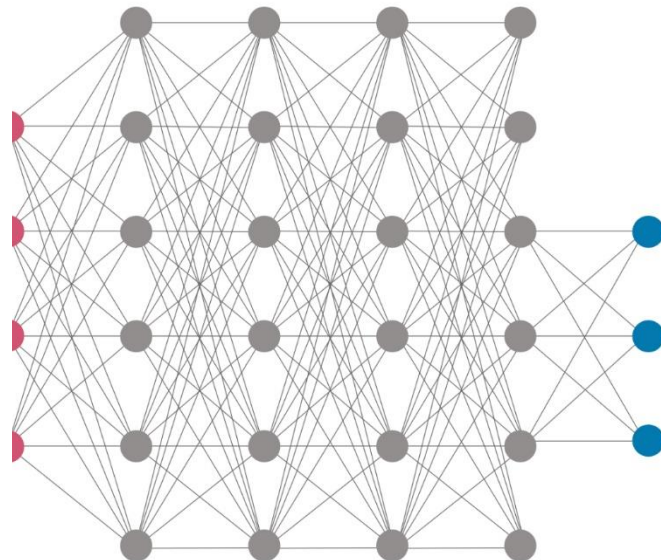
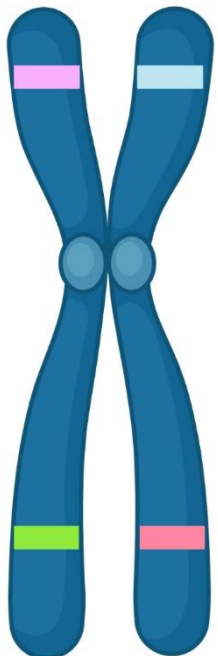
Gene 2

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



2016



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

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



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

Luc Ferry: Philosopher, Minister of education and research