What ethics does neuroethics bring to bear on the issue of neurotechnologies ?

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When science-fiction intrudes on human life.

Reading minds, deciphering dreams, communicating and writing with thoughts, downloading the mind and brain function into a computer...

Is this world still science-fiction, or will it soon be real?

What kind of world do we want to live in?

**What kind of society are we building?**

Neuroscience
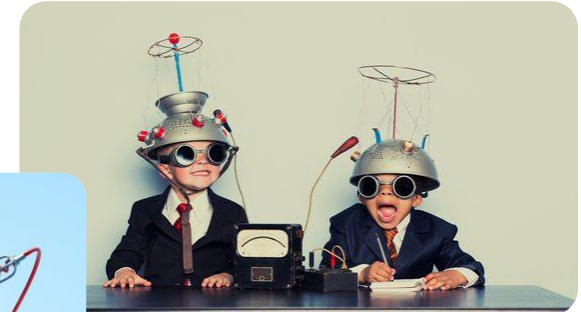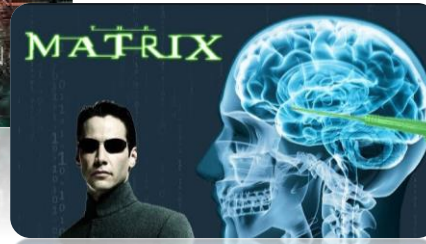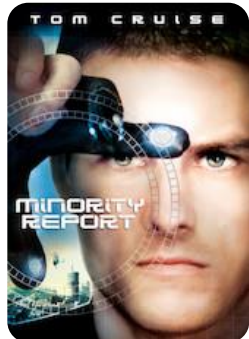
**Transdisciplinary research fields:**

biology, chemistry, math, bioinformatics, neuropsychology. Born of the convergence of molecular and cellular approaches to nervous tissue with more integrated neurophysiological and cognitive research.

Encompass all scientific fields of study of the brain:
→ From molecules and cells to behaviours
→ From genetics and embryonic development to evolution and more computational aspects.
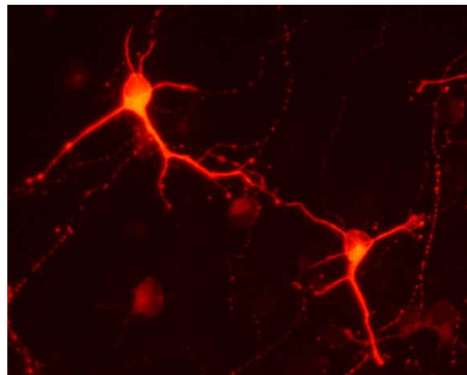
Neurones x 40.
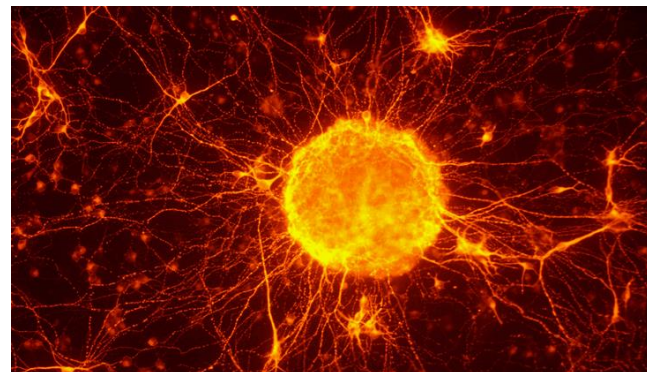
Neurosphères x 20

Plasticité neuronale

Remodelage des connexions

Plasticité synaptique

Remodelage des synapses
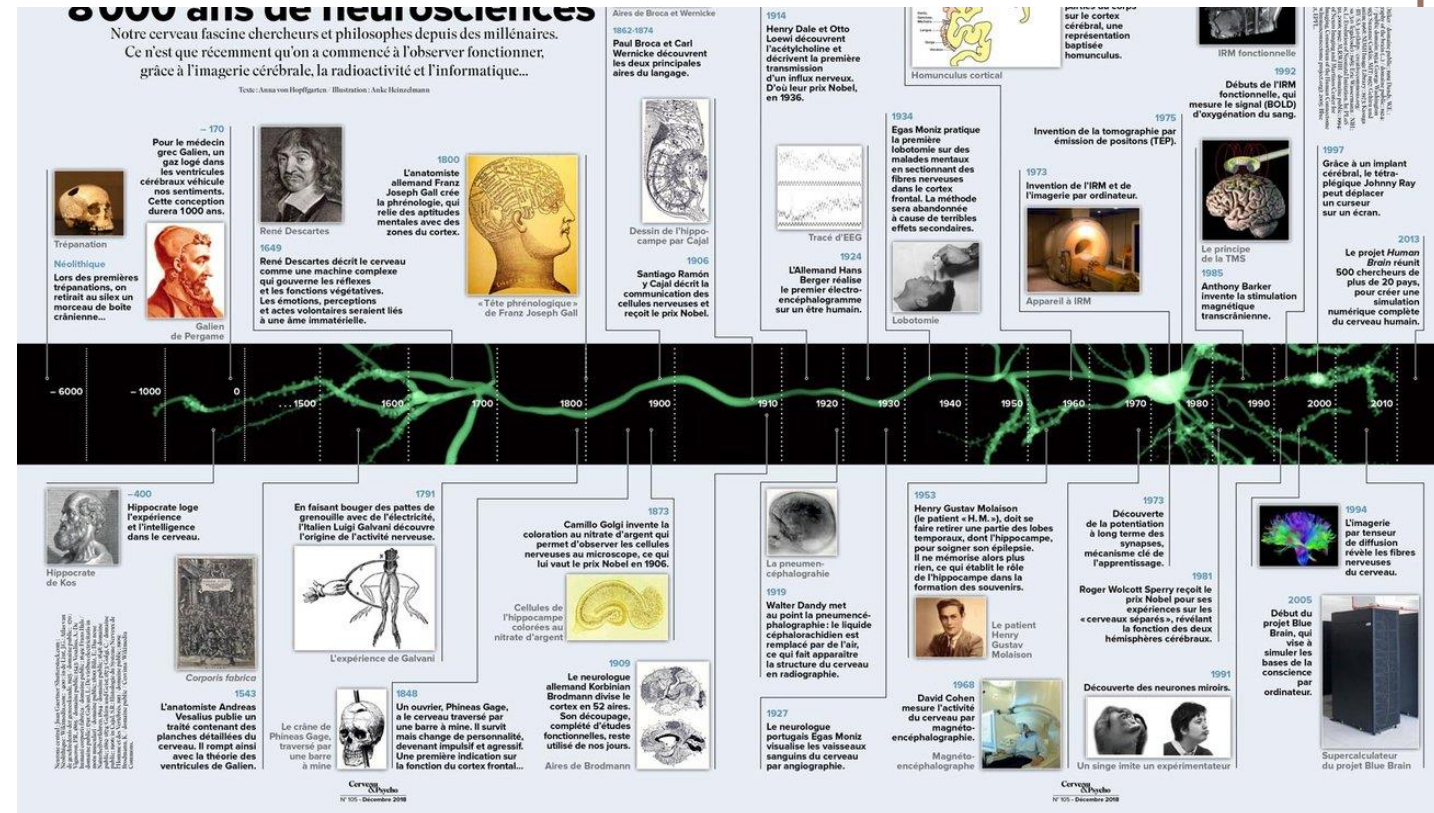
Story of the brain and neuroscience

The long-term story of the sciences concerned with the brain and nervous system is marked by a continuity of **questioning about the relationship between body and mind**.

Is the brain the seat of the soul?
What are the links between living matter and thought?

It's all about **knowing the human essence** and **what it means to be human**.

Story of a 1ˢᵗ convergence: From automata to neuroscience

The result of a long evolution combining scientific and technical progress.
→ Research to simplify calculations and thinking.
→ Computing is closely linked to the linguistic representation of information, data and knowledge, and the history of watchmaking.

At the same time, philosophical thought **has linked language to thought, and therefore to intelligence, as well as to the emotions and feelings it expresses.**

In 1642, Blaise Pascal invented the Pascaline calculating machine.

In 1671, Gottfried Leibniz added an automatic multiplication and division interface to the Pascaline.
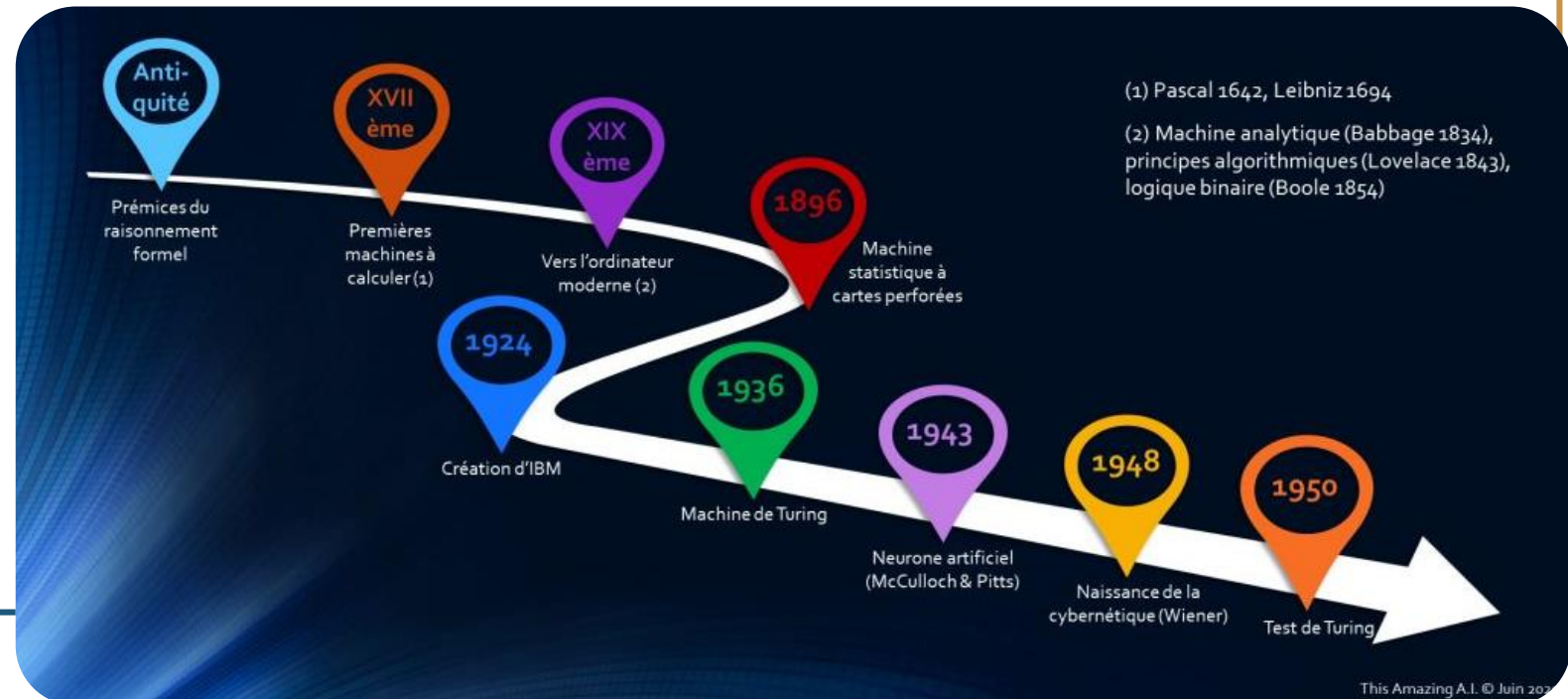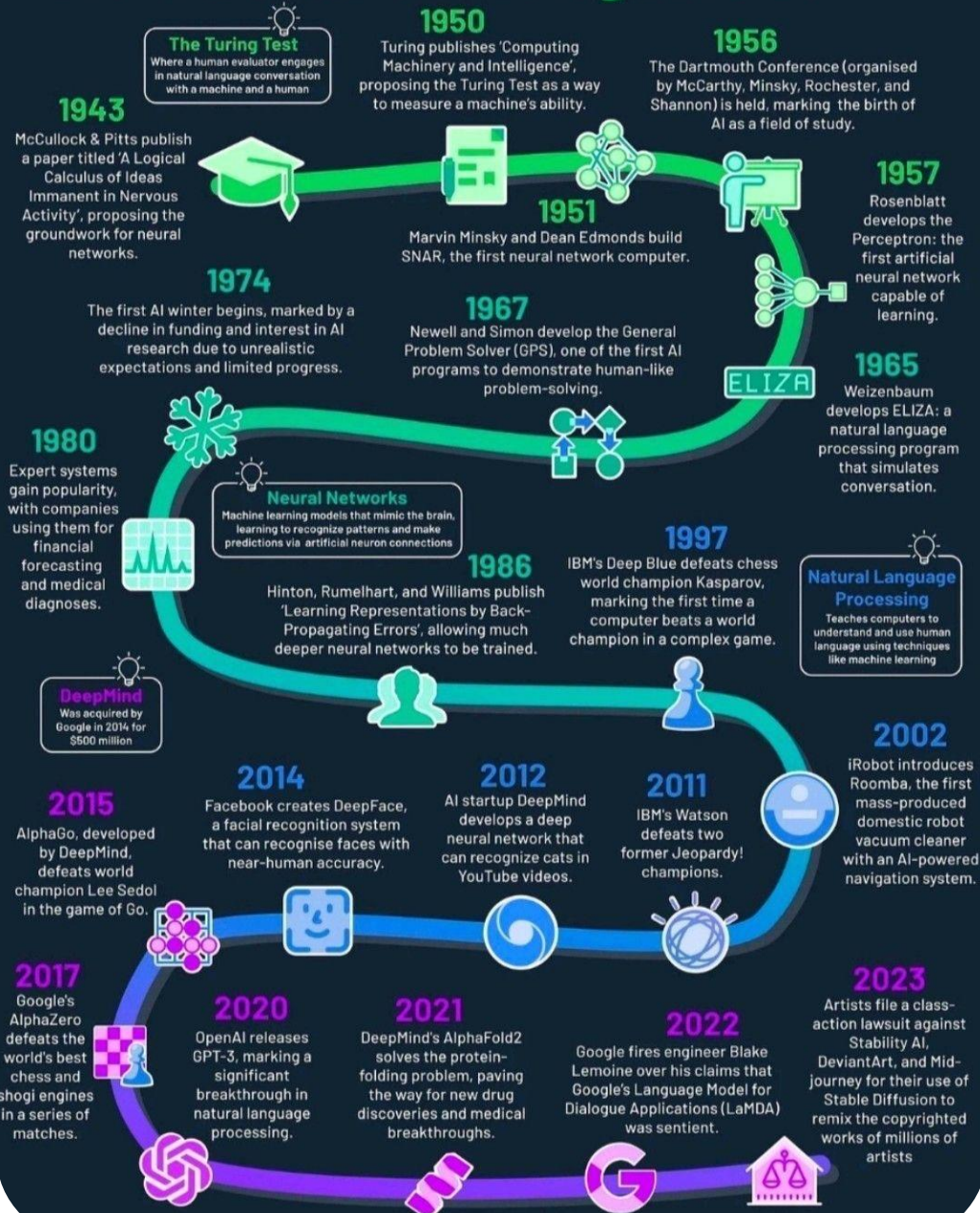
Story of a 2nd convergence: digital and neuroscience

Neuroscience has inspired the development of digital technology and artificial intelligence, the mainstay of digital transformation.
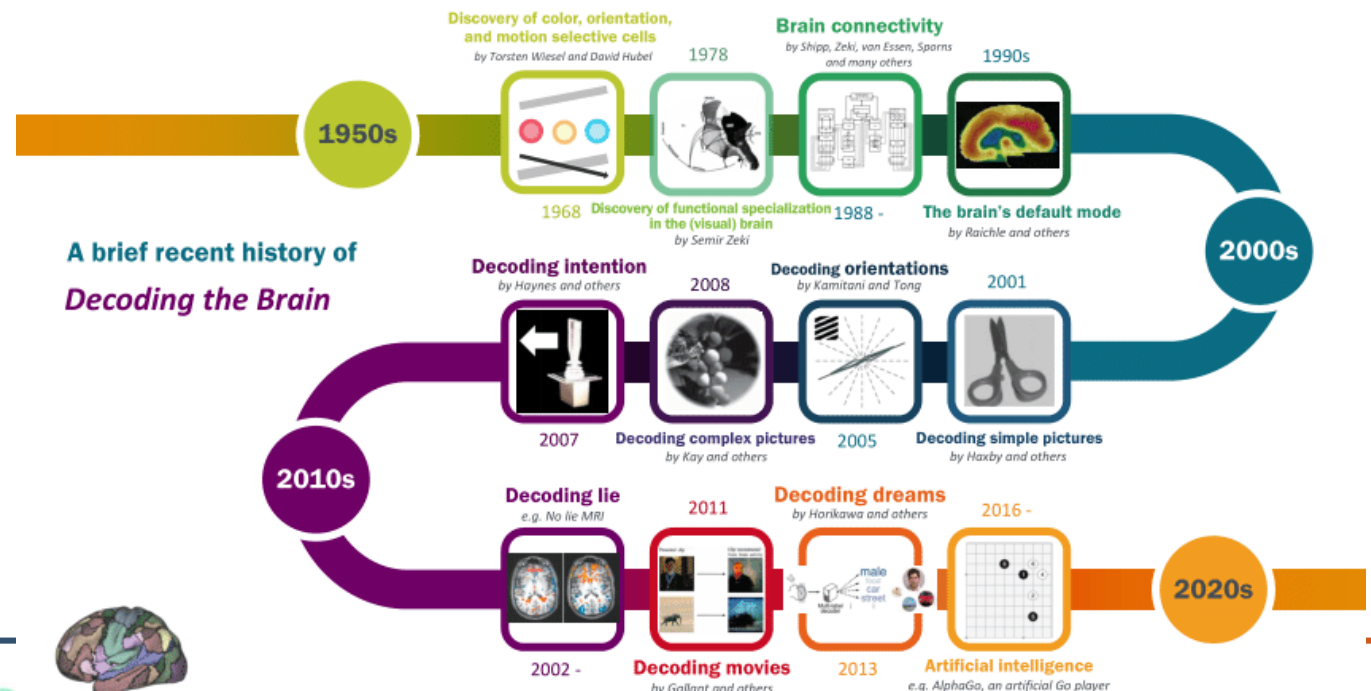
The convergence of computer science, digital technology and neuroscience → a major challenge for society.

→ **brain research has only progressed by putting aside this horizon**, in many respects out of reach, to focus on more accessible objectives
→ **Understand, relieve, heal, repair…**

Today, in 2023,
→ **The global race** is intensifying as neuroscience and computer science progress and is becoming more sophisticated as the neurosciences advance,

→ have given the field of neuroscience exceptional visibility in social, ethical, legal and political debates.

- **On what foundations has this discipline been built?**
- **What were the milestones along the way?**
- **What dynamics have driven it?**
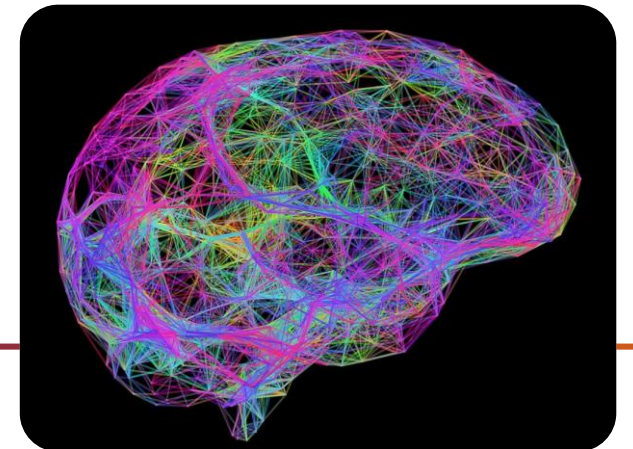
This convergence :

→ Is **a powerful tool** in the service of human beings, citizens and their well-being, medicine and human health.

→ **Enables us to unravel the mystery of the brain**, from its fundamental to its most functional aspects, without damaging it, and to carry out highly precise interventions.

→ **Changes our traditional philosophical and ethical conceptions** by providing information built on the biological basis of our moral behavior

→ **Generate brain databases**

→ **Enable us to unravel the mysteries of the brain, from its fundamental to its most functional aspects.** → Perception, language, motivation, reasoning, emotions …

→ Essential for understanding and anticipating the challenges facing our society.

→ **Go hand in hand with the development of certain brain exploration techniques: brain-computers interfaces or neurotechnologies.**
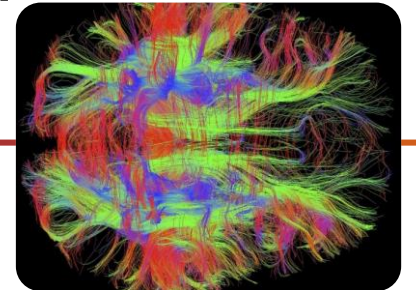
Brain-computer interfaces (BCI) / neurotechnologies

Research that aims **to understand the structure and functioning of the networks and brain** processes involved in emotions, interactions and behaviors **uses neurotechnologies.**

According to **OECD recommendation n°457** of 2019 and **the National Neurotechnology Charter (2022)** :

➢ Devices developed at the interface between brain and machine.
➢ Development **of recording and intervention** applications and devices
➢ To **visualize, decipher, decode and modulate** the brain's physiological functioning and pathological dysfunctions.
➢ Enable high-precision interventions

Their aim:
→ **Better understand** the structure and functioning of the brain and the cerebral processes involved in emotions, interactions and behaviors
→ **Record and intervene** on brain activity.
→ **monitor mental states** in daily life, to control and repair them in the event of failure.

→ Developed in academic laboratories and companies
→ **Already marketed to a healthy public.**
→ Invasive, semi-invasive, others are non-invasive **but no less intrusive.**
→ May or may not be coupled with AI, algorithms or machine learning.

These systems focus on detection, assessment, control and regulation :

- Stress, anxiety
- Concentration, motivation
- Emotions,
- Sleep,
- checking and controlling
- Attention
- Learning ...

Dreem© headsets,

To improve sleep.
(Thomas Pesquet took some with him on the ISS).

Melomind™ headsets, MyBrainTechnologies

To combat stress, relax, sleep better or concentrate more effectively.

Play on synaptic plasticity to promote relaxation through neurofeedback.

What status have BRAIN DATA ? What do they mean?

Brain privacy and freedom of thought, private spaces and individual identity need to be **integrated into our conception of human rights.**

What status do they have? What do they mean?

What kind of data are we talking about?
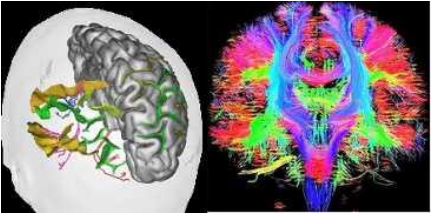
Combined with other data (genetic, anatomic, identity, health, location, financial ...)

→ could **provide very precise information on our behavior** and **may become sensitive data.**

  ✓ Must not be used without free and informed consent

  ✓ risk of manipulation of users, populations, groups of people, etc.

How far should we go? A new world of relationships is emerging.

Navigating between hopes and fears, these are powerful tools that can be used to serve human medicine, society and the citizen.

1. **Bearers of fantastic and revolutionary promises, dreams and hopes, with incredible benefits and potential**

<div align="center">

and at the same time

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2. Can be a risk and even a danger for humanity and human beings, raising concerns too.

→ **It's impossible to know how humans will react to a world in profound upheaval.**

Neurotechnologies can directly access, manipulate and emulate the structure of the brain, producing information about our identities, emotions and fears.

With this neuroscience/digital convergence, the resulting potential can easily become a threat to notions of human identity and dignity, freedom of thought, autonomy, mental privacy and well-being.

The decoding of the neural code, connections by WIFI / Bluetooth …

These technologies and techniques can enable developers, public or private, to abuse cognitive biases and trigger reactions and emotions without consent.

This can lead to attempts

➢ to control and manipulate an individual's behavior,

➢ To a loss of freedom to be and to decide,

➢ Incentives to consume,

➢ Surveillance, stigmatization or exclusion of some individuals.

➢ Risk of data piracy → cybersecurity, national defense, military use

This is not a technological debate, but a societal one → risk of manipulation of people, country, democracy …

→ **The frontier between medical and non-medical uses**, **between civil and military, is becoming very porous,** with different objectives and investments.

→ **Relationships to technology, the place of humans in the face of technology**, the fear of being replaced, real and virtual relationships are key issues.

→ **The prospect of monitoring states** of fatigue, stress, vigilance in different situations, of reading thoughts and controlling **them raises as many hopes as fears and calls for real caution.**

Neurosciences modify our traditional philosophical and ethical conceptions
by providing information about the biological basis of our moral behaviour

Opening a new era in the scientific understanding of neural circuits and allowing new methods of access to the fundamental mechanisms **underlying human identity, memories, emotions, personality and, more generally, our mind.**

→ Open **new ethical, social and legal issues.**

→ Open **new dilemmas for human rights:** the right to keep one's thoughts private, the right to freedom of thought.

→ **Call into question the legal concept of free will, and therefore the foundations of legal responsibility.**

The acceleration of these innovations makes it essential to regulate and guide scientific, research and business practices by :

1) **Consideration** of societal, ethical and legal issues;

2) **Design interdisciplinary** data collection / storage, evaluation and monitoring system

3) **Implementation of governance frameworks, risk mapping and decision-making**, adapted to the sociological, ethical and legal **values of France and Europe**.

Ethics in neuroethics ?

« Agis de telle sorte que les effets de tes actions soient compatibles avec la pertinence d'une vie authentique humain sur Terre ». *(Principe responsabilité, Hans Jonas, 1979, p30-31)*

« L'éthique est le mouvement même de la liberté qui cherche une vie bonne, dans la sollicitude envers autrui et dans un juste usage des institutions sociales. » Paul Ricoeur.

Ethics is a **Compass.**

→ Man is held responsible for his actions and his decision.

→ It means directing our actions towards the good of acting.

→ Ethics is not a set of rules to be followed in the present, it's everyone's duty to consider the impact of their actions in the future.

❖ **A sense of perspective and the tensions** involved in questioning

❖ **Uses** philosophy, the history of science and technology, neuroscience, medicine, humanity, sociology and anthropology **to provide food for thought and clarify questions.**

❖ **Highlighting dilemmas**

❖ **Does not provide answers.**

❖ **Purpose of ethics:**
  ❖ **opening the way** to good action/good living together with some consensus
  ❖ **Putting different points of view into dialogue** to reach a consensus on the purpose for which it was designed
  ❖ **Helps identify important questions** facing our society
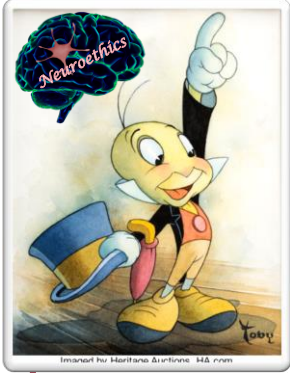
Neuroethics is

The constructive critical consciousness of neuroscience.

Young discipline (2002), but heir to the history of medicine, philosophy and neuroscience

Pluridisciplinary by birth, it is at the **intersection of** human sciences and neuroscience.

Examine the potential and limitations of neuroscientific questions and methodologies and **their impact on research and society**.

➔ Is structured through international projects and consortia, such as **the Human Brain Project, EBRAINS, International Brain Initiative …**

It provides a set of ethical, legal and philosophical tools for responsible research.
- Making research and thinking complementary, rigorous, relevant and therefore more reliable.
- Calling for a more reflective neuroscientific practice, supported by the social sciences.

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Ethical issues extend to the fundamental philosophical questions that neuroscience, neurotechnology and the digital/neuroscience convergence **are profoundly renewing :**

- Cerebral / mental integrity and human dignity
- Personal identity and psychological continuity
- Free will, individual freedom and autonomy of the human being.
- Mental privacy
- Accessibility and social justice
- Responsibility
- Vulnerability

Legal, ethical and epistemological frameworks necessary to allow **free and informed consent.**

→ **The challenge is to respect** **human rights, vulnerability** and **integrity** and **to preserve autonomy, human dignity, free will and freedom of thought.**

The ability of an individual to make decisions and act freely according to his or her own will.

→ **It is the inviolation of one's physical and psychological person.**

The ethical challenges raised by neuroscience :
a *Neuroethics by Design* for neurotechnologies.

Advances in neuroscience are changing the lives of citizens and patients.

➔ Having the ability to record and modulate brain activity by intervening on neuronal functioning calls into question the principles of :

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what a human being is, therefore of humanity…

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➔ They involve **the conception we have of ourselves as free and responsible persons and have profound consequences on human identity and society.**

Problematize ethics by design, in a digital context :

➔ not as a ruse in the sense of manipulation (which would translate into a form of ethical nudging that poses many ambivalences)

➔ but as a ruse in the sense of **an ingenious arrangement with the constraints posed by code, the complexity of architectures, interfaces, the environment and culture**.
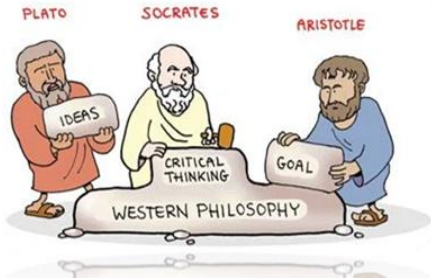
The challenge of Neuroethics by design: Could ethics by design be a way of bringing all these approaches together in the digital age?

→ **To articulate several ways of approaching ethics**, from conception through to the intended product :
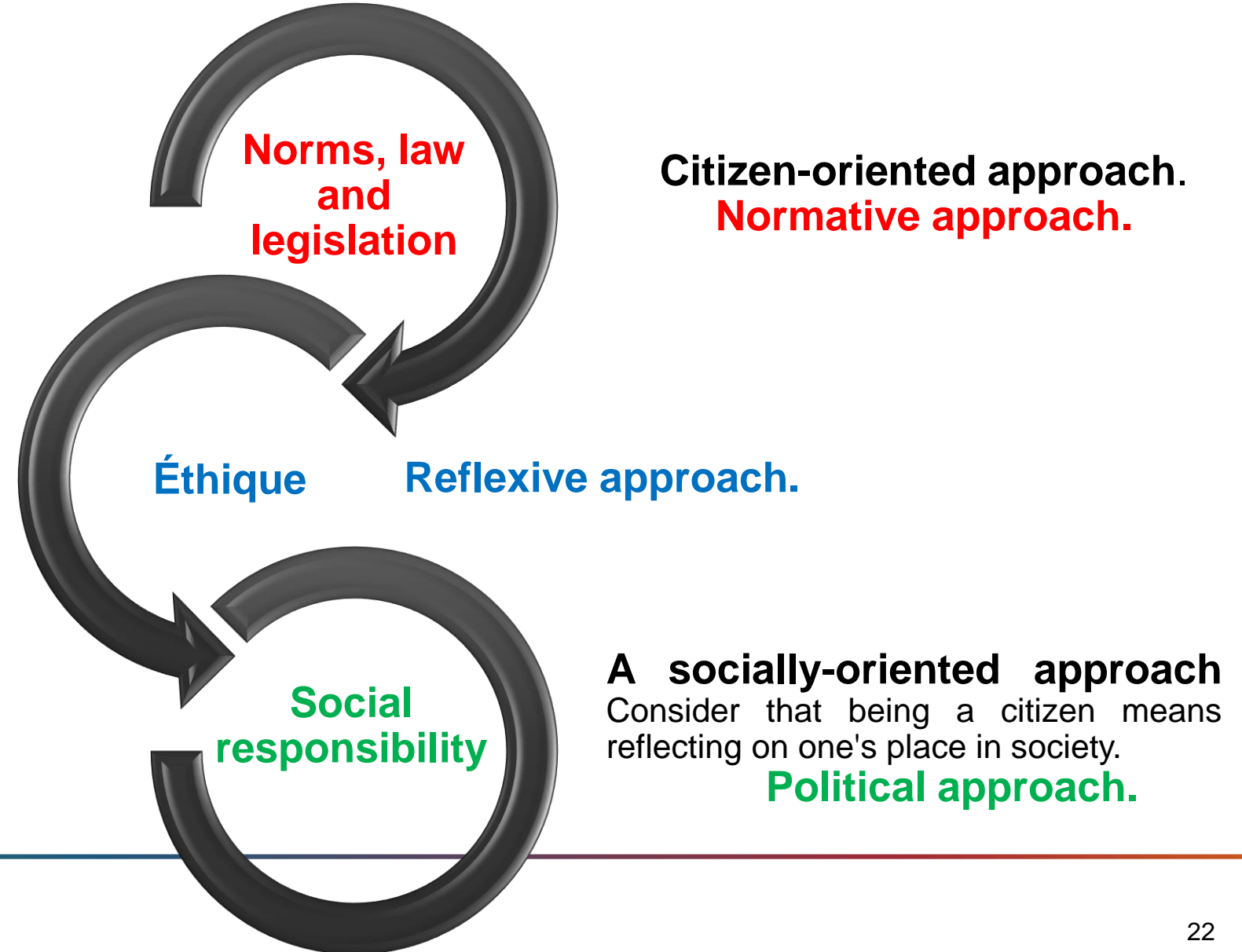
empirical ethics / ethics of anticipation / research ethics / digital / AI ethics

1. **Anticipation approach / anthropocentric approach :** can then focus on the actions and choices made by the actors working upstream of the design process → deontologism and consequentialism

2. Ethics by design as a priori "ethics by design": an **object-oriented approach :** The aim would then be to control from start to finish how the tools "should" behave, a priori, from a moral point of view.

3. Ethics by design, as **ethical mediation: a relational approach (subject-object)** : how techniques and their social and natural environment are jointly formed.

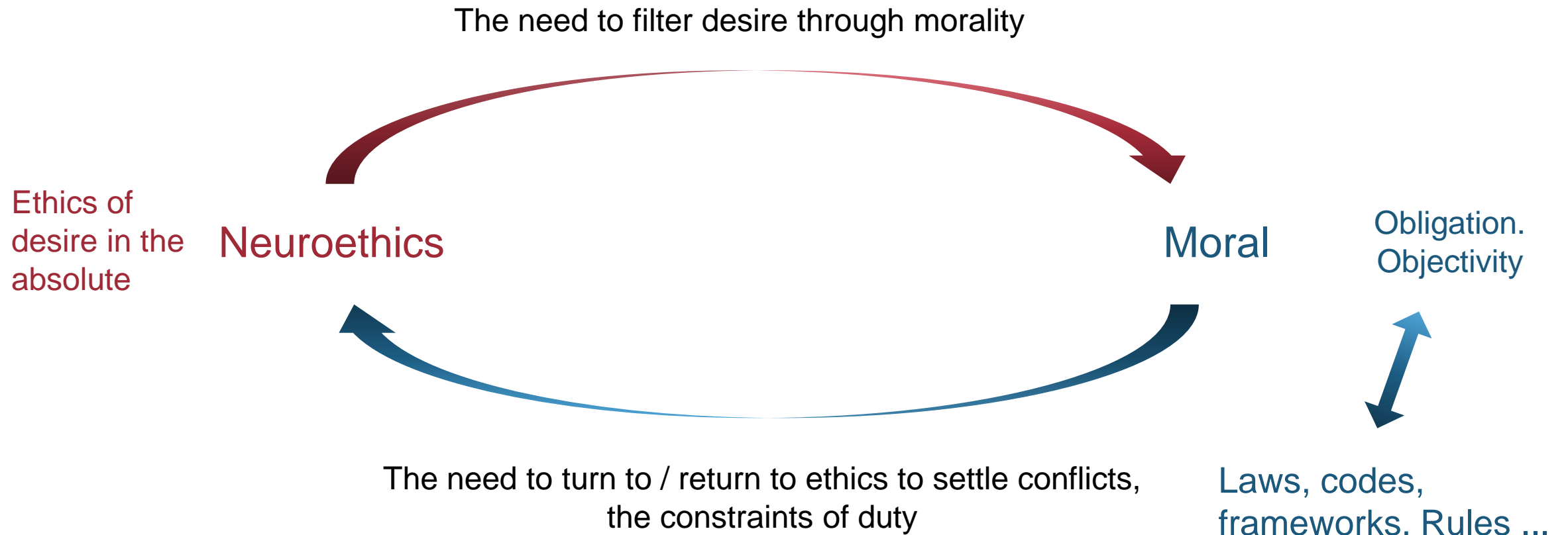# Neuroethics as a reflexive pivot

Inherited from the history of science and technologies, medicine and philosophy

Norms, law and legislation

Citizen-oriented approach.
Normative approach.

Éthique   **Reflexive approach.**

Social responsibility

A socially-oriented approach
Consider that being a citizen means reflecting on one's place in society.
Political approach.

« La sagesse pratique » according to Paul Ricoeur

The need to filter desire through morality

Ethics of desire in the absolute

Neuroethics

Moral

Obligation. Objectivity

The need to turn to / return to ethics to settle conflicts, the constraints of duty

Laws, codes, frameworks, Rules ...

Ethics and digital: when the law comes into play!

In EU and France → Adoption of laws and recommendations on AI, data and neurotechnologies:

- Data Act : 2022-23

- AI Act : 2022-23 https://artificialintelligenceact.eu/

- Digital Service Act and Digital Market Act in 2022-23

- General Data Protection Regulation or GDPR , 2018,

- OECD Recommandations n°449, 457, 463, in 2019 / 2021 and n°433, 2016,

- UNESCO Recommandations 2021 and 2023.

- WHO recommandation

- CNIL , french financial markets authority.

→ French charter for responsible neurotechnologies, 17 nov. 2022

→ **French Bioethics Law of August 2, 2021** :

→ is beginning to regulate neuroscience, artificial intelligence, algorithms, neurotechnologies, digital, scientific and health data, open science, big data…
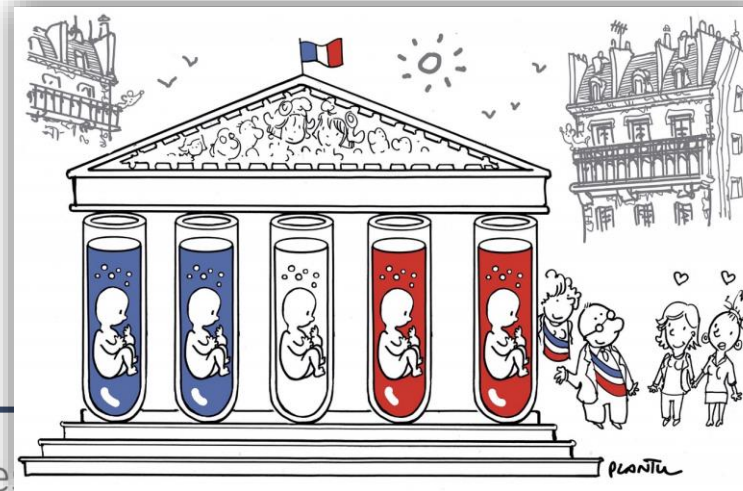
https://www.legifrance.gouv.fr/dossierlegislatif/JORFDOLE000038811571/

https://www.ccne-ethique.fr

https://cnnumerique.fr/

https://www.agence-biomedecine.fr/

The notion of Neurorights appears:

Neurorights, since 2021 (Chili, … USA, UE, Australie, UK, Japon, Israël …)

Bioethical and legal issues can only be addressed in the light of the complexity of living beings to understand and **respect human beings** in their **vulnerability,**

> **If neurotechnology interferes with free will, who is responsible for actions?**

New dilemmas for human rights:

→ **the right to keep one's thoughts private, the right to freedom of thought.**

→ **Challenge** the legal concept **of free will,** and thus **the basis of legal responsibility**.

> **Do current rights sufficiently protect individuals from the potential intrusions of neurotechnologies on brain activity?**

Formulating legislation in response to the challenges imposed by neuroscience and neurotechnology would:

✓ Limit the **potential abuses** of brain data mining

✓ To **integrate the development and use** of these technologies **with our fundamental societal and human values**.

4 new rights (Ienca and Andorno)

1. the right to cognitive freedom
2. the right to privacy
3. the right to mental integrity
4. the right to psychological continuity

The topics addressed in these recommendations

- The benefit/risk balance of neurotechnologies
- The values of personality, humanity, being a human being
- The concepts of normality and pathology
- The principles of personal autonomy
- The principles of moral and legal responsibility
- The notions of mental intimacy
- The notion of informed consent

To conclude

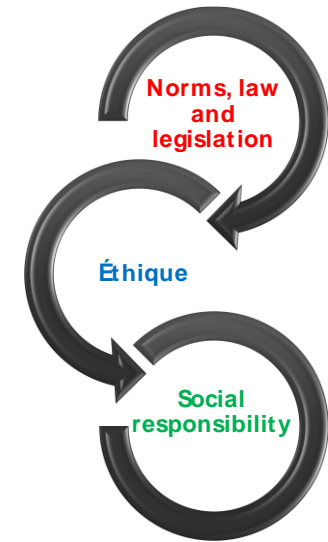**Their development calls for specific ethical vigilance.**

By reaching the market very quickly, they

✓ Disrupt the research process,

✓ Short-circuit the time for questioning the ethical and legal issues,

their uses, risks and benefits.

Requiring :

✓ **To reflect** on the **reliability of this research** → robustness and relevance for society.

✓ **To evaluate** the scientific validity of their implications

✓ **To examine their consequences** on the life in society and the conception that we have of an autonomous human being and responsible for his acts.

It is therefore a challenge for research and society to be transparent and to protect users.

Norms, law and legislation

Éthique

Social responsibility

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Thank you for your attention

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