

# RE-ENGINEERING HUMAN NATURE?

## Neurotechnology Governance

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# RESEARCH FIELD: SOCIETAL FUTURES

- **Objective & Outcome**
  - Interdisciplinary exchange on emerging technologies
  - Foresight Briefs on future issues and societal changes
- **Engagement and dialogue activities**
  - Public events with citizens and experts
  - Card game for citizen engagement activities



# WHAT ARE NEUROTECHNOLOGIES?

- **Neurons:** building blocks of the brain. When **thinking, moving** or **remembering**, electrical impulses are sent between neurons
- **Neurostimulation:** Using electrical or magnetic impulses to stimulate specific areas of the brain, e.g., to prevent epileptic seizures.
- **Sensory prostheses:** Technologies such as cochlear or retinal implants that restore hearing or vision.
- **Brain–computer interfaces (BCIs):** Measure neural activity and translate it into control commands (e.g. to operate computers or prosthetic limbs.



Deep Brain Stimulation, Cochlea Implantat, EEG

# EXAMPLES OF POTENTIAL APPLICATIONS

- **Medical restoration:** using implanted BCIs to let paralyzed patients control robotic limbs and regain sensory feedback (Copeland & Obama, 2016; Beinao-1, 2025).
- **Consumer communication:** developing non-invasive BCIs for thought-based typing and social interaction (Regina Dugan & Facebook, 2017)
- **Human–AI integration:** Implantable BCIs for therapy, enhancement, high-bandwidth brain–machine communication, Mind-Upload (Neuralink, 2023).



Top: Barack Obama & Nathan Copeland, Fist Bump (2016)  
 Mid: Regina Dugan (former Facebook, 2017);  
 Bottom left: Neuralink (2024); Beinao-1 (China, 2025)

# CRITICAL THEORY AND NEUROTECHNOLOGY

- **Digital capitalism** is expanding toward the brain
  - Commodification of brain data
- **Critical Theory** becomes essential for:
  - exposing power relations in emerging neurotechnologies
  - analysing ideologies of enhancement, optimization, and “techno-solutionism”
  - examining how discourse on neurotechnology redefines subjectivity, autonomy and “the mind”

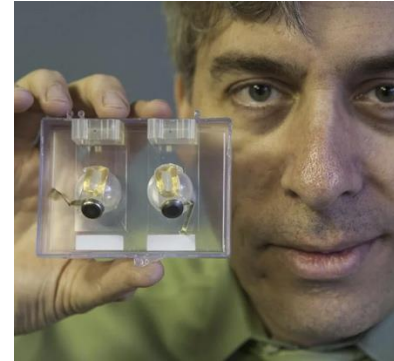


# FIVE CHALLENGES



# ETHICS & HUMAN RIGHTS

- Neurotechnologies access **thoughts, emotions, and cognitive processes**
  - fundamental questions about **mental privacy, cognitive freedom, and autonomy**
- Neuroprosthetics create new **dependencies on devices and companies**
  - highlighting issues of long-term responsibility, support, and safety, and obsolete abandonware
- Technologies reshape **social and cultural norms**
  - Ethics of enhancement, **ableism** and definition of a **“normal” mind** (esp. for non-medical applications).



Left: Robert Greenberg, Founder of Second Sight  
 Right: Barbara Campbell's implant switches off (2022)

# TECHNICAL & SECURITY RISKS

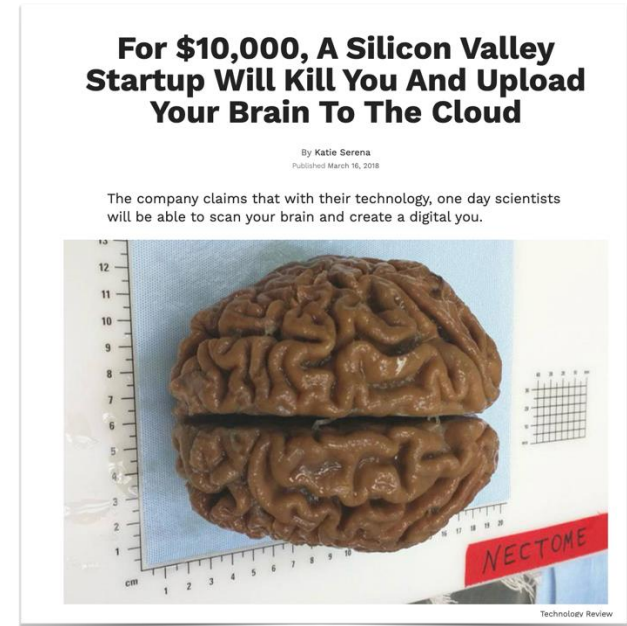
- **Technical vulnerabilities** and risk of **error or interference**
  - undermines human agency and creates **safety and governance risks**
- Neurotechnologies carry **dual-use** potential
  - enabling **therapeutic** applications and practices of **surveillance, manipulation, or military** enhancement.
- **Law enforcement** and **security contexts**
  - ethical and human-rights challenges, including **consent, self-incrimination, and responsibility.**



DARPA and the Brain Initiative (Fiori, 2019)

# SOCIETAL & CULTURAL

- Public **perceptions** & cultural **meaning**
  - shape how neurotechnologies are introduced, influencing trust in the technology and its developers.
- **Hype narratives** amplified by **corporate storytelling**
  - creating inflated expectations, misconceptions, and **sci-fi-inspired myths, obscure real capabilities**
- Reinforcing ideologies of **enhancement and optimization**
  - Risk **marginalizing disabled communities** and reproducing ableist assumptions
  - highlighting need for an **inclusive societal dialogue** around responsible integration of neurotechnologies.



Nectome Press Release

# LEGAL & REGULATORY

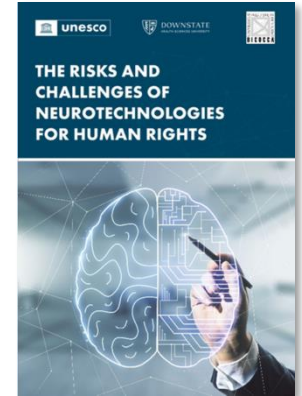
- Governance to balance **protection** and **innovation**
  - Ensuring to **safeguard public interests** without **suppressing beneficial research**.
  
- Global debates on **neurorights**
  - **neurodata protection**, especially for non-medical applications across work, education, entertainment, and wellness.
  
- Emerging regulations necessary?
  - EU AI Act, GDPR, DSA already sufficient?
  - Global human-centred to protect **autonomy**, **privacy**, and the **risks posed by AI-driven** analysis of neural data.



Chile pioneering in Neurorights

# POLITICAL & INTERNATIONAL

- Neurotechnology requires **global cooperation**
  - Ethical and legal issues are increasingly addressed in **UNESCO, OECD or the UN Human Rights Council**
  - 脑机接口研究伦理指引 (China, 2024)
- Diverging governance models and **national interests**
  - Ranging from **value-based frameworks** (EU), **market-driven models** (USA), **technology leadership** (China) make shared standards / ethics difficult.
- **Unequal participation** in research and innovation (globally)
  - making inclusive international norms and multilateral standards essential



Top left: OECD neurotechnology guide (2019)  
 Top right: UNESCO report on Neurotechnologies (2023-2025)  
 Bottom: Chinese BCI guidelines (2025)

# AUSTRIAN PERSPECTIVE

- Austria hosts a **strong neurotechnology ecosystem** with leading companies (e.g., **g.tec**), major **clinical centres (Vienna & Graz)** advancing neuroprosthetics, BCIs, and cognitive science.
- Platforms like the **Ars Electronica NeuroExperience Lab** and **Austrian Institute of Technology** foster societal engagement and public understanding of neurotechnologies.
- Austrian institutions (e.g. AIT, BMEIA) **contribute to European and global governance**, including EU-funded projects, parliamentary studies, and UNESCO negotiations, positioning Austria as a **proactive actor in responsible neurotechnology development**.



 Federal Ministry  
 European and  
 International Affairs  
 Republic of Austria



# CONCLUSION

- Neurotechnologies reshape core societal values by challenging autonomy, mental privacy, human rights, and established understandings of cognition and personhood.
- Technological, ethical, clinical, and social dimensions intersect, requiring governance that integrates research, regulation, public engagement, and cultural reflection.
- Hype, narratives, and global politics influence development pathways, reinforcing the need for critical theory to expose underlying ideologies and power structures.
- Inclusive, democratic dialogue strengthens societal trust and ensures that neurotechnologies serve collective well-being rather than narrow interests.
- A continuous global dialogue is necessary to strengthen responsible innovation, international governance and shape the technology for the good of all mankind.

谢谢

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# ETHIK & MENSCHENRECHTE

- **Chile:** Neurorechte in der Verfassung (2021)
  - Erstes Land mit Gesetz zum Schutz der **geistigen Privatsphäre**, der **Willensfreiheit** und der **Nichtdiskriminierung** beim Umgang mit Neurotechnologien
- Und **Österreich?**
  - Ist die DSGVO, DSA oder auch AI-Act ausreichend für den **Schutz der geistigen Privatsphäre?**
  - Fordert die invasive Natur der Neurodatenerfassung **neue Gesetze?**
  - Welche **Leitlinien** braucht es, um mögliche Risiken und Gefahren zu regulieren?



Allan McCay

**TECHETHOS**  
FUTURE ○ TECHNOLOGY ○ ETHICS

Key messages for the ethical governance of neurotechnologies



Oben: Artikel zu Neurorechte in Chile (Allan McCay, 2022)  
Mitte: TechEthos Policy Empfehlungen zur ethischen Governance von Neurotechnologien (2023)  
Unten: UNESCO Entwicklung von ethischen Leitlinien zur Gestaltung von Neurotechnologien (2024)

# ANWENDUNGEN

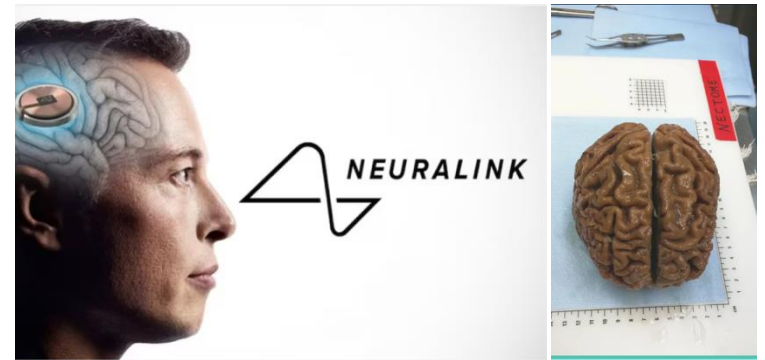
- **Medizinische Anwendungen:**
  - Parkinson, Schlaganfall, neurologische Erkrankungen
  - (Wieder-)Herstellung der Sinne
- **Ethische Herausforderungen:**
  - Datensicherheit & Privacy
  - Was definiert den „gesunden“ Menschen?
  - Abhängigkeit von Technologien und Unternehmen
- Beispiel:
  - **Second Sight** Netzhautimplantate werden eingestellt (2022)



Oben: Barack Obama & Nathan Copeland, Fist Bump (2016)  
 Unten links: Robert Greenberg, Mitbegründer von Second Sight  
 Unten rechts: Barbara Campbells Netzhautimplantat schaltete sich aus (2022)

# VISIONEN

- Vision: **Human Enhancement**
  - Die Erweiterung der menschlichen Fähigkeiten
  - Hybris? 50 Jahre Entwicklung vs. Evolution
- **Neuroenchantment:** Mythen und Vorstellungen rund um Neurotechnologien
  - Science-Fiction, Hypes, Übertreibungen
  - Unternehmensvisionen
- **Utopien:** Effizienzsteigerung am Arbeitsplatz, Direkte Kommunikation, Mind-Upload, uvm.
- **Dystopien:** Überwachung, Manipulation von Gedanken, Datenmissbrauch, Abhängigkeiten



Oben: Regina Dugan (ehem. Facebook, 2017);  
 Unten links: Elon Musk's Neuralink (2024);  
 Unten rechts: Nectome Press Release (2018)