IS A GLOBAL GOVERNANCE FRAMEWORK NECESSARY FOR NEUROTECHNOLOGY?

Foreword by Clare Stark*

Neurotechnology is often recognized as "the field of devices and procedures used to access, monitor, investigate, assess, manipulate, and/or emulate the structure and function of the neural systems of animals or human beings."¹ Neurotechnology can help people with paralysis to move and feel, deaf people to hear, and blind people to partially see.² Neurotechnology also has the potential to treat many diseases of the nervous system, neurological diseases, and mental illnesses, which represent a high cost in terms of health care expenditures.³ According to the Organisation for Economic Co-operation and Development (OECD), mental health illnesses drive economic costs of more than 4% of gross domestic product (GDP).⁴

Neurotechnology is a booming sector. Over the past decade, the overall investments of 1,200 NeuroTech companies have amounted to \$33.2 billion, and the numbers are still set to grow.⁵

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^{1.} Int'l Bioethics Comm., Rep. of the Int'l Bioethics Comm. of UNESCO (IBC) on the Ethical Issues of Neurotechnology, ¶ 6, U.N. Doc. SHS/BIO/IBC-28/2021/3 Rev. (Dec. 15, 2021) [hereinafter Rep. of the IBC on the Ethical Issues of Neurotechnology].

^{2.} See id. ¶¶ 25–26; Neurotechnology Provides Near-Natural Sense of Touch, DEF. ADVANCED RSCH. PROJECTS AGENCY (Sept. 11, 2015), https://www.darpa.mil/news-events/2015-09-11; Brain Implant Restores Partial Vision to Blind People, THE GUARDIAN (July 13, 2019, 2:51 AM), https://www.theguardian.com/science/2019/jul/13/brain-implant-restores-partial-vision-toblind-people.

^{3.} See Rep. of the IBC on the Ethical Issues of Neurotechnology, *supra* note 1, ¶ 9; Clifton L. Gooch, Etienne Pracht, Amy R. Borenstein, *The Burden of Neurological Disease in the United States:* A Summary Report and Call to Action, 81 ANNALS NEUROLOGY 479, 479–82 (2017).

^{4.} ORG. FOR ECON. COOP. & DEV. [OECD], A NEW BENCHMARK FOR MENTAL HEALTH SYSTEMS: TACKLING THE SOCIAL AND ECONOMIC COSTS OF MENTAL ILL-HEALTH (2021), https://www.oecdilibrary.org/sites/4ed890f6en/index.html?itemId=/content/publication/4ed89 0f6-en; see also Gooch et al., supra note 3, at 479–82.

^{5.} See NEUROTECH ANALYTICS, NEUROTECH INDUSTRY: GLOBAL NEUROTECH INDUSTRY INVESTMENT DIGEST 2021, at 3 (2021), http://analytics.neurotech.com/neurotech-investment-digest.pdf.

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Neurotechnology has implications for the health sector⁶ but also for commercial purposes,⁷ including in areas of education,⁸ gaming,⁹ entertainment,¹⁰ transportation,¹¹ and much more but at what expense to our mental integrity and our cognitive liberty? New advances in neurotechnologies include translating thought to text,¹² controlling machines through brain to computer interfaces,¹³ "develop[ing] wearables to infer a person's intended speech or movement,"¹⁴ monitoring attention levels and engagement,¹⁵ and implanting false memories into an animal's brain.¹⁶

13. See generally Ferris Jabr, *The Man Who Controls Computers with His Mind*, N.Y. TIMES MAG., https://www.nytimes.com/2022/05/12/magazine/brain-computer-interface.html (May 13, 2022) (explaining the story of Dennis DeGray, a man who was permanently paralyzed from the neck down, and subsequently participated in a study at Stanford University where researchers imbedded neural interfaces in his brain and he learned to control various forms of technology with his mind).

14. *See* Dario Gil, *The Ethical Challenges of Connecting Our Brains to Computers*, SCI. AM. (Dec. 26, 2020), https://www.scientificamerican.com/article/the-ethical-challenges-of-connecting-our-brains-to-computers/.

^{6.} See Rep. of the IBC on the Ethical Issues of Neurotechnology, supra note 1, at ¶ 14.

^{7.} See id.

^{8.} Id.

^{9.} See Slava Bobrov, What if You Could Connect Your Brain and Body to a Video Game? NeurotechGaming 2020, MEDIUM (July 27, 2020), https://medium.com/neurotechx/what-if-you-could-connect-your-brain-and-body-to-a-video-game-neurotechgaming-2020-3abefa0a56be ("On July 18th–19th NeuroTechX—the largest international community of neurotechnology enthusiasts—hosted a global online event series that took attendees through a deep dive into the intersection of gaming and neurotechnology.").

^{10.} See Braintech Startup Reinventing Entertainment, YNEURO, https://www.yneuro.com/ (last visited Apr. 15, 2023).

^{11.} See Stephen H. Fairclough & Fabien Lotte, Grand Challenges in Neurotechnology and System Neuroergonomics, FRONTIERS IN NEUROERGONOMICS, Nov. 30, 2020, at 1, 1.

^{12.} See Jo Best, How Brain-Computer Interfaces Are Turning Thoughts into Text, ZDNET (Mar. 8, 2022), https://www.zdnet.com/article/how-brain-computer-interfaces-are-turning-thoughts-into-text/.

^{15.} See Ian Daly, Could Neurotechnology Make Lawyers Smarter Workers?, DAILY REC. (Sept. 2, 2022, 3:00 AM), https://omahadailyrecord.com/content/could-neurotechnology-make-lawyers-smarter-workers.

^{16.} See generally Mo Costandi, False Memories Implanted into the Brains of Sleeping Mice, THE GUARDIAN (Mar. 9, 2015, 12:00 PM), https://www.theguardian.com/science/neurophilosophy/ 2015/mar/09/false-memories-implanted-into-the-brains-of-sleeping-mice ("Neuroscientists in France have implanted false memories into the brains of sleeping mice. Using electrodes to directly stimulate and record the activity of nerve cells, they created artificial associative memories that persisted while the animals snoozed and then influenced their behaviour when they awoke.").

The capabilities of neurotechnology create a new commercial market for neural data that raises ethical concerns related to "the autonomy, privacy, responsibility, consent, integrity and dignity of a person."¹⁷ Is the brain sufficiently protected, or is it at risk of being hacked, manipulated, or controlled? This is particularly worrisome as inferences that can be drawn from brain data may also enable prediction of an individual's behavior.¹⁸ Along the same lines, are humans adequately from new forms of surveillance, called protected neurosurveillance¹⁹ Neurosurveillance is the monitoring of brain data for "attentional engagement or awareness," in places such as the workplace, school, or military.²⁰ Some governments have already used neurotechnology to detect changes in emotional states in employees or to monitor the attention levels of students.²¹

In light of neurotechnology advancements, it is worth considering what ethical questions neurosurveillance raises for the justice system, the labor market, and more widespread use across a host of other sectors and society at large? Neurotechnology also uses artificial intelligence for the collection of data, which increases risks of bias and discrimination.²² Moreover, ethical concerns are raised relating to human enhancement. To what extent should humans allow neurotechnology to go beyond restoring the abilities of people who are ill and with impairments to "enhancing, or

^{17.} See Gil, supra note 14.

^{18.} See Rep. of the IBC on the Ethical Issues of Neurotechnology, supra note 1, ¶ 151.

^{19.} See id. at ¶ 183(d)(ii).

^{20.} *Id.; see also* Karl E. Friedl, *Military Applications of Soldier Physiological Monitoring*, 21 J. SCI. & MED. SPORT 1147, 1150 (2018).

^{21.} See Valerio De Stefano, Neuro-Surveillance and the Right To Be Human at Work, ONLABOR (Feb. 15, 2020), https://onlabor.org/neuro-surveillance-and-the-right-to-be-humans-at-work/; Mojtaba Taherisadr, Berken Utku Demirel, Mohammad Abdullah Al Faruque & Salma Elmalaki, Future of Smart Classroom in the Era of Wearable Neurotechnology 2–3 (Oct. 21, 2021) (unpublished manuscript), https://arxiv.org/pdf/2110.11475.pdf.

^{22.} See Ankita Moss, The Coded Bias Within Neurotechnology, NEUROETHICS BLOG (Apr. 27, 2021), http://www.theneuroethicsblog.com/2021/04/the-coded-bias-within-neurotechnology .html.

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'augmenting'" healthy people?²³ Providing equal access to these technologies should be considered; if only the wealthy have access to cognitive and physical augmentation, these technologies risk creating new types of inequalities.²⁴

The International Bioethics Committee (IBC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) highlighted the ethical, legal, and social issues of neurotechnologies in its report published in December 2021.²⁵ The report notes the benefits that may result from the development of neurotechnologies but also pointed out some fundamental human rights that could be jeopardized by this technology.²⁶ These fundamental human rights include:

- a. "human dignity," as it pertains to the issue of respecting the "integrity" of each individual's brain,
- b. "[p]ersonal identity" and the "ability to think and feel for ourselves",
- c. "freedom of thought" and "free will", if devices "interfere with our [judgment and] decision-making" abilities,
- d. "privacy"/"confidentiality" of our thoughts and "[t]he inference that can be drawn from brain data analysis [to] predict[] . . . an individual's behavior [with] the risk of neurosurveillance,"
- e. equal access/"[d]istributive justice . . . if their availability and accessibility [lead to] increase[d] inequalities,"

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^{23.} *See* Federico Mantellassi, *In Focus: The Challenges of Neurotechnology*, GENEVA CTR. FOR SEC. POL'Y (Apr. 11, 2022), https://www.gcsp.ch/global-insights/focus-challenges-neuro technology.

^{24.} Id.

^{25.} See generally Rep. of the IBC on the Ethical Issues of Neurotechnology, supra note 1.

^{26.} See id. at ¶ 183.

- f. the risk of "discrimination" if there is "bias" in the "algorithms" used,
- g. the risk of "[m]isuse," "unauthorized," or "coercive" use for "malicious" purposes,
- h. the issue of "[a]ugmentation" and "enhancement",
- i. "[i]nformed consent:" Given the potential for influence regarding "perce[ived] . . . personal identity and cognitive abilities," and
- j. the "[i]nterests of the child", as a child's brain is "rapidly changing" and determining the life of the individual.²⁷

Given the risks that neurotechnology poses to fundamental human rights, and as it rapidly develops and becomes increasingly available on the global marketplace, it is important to consider how to ensure sufficient protection of the brain. More specifically, the question that arises today is whether current human rights laws sufficiently protect the individual against the potential intrusions of neurotechnologies into brain activity.²⁸

To protect against the risks associated with neurotechnology, the notion of neurorights emerged.²⁹ Neurorights, as defined by the Neurorights Initiative, are "a new international legal framework for human rights specifically aimed at protecting the brain and its activity as neurotechnology advances."³⁰ This begs the question: do we need neurorights? Proponents of neurorights call for "a new international legal and human rights framework [that] can be understood as a new set of human

^{27.} See id.

^{28.} See id. at ¶ 163.

^{29.} See Frameworks to Inform Neurotechnology Policy, THE NEURORIGHTS FOUND.,

https://neurorightsfoundation.org/mission (last visited Apr. 15, 2023).

^{30.} What Are Neurorights and Why Are They Vital in the Face of Advances of Neuroscience?, IBERDROLA, https://www.iberdrola.com/innovation/neurorights (last visited Apr. 15, 2023).

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rights [for] the brain."³¹ Led by Rafael Yuste, the NeuroRights Initiative proposes five neuro-rights: "Mental Privacy," "Personal Identity," "Free Will," "Fair Access to Mental Augmentation," and "Protection from Bias."³²

Although there has not yet been widespread global consensus on what constitutes these neurorights, neurorights are being translated into legal provisions to some extent.³³ The most well-known provision is an amendment to the Chilean constitution, which now protects mental identity as a fundamental right.³⁴ The governments of Spain and Argentina are also contemplating proposed neuroprotection laws,³⁵ and France introduced a bill to protect against the abusive use of neural data in its framework of the revision of the bioethics law in 2021, articles 18 and 19.³⁶

The European Union is also investigating the issue of how to treat neural data.³⁷ In May 2022, the European Parliament

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^{31.} Rafael Yuste, Jared Genser & Stephanie Herrmann, *It's Time for Neuro-Rights*, HORIZONS: J. INT'L RELS. & SUSTAINABLE DEV., Winter 2021, at 154, 160.

^{32.} See Frameworks to Inform Neurotechnology Policy, supra note 29.

^{33.} See, e.g., What Are Neurorights and Why Are They Vital in the Face of Advances of Neuroscience?, supra note 30 ("Neurorights can be defined as a new international legal framework for human rights specifically aimed at protecting the brain and its activity as neurotechnology advances"); Yuste et al., *supra* note 31, at 160–61 ("To close protection gaps under the existing international human rights system and to protect people from the unique concerns associated with neurotechnology, researchers and bioethicists have proposed a new international legal and human rights framework—the so-called neuro-rights—which can be understood as a new set of human rights to protect the brain."); *see also* Constitución Política de la República de Chile [C.P.]; GOBIERNO DE ESPAÑA: PLAN DE RECUPERACION, TRANSFORMACION Y RESILIENCIA, CHARTER OF DIGITAL RIGHTS 28 (2021), https://portal.mineco.gob.es/RecursosNoticia/mineco/prensa/noticias/2021/SPAIN_Charter-of-Digital-Rights.pdf.

^{34.} *See* Constitución Política de la República de Chile [C.P.] art. 19; *see also NeuroRights in Chile*, THE NEURORIGHTS FOUND., https://neurorightsfoundation.org/chile (last visited Apr. 15, 2023).

^{35.} See Lorena H. Guzmán, Chile: Pioneering the Protection of Neurorights, U.N. EDUC., SCI. & CULTURAL ORG., https://en.unesco.org/courier/2022-1/chile-pioneering-protection-neurorights (last visited Mar. 1, 2023).

^{36.} *See* Code civil [C. civ.] [Civil Code] art. 16-14 (Fr.) (stating brain imaging techniques may only be used for medical or scientific research purposes or in the context of forensic examinations).

^{37.} See Neurodiversity – Understanding the Legal and Social Impacts, EUR. COMM'N (Aug. 17, 2018), https://ec.europa.eu/research-and-innovation/en/projects/success-stories/all/neurodiversity-understanding-legal-and-social-impacts.

adopted a resolution on artificial intelligence in a digital age (2020/2266(INI)).³⁸ This resolution relates to the use of AI technologies in the health sector and the concept of brain imaging, emphasizing that the EU should contribute to "the development of safe neurological technologies."³⁹ Also, the European Parliament calls on the European Commission to consider the initiative on neurorights, which aims to protect the human brain and its activity as neurotechnology advances.⁴⁰

The OECD has adopted a Recommendation on the Responsible Innovation in Neurotechnology,⁴¹ which "aims to guide governments and innovators to anticipate and address the ethical, legal and social challenges raised by novel neurotechnologies while promoting innovation in the field."⁴² However, the Recommendation is more directed towards ensuring the responsible use of this technology rather than protecting the neurorights of individuals against possible harms.⁴³

In its 2021 report, the IBC concluded that Member States should take great care in developing neurorights and assess how neurotechnology impacts and poses challenges to existing human rights.⁴⁴ The report called for protection of neurorights in order to protect the brain from the risks identified in the report.⁴⁵ Further, the report found that certain human rights that are already recognized in international law encompass neurorights.⁴⁶ These rights are based on the recognition of the fundamental rights of all individuals to physical and mental

^{38.} See Resolution on Artificial Intelligence in a Digital Age, EUR. PARL. DOC. P9 TA(2022)0140 (May 4, 2022) [hereinfter EUR. PARL. DOC. P9 TA(2022)0140].

^{39.} See id. at ¶ 36.

^{40.} See id. at ¶ 247.

^{41.} See generally Org. for Econ. Co-operation & Dev. [OECD], Recommendation of the Council on Responsible Innovation in Neurotechnology, OECD Legal Doc. 0457 (Oct. 12, 2019) [hereinafter Recommendation of the Council on Responsible Innovation in Neurotechnology].

^{42.} *Id.* at 3.

^{43.} See id.

^{44.} Rep. of the IBC on the Ethical Issues of Neurotechnology, *supra* note 1, ¶ 17.

^{45.} See id. at $\P\P$ 184–95.

^{46.} *Id.* at \P 185.

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integrity, mental privacy, freedom of thought and free will, the right to enjoy the benefits of scientific progress, and the need to protect and promote these rights with respect to neurotechnology.⁴⁷ It also includes the right to decide freely and responsibly on matters related to the use of neurotechnology, free from any form of discrimination or coercion.⁴⁸

"To this end, the IBC calls on UNESCO to use its unique global mandate in the ethics of science and technology, and its multifaceted expertise, to address the challenges highlighted by this report"⁴⁹ UNESCO would be able "[t]o provide new insights into the interpretation and application of existing human rights instruments by legislative bodies and courts in relation to the new challenges"⁵⁰ It also calls upon the Organization "[t]o organize global dialogues in the field of human rights toward building a consensus on the nature and substance of neuro-rights."⁵¹

In 2021, the 193 Member States of UNESCO's General Conference adopted the first global normative instrument on the ethics of AI, which highlighted the importance of addressing AI-powered systems for neurotechnology and brain-computer interfaces.⁵² Member States may have an take further opportunity to action later in 2023.53 The Director-General of UNESCO decided to introduce an item to its Executive Board on a preliminary study on the technical legal aspects relating the desirability and to of

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^{47.} See Marcello Ienca, On Neurorights, FRONTIERS HUM. NEUROSCIENCE, Sept. 24, 2021, at 1, 7–9.

^{48.} See id. at 5–6.

^{49.} Rep. of the IBC on the Ethical Issues of Neurotechnology, *supra* note 1, ¶ 186.

^{50.} *Id.* at ¶ 186(a).

^{51.} Id. at ¶ 186(c).

^{52.} See UNESCO Adopts First Global Standard On The Ethics Of Artificial Intelligence, UNESCO, https://www.unesco.org/en/articles/unesco-adopts-first-global-standard-ethics-artificial-intelligence?TSPD_101_R0=080713870fab2000de4725d13d740d189904636ee26f7506e5a67e7e98f 23843de763d07a1a0283908cbb4d26f143000db0bf84b1290914e96f1516185a55effabb472fe042a0a d8acab5993c9fbb2762bad0a9820fa1abee68bd688ff02f8cb (Apr. 21, 2022).

^{53.} *See Executive Board*, UNESCO, https://www.unesco.org/en/executive-board (last visited Apr. 15, 2023).

standard-setting instrument on the ethics of neurotechnology.⁵⁴ The Executive Board adopted a decision in May 2023 and decided to include this item on the provisional agenda of UNESCO's General Conference in November 2023.⁵⁵ They recommended that the General Conference, at its 42nd session, invite the Director-General to submit a draft text of a new standard-setting instrument on the ethics of neurotechnology which would be in the form of a recommendation for consideration by the General Conference at its 43rd session.⁵⁶

Additionally, the U.N. Human Rights Council will be "prepar[ing] a study ... on the impact, opportunities[,] and challenges of neurotechnology with regard to the promotion and protection of all human rights "57 The U.N.'s study will "includ[e] recommendations on how human rights opportunities, challenges[,] and arising from gaps neurotechnology could be addressed by the Council and its special procedures and subsidiary bodies[-]in a coherent, holistic, inclusive and action-oriented manner "⁵⁸ The study is scheduled to be presented to the fifty-seventh session of the Human Rights Council and will be an important contribution to the global neurotech debate.⁵⁹

Although there are a number of national and regional initiatives underway to protect mental privacy, there is currently no global governance framework which sets the global standard for the protection of these rights.⁶⁰ A

^{54.} See UNESCO, PRELIMINARY STUDY ON THE TECHNICAL AND LEGAL ASPECTS RELATING TO THE DESIRABILITY OF A STANDARD-SETTING INSTRUMENT ON THE ETHICS OF NEUROTECHNOLOGY 4 (2023), https://unesdoc.unesco.org/ark:/48223/pf0000385016.

^{55.} See UNESCO, DRAFT DECISIONS RECOMMENDED BY THE PROGRAMME AND EXTERNAL RELATIONS COMMISSION (PX) 9 (2023), https://unesdoc.unesco.org/ark:/48223/pf0000385470.

^{56.} See id.

^{57.} G.A. Res. 51/3 (Sept. 29, 2022).

^{58.} Id.

^{59.} See id.; see also Regular Sessions, UNITED NATIONS HUM. RTS. COUNCIL,

https://www.ohchr.org/en/hr-bodies/hrc/regular-sessions (last visited Apr. 15, 2023).

^{60.} *See, e.g.,* Constitución Política de la República de Chile [C.P.] art. 19 (outlining the role of the state and the individual in health protections in the constitution for the country of Chile); Eur. Parl. Doc. P9 TA(2022)0140, *supra* note 38 (admonishing the utilization of "AI-fuelled surveillance in the workplace" due to its "negative effects on the mental health of workers");

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comprehensive and multilayered approach to governance is needed, including both codes of conduct for the industry as well as regulatory frameworks. Such an approach would ensure that the technology is developed in a manner that protects the neurorights of individuals while ensuring the responsible development of this technology. As indicated in UNESCO's IBC report, Codes of Conduct should be based on the OECD Recommendation and not only restricted to the health sector but expanded to the wider development of neurotech devices for the commercial sector and other sectors.⁶¹ Doing so would "enhance security standards of neurodevices, algorithms and data-sharing infrastructures and develop a user-centered design."⁶²

A multilayered governance approach would also require ensuring that the public is educated about the issue and is meaningfully engaged in deciding what should or should not be accepted.63 It is of critical importance that the media recognizes its role and the responsibility in raising public awareness of these issues and helping the public understand the implications and significance of the same.⁶⁴ This is especially true because neurotech products are already hitting the consumer market, with risks to autonomy, privacy, responsibility, consent, integrity, and dignity of a person.⁶⁵ As such, a multidisciplinary global neurotech debate, which defines a global governance roadmap to strengthen the regulation of neurotechnology, is imperative in order to guide neurotech's rapid development, deployment, and use before it is too late.66

Yuste et al., *supra* note 31, at 164 ("[T]he United Nations should forge a path for states by setting global standards for the protection of neuro-rights.").

^{61.} Rep. of the IBC on the Ethical Issues of Neurotechnology, supra note 1, \P 193(a); see also Recommendation of the Council on Responsible Innovation in Neurotechnology, supra note 41, $\P\P$ 1–4.

^{62.} Rep. of the IBC on the Ethical Issues of Neurotechnology, supra note 1, ¶ 193(a).

^{63.} See id. at ¶ 191(c).

^{64.} See id. at ¶ 194.

^{65.} See id. at ¶ 11.

^{66.} See id. at ¶ 187.

Given neurotechnology's rapid advancement, neurotechnology has crucial implications on various sectors and presents unique challenges for regulators. To address these considerations, the Drexel Law Review and Drexel University Kline School of Law Center for Law and Transformational Technology came together to co-host a symposium on neurotechnology and law on October 28, 2022.⁶⁷ This symposium, Neurotech: Neurotechnology and the Law, provided a platform to discuss various aspects of neurotechnology and an opportunity for experts to discuss how to develop global governance for neurotechnology.⁶⁸ It provided a forum for interdisciplinary presentations and contemplative conversation on the issue with global experts working in neurotechnology.⁶⁹ Global experts discussed the ethical, legal, and policy considerations in the development of neurotechnologies and contemplated solutions.⁷⁰ The experts' conversation in the symposium is reflected and continued in this issue of the Drexel *Law Review*.⁷¹ Each of the authors bring their unique insight to the issue, providing a well-rounded, multidisciplinary consideration of neurotechnology.

^{67.} *Symposia*, DREXEL L. REV., https://drexel.edu/law/lawreview/symposia/overview/ (last visited Apr. 15, 2023).

^{68.} Id.

^{69.} Id.

^{70.} Id.

^{71.} Id.