HUMAN NEURO-RIGHTS

Neuroderechos humanos

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ABSTRACT

The invasion of the rights to privacy and intimacy, a result of massiveness achieved by the new information and communication technologies, becomes today a greater threat with the possibility that third parties access our thoughts and manipulate our memory. Technology applied to neuroscience may make this possible in the near future. Although at present the legal regulation of the use of neurotechnologies seems unnecessary, the question becomes relevant when they are used to map and modify the activity of the human brain. The future possibilities of the use of neurotechnologies will affect not only our lifestyle, but the very nature of what we understand today as the human being.
In this first article we present the intersections between neurotechnology and law, which generates a new field called Neuro-Law. Along with the current legal disruption taking place, we describe the basic characteristics of the proposal to affirm entirely new human rights based on new technologies applied to Neuroscience.

Keywords: human rights / neurotechnology / neuro-rights / legal disruption / NeuroLaw

RESUMEN

La invasión de los derechos a la privacidad e intimidad producto de la masividad lograda por las nuevas tecnologías de la información y la comunicación, deviene hoy una amenaza mayor frente a la posibilidad que terceros accedan a nuestros pensamientos y puedan manipular nuestra memoria. La tecnología aplicada a la neurociencia puede volver esto posible en un futuro cercano. Si bien al presente la regulación legal del uso de las neurotecnologías parece innecesaria, la cuestión cobra relevancia cuando son utilizadas para mapear y modificar la actividad del cerebro humano. Las posibilidades futuras del uso de neurotecnologías, afectarán no solo nuestro estilo de vida, sino la misma naturaleza de lo que hoy entendemos es el ser humano. En este primer artículo presentamos las intersecciones entre neurotecnología y derecho, generando un espacio llamado Neuroderecho. Frente a la disrupción jurídica en marcha, describimos las características básicas de la propuesta de afirmar nuevos derechos humanos fundados en las nuevas tecnologías aplicadas a la Neurociencia.

Palabras clave: derechos humanos / neurotecnología / neuro-derechos / disrupción legal / Neuro Derecho

I. INTRODUCTION

Entering the third decade of this XXI century, Science has opened up the possibility of creating hybrid humans with artificially enhanced cognitive abilities. Imagine that companies interested in obtaining our personal information, not only access our daily activities, but our thoughts. This situation could well be considered the plot of a series of streaming services. Without proper security measures, there is the risk that technology could be used to change people's minds using algorithms, to dictate their memories, interests, even consumption patterns. Some years ago, when the sci-fi thriller Inception topped the box office worldwide, audiences were thrilled by its futuristic story of a criminal gang invading people's dreams to steal valuable data or hang on to people's decisions. More than ten years later, neurotechnology may allow anyone to come to that end.

The neurobiologist Rafael Yuste sees neurotechnology as a "tsunami" that humanity will have to face, so people and governments need to be prepared. Yuste, Sarah Gehring, along with a group of scientists called to develop an ethical framework that would govern the use and development of advanced neurotechnology. This was the beginning of what we now call "neuro-rights". Professor Yuste explains:

> "the brain works electrically: we have 86,000 million neurons inside the skull. The number and connections is astronomical, in each brain there are more connections and nodes than in the entire Internet on earth. All that complexity of neurons is fired electronically and through processes that we do not understand. From there arises the vision, the sensations, the behaviour, the ideas, the memory, the emotions, the conscience, the mind, everything that we are".[1]

Could any of these human entities be appropriated and used by third parties, even robots? While the Law must establish a position on bioethical issues, different experts[2] have begun to debate since 2017, about the need to affirm new human rights are affected by neurotechnology. Among these, they include (i) cognitive freedom; (ii) mental privacy; (iii) mental integrity; and (iv) psychological continuity.[3] We call them *new rights* because the way traditional rights are challenged and menaced by unforeseen situations that emerge out of neurotechnology, change their very nature.

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[1]) Professor Yuste is a spanish neurobiologist, one of the minds behind the BRAIN project and currently Co-Director of the Institute of Neurologic Research of the Columbia University, EEUU.

[2]) Among them we fin the group made up of Rafael Yuste and other neuroscientists from the Center for Neurotechnology of Columbia University, New York, USA, as well as researchers and experts such as Marcello Lenca and Roberto Andorno.

[3]) The group led by Yuste talks about (i) mental privacy; (ii) personal identity; (iii) free will; (iv) equitable access; and (v) non-discrimination

One of the ways to cope with this legal disruption produced by AI could be the creation of human neuro-rights.

Neuro-rights derive from neurotechnology, which encompasses any method or device in which electronics interface with our nervous system to monitor or modulate neural activity. Neurotechnology enables users to manipulate distant objects[4], prevent, mitigate, or prepare for disruptive neurological events[5], and monitor, influence or regulate mood, emotion, and memory[6]. This way, it has a fundamental impact on the way people understand the brain and various aspects of consciousness, memory and higher mental functions. Consequently, a new born legal field, *Neuro-law* regulates social relations arising from the use of technologies that affect aspects of consciousness, memories and the activity of mental functions.

Neuroscience and law have been interacting for a long time, but since 1990 neuroscientists and neurologists often debated the possibility of neurology popularization. Neurolaw is a relatively new and quite specific field, because the first human brain studies were submitted by medical and legal communities only few years ago. The term "neurology" was first introduced among legal scholars by Taylor[7], whose work is of great importance in academic circles and neurolaw research, mainly in legal practice. In addition, in several academic conferences speakers often address this topic in the United States, The United Kingdom, France and Canada.

Neurolaw is commonly referred to as a set of legal issues arising from current developments in neurobiological research and treatment not yet established as an independent discipline. On the contrary, the debate on the legal implications of neurobiological development is still at an early stage, and thus, demonstrates a wide range of topics that still need to be structured to stimulate the emergence of new points of view. Consequently, the versions of different countries in the field of neurolaw show a wide variety of viewpoints in the description of individual national legal systems. Nevertheless, there is a tendency in some countries to consider certain common topics as relevant,

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[4]) Muelling K, Venkatraman A, Valois J-S, Downey JE, Weiss J, Javdani S, Hebert M, Schwartz AB, Collinger JL, Andrew Bagnell J. (2017). Autonomy infused teleoperation with application to brain computer interface controlled manipulation. Autonomous Robots ;41(6):1401–1422. doi: 10.1007/s10514-017-9622-4.

[5]) Cook MJ, O'Brien TJ, Berkovic SF, Murphy M, Morokoff A, Fabinyi G, D'Souza W, Yerra R, Archer J, Litewka L, Hosking S, Lightfoot P, Ruedebusch V, Sheffield WD, Snyder D, Leyde K, Himes D. (2013) Prediction of seizure likelihood with a long-term, implanted seizure advisory system in patients with drug-resistant epilepsy: A first-in-man study. The Lancet Neurology;12(6):563–571. doi: 10.1016/S1474-4422(13)70075-9.

[6]) Steinert S, Friedrich O. Wired emotions: Ethical issues of affective brain–computer interfaces. Science and Engineering Ethics. 2020;26(1):351–367. doi: 10.1007/s11948-019-00087-2.

[7]) Taylor JS, Harp JA, Elliott T. (1991). Neuropsychologists and neurolawyers. Neuropsychology. 1991; 5 (4) : 293–305.

although they are discussed with different intensity. Legal science is also concerned that modern digital technology has the potential to completely restrict human freedom. For instance, access to credit cards is already being opened in a number of States in exchange for political loyalty. Security cameras are installed in all governmental and private institutions to monitor the population and political opposition among them. E-mails, whatsApp chats, Instagram photos and the like are available to a greater or lesser extent to different stakeholders. Many gadgets can be used to stalk a person and collect and store information, sometimes far away from the host country. Thus, along with comfortable and enjoyable communication, internet networks and technology created a system capable of monitoring the individual and managing the masses.

II. THE BRAIN INITIATIVE 2013-2028

US President Barack Obama launched in April 2013 a project called Brain Research through Advancing Innovative Neurotechnologies (BRAIN)[8], aimed at promoting and financing neurotechnologies capable of mapping the human brain. The Initiative foresees a duration of -at least- 15 years (until 2028), a budget that at the end of 2019 exceeded 6,000 million dollars and having laboratories located in different States of the world. It represents a study based on neuroscience, aimed at knowing the nervous system and the interaction produced between the different parts of the brain that gives rise to the biological foundations of cognition. Its stated purpose is to map the entire neuronal activity of the human brain to understand how it works. If achieved, the final consequences are difficult to imagine: from the possibility of treating Parkinson's and Alzheimer's to the creation of prostheses that allow linking the brain to the Internet, learning about past events, predicting behaviours, and eventually modifying future patterns. Potential changes will no longer affect a certain lifestyle, but the very nature of what is now understood to be a human being. The BRAIN initiative is structured in a way similar to the human genome project, a global scientific initiative launched in the mid-1980s with the objective of identifying each of the around 25,000 genes that make up human DNA, a stage completed in 2001.

The general objectives of the BRAIN initiative are divided into three main fields: (i) mapping neuronal activity, (ii) assisting in the cure of neurological conditions, and (iii) contributing to the creation of new theoretical and computer models.

[8]) BRAIN is the acronym for Brain Research through Advancing Innovative Neurotechnologies.

The first objective refers to the possibility of recording the activity of the approximately 86,000 million neurons that exist in the brain. The neuron is the main cell of the nervous system, and is in charge of receiving, processing and transmitting information through chemical and electrical signals. At present, it has only been possible to record the activity of very small groups of neurons at the same time and in small animals. The second objective has a more direct application, since once it is possible to understand the functioning of the brain, certain mental disorders such as depression and neurological diseases can be understood, which would lead to improve the treatment of medical conditions such as Alzheimer's or Parkinson's. The third objective consists of the possibility of improving or even surpassing artificial intelligence[9], since knowing the functioning of the brain would help to understand the way in which it performs calculations. It is presumed that for this reason, the brain uses more sophisticated algorithms than those currently used by artificial intelligence, but with extremely less energy expenditure. This circumstance would lead to consider artificial intelligence as an out-dated model.

Other developed States have joined the initiative with their own versions of the project: Japan, China, South Korea, Australia, Canada, Israel and the EU. At the University of Bern, the Human Brain Project team is working on a new type of thinking machine, the so-called "neuromorphic computer". Their silicon chips are lightning fast and mimic the structure of the brain. The Blue Brain Project is a project to computer simulate the human brain that began in July 2005. IBM and the Swiss Federal Institute of Technology in Lausanne (École Polytechnique Fédérale de Lausanne - EPFL) are working on the project. On June 29, 2020, the Human Brain Project (HBP) announced the start of its final phase. The European Commission signed a grant agreement to fund the HBP for 150 million euros until 2023.

III. LEGAL IMPLICATIONS AND THE BIRTH OF NEURO-RIGHTS

The development of technologies that allow us to understand the functioning of the brain, opens the way to intervene directly on it and consequently, manipulate the brain activity in various ways. As technology claims to be neutral, its use may produce both positive and negative consequences. The medical and technological possibilities that can be unleashed by successfully deciphering the neural code, generate relevant challenges. Based on this threat, a group of

[9]) Artificial Intelligence consists of the development of computational algorithms that are based on what we think happens inside the brain. They are artificial neural networks that learn and solve problems that can be computable. They are based on a primitive understanding of how the brain works.

neuroscientists led by the aforementioned Yuste, published in the journal Nature, a series of ethical rules whose purpose is to regulate the application of these technologies.[10] They called them "neuro-rights" and their objective is to provoke a discussion relevant enough that at some point, the law would rule on what is due and what is prohibited as regards neurotechnology. The group of experts proposes to add certain neuro-rights to the Universal Declaration of human rights, or better yet, to elaborate an international treaty that specifies the prohibited actions related to neurotechnology, which together with a monitoring committee, could lead any use that arises from them. Actually and beyond any methodology applied, their intention is to establish universally agreed and accepted rules, which at the same time are effective. In this ever changing neurotechnological scenario, an article, published in Life Sciences, Society and Policy, advocates the reconceptualization and even the creation of new human rights, namely the rights to cognitive freedom, mental privacy, mental integrity and psychological continuity".[11] We discuss them next.

III.a. The right to cognitive freedom

The term Cognitive Freedom means the freedom to have complete sovereignty over one's own consciousness, a concept that extends the concepts of freedom of thought and freedom of action over one's body. Cognitive freedom is the freedom of the mind. John Stuart Mill wrote in 1869 that *"freedom is not applicable as a principle under the order of things, when men are not yet capable of self-development by freedom"*. The nongovernmental organization Center for Cognitive Freedom and Ethics defines cognitive freedom as:

> *"the right of each individual to think independently and autonomously, to use the full spectrum of his or her mind, and to engage in multiple modes of thought".*[12]

Possessing cognitive freedom means being unrestricted in the ways of achieving altered states of consciousness, whether that means practicing meditation, yoga, using psychoactive substances, etc. Also, a cognitively free person should not be forced in any way to change his or her consciousness against his or her will:

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[10]) See the original article Four ethical priorities for neurotechnologies and AI, Nature Magazine, 11/08/2017. Available on the internet https://www.nature.com/news/four-ethical-priorities-for-neurotechnologies-and-ai-1.22960. All of the scientists who endorsed the initiative are mentioned there.

[11]) Marcello Lenca y Roberto Andorno (2017). Towards new human rights in the age of neuroscience and neurotechnology. Life Sciences, Society and Policy 13, p. 5. Published online (26/04/2017), available at https://doi.org/10.1186/s40504-017-0050-1 .

[12]) Center for Cognitive Liberty and Ethics (September 15, 2003). Archived from the source on March 12, 2012. Verified on October 20, 2007.

> "We're playing with half a deck as long as we tolerate that the cardinals of government and science should dictate where human curiosity can legitimately send its attention and where it cannot. It's an essentially preposterous situation. It is essentially a civil rights issue, because what we're talking about here is the repression of a religious sensibility. In fact, not a religious sensibility, the religious sensibility".[13]

Timothy Leary summarized this concept by postulating two new commandments of what he calls the molecular age: (i) You must not alter your neighbor's consciousness; (ii) You must not prevent yourself from changing the consciousness of your neighbor.[14]

Cognitive freedom may constitute a new item on the list of human rights[15]. The rapid development of advanced technology raises concerns not only among ordinary people, who find themselves unprepared for progress. Unfounded anxieties arise among advanced researchers as well. A group of Swiss scientists, headed by a lawyer from the University of Zurich and a specialist in neuroethics from the University of Basel, propose to introduce into international humanitarian law a concept called as "cognitive freedom" or "freedom of mind". And there are good reasons for this. Achievements in the field of neurotechnology, which are associated with the analysis of brain processes and influencing them, are undoubtedly important for modern medicine. At the same time, they leave a person and his mind defenseless against the threat of using cognitive resources for criminal purposes. This is what Swiss scientists talk about in a new study:

> "Our thoughts are the last refuge of personal freedom, but advances in neural engineering and brain imaging techniques are compromising the freedom of the mind. We propose to legislate a human right against the coercive or invasive use of such technologies, as well as to protect the physical and mental aspects of the mind from possible harm"[16].

According to the authors of the initiative, the use of methods of electrical stimulation of the brain, or such cases of implanting electrodes in the brain, raise concerns about the impact of these actions on the patient's personality. In defense of their position, the Swiss lawyers and physicians present substantial examples. They recall that US military scientists have reported a procedure called "transcranial direct current stimulation" (tDCS), which enhances the mental capacity of

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[13]) Terence McKenna (1988). Non-Ordinary States Through Vision Plants. - Mill Valley CA: Sound Photosynthesis. - ISBN 1-569-64709-7.

[14]) Leary, Timothy (2012). Two Commandments for the Molecular Age. Archived from the source on March 12.

[15]) Sergei Soin (28 April, 2017). «Kognitivnaya svoboda» — novyi punkt v spiske prav cheloveka (in English "Cognitive freedom" is a new item on the list of human rights). Available on the internet https://sciencepop.ru/kognitivnaya-svoboda-novyj-punkt-v-spiske-prav-cheloveka/

[16]) Lenca M, and Andorno R (2017). Towards new human rights in the age of neuroscience and neurotechnology. Life Sciences, Society and Policy, 13 (1) PMID: 28444626 https://www.discovermagazine.com/mind/new-human-rights-for-the-age-of-neuroscience

personnel. Devices with this function are already available on the open market. In 2011, scientists at the University of California, Berkeley, used brain scans to recover frames from movies that people had previously watched. To these, we can add the practice of brain electro-stimulation performed on people with Parkinson's disease. It is not uncommon for people to lose some aspects of their self-awareness after such an intervention. Defenders of the right to cognitive freedom add that this process should not be delayed. "*It's always too early to evaluate technology until it's too late*" adds one of the study's authors, lawyer Roberto Andorno.[17]

Professor Akulin states that *"With regard to various advanced technologies in medicine, there is a universal problem*[18]. First of all, he refers to the observance of medical secrecy and the right to protect personal health information. This rule may be extended to protect the mind from physical, informational, and manipulative attacks. If so, both direct and indirect attacks on a person's brain for purposes other than treatment indications would need to be considered. As part of the annual conference Medicine and Law in the 21st Century, which took place at the Faculty of Law of St. Petersburg State University in November 2021, the idea of introducing the concept of cognitive freedom was considered as one of the topics of discussion.

Also called the right to mental self-determination, cognitive freedom is the freedom of the individual to control his or her own mental processes, cognition and consciousness. This idea extends to concepts such as freedom of thought and conscience and freedom to act upon one's body. It also includes the possibility to use emerging neurotechnologies, and on the other hand, to avoid their coercive use or use without prior informed consent.

Neurotechnology is being developed to improve cognitive abilities. We may think of it as a kind of "cognitive doping". We need to draw a line when these enhancing neurotechnologies can be used properly, and how. It is also important to prevent possible inequalities between those who wants and can afford to enhance their cognition capabilities compared to those who do not. In doing so, information derived from brain functioning should not be used to harm or discriminate against an individual, family, or group in both clinical and nonclinical areas, including employment, insurance, access to social integration and opportunities for increased general well-being[19] .

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[17]) "It's always too early until suddenly it's too late" (19 April 2018). Glasgow Molecular Pathology Node. University of Glasgow website. Available on the internet https://www.gla.ac.uk/colleges/mvls/node/newsandevents/newsarchive/newsletterapril2018/headline_578957_en.html

[18]) Akulin, Igor Mikhailovich, Doctor of Medicine, Professor, Head of the Department of Medical Organization at St. Petersburg State University, President of the Association of Lawyers in Medicine

[19]) European Commission (2004). Independent Expert Group. 25 recommendations on the ethics, legal and social

The right and freedom to control one's own consciousness and electrochemical processes of thought are the necessary basis for almost every other freedom. This way, cognitive freedom reveals itself as a pre-requisite to the exercise of other freedoms: it constitutes the neurocognitive substrate. From this perspective, cognitive freedom becomes a conceptual update of freedom of thought. It is a previous phase of the latter. The possibility of manipulating the brain and neural activity would threaten this freedom, as it is possible to monitor, manipulate and alter cognitive functions.

Authenticity and enhancement of human capabilities relates to cognitive freedom to the extent that neural manipulation enters the individual's sphere of free thought and leads him to perform actions that he later does not recognize as his own.

The possibility that any person can quickly distinguish themselves from the rest, to obtain ephemeral fame and eventually, economic returns, can serve as an incentive for an individual to decide to adopt improved neurotechnologies, such as those that allow to radically expand physical resistance or sensory or mental capacities. The concept of human authenticity becomes vital here. There is widespread concern that the use of neurological enhancements to intensify cognitive functions or alter emotions with the help of pharmaceutical or other biotechnological mean, undermines the authenticity of an individual.[20] This occurs when the subject's personality is altered to such an extent that others can affirm that "she/he is no longer the same." As Bublitz and Merkel assert[21], the main tension between the different theories of authenticity is between essentialist views for whom authenticity is threatened by everything that causes people to depart from who they really are and existentialists, for whom the individual is created according to his own ideals, whereby an authentic personality consists of self-defined and self-established characteristics.

In this context, personal autonomy can be understood as an agent's state of being capable to respond to reactive attitudes such as praise and punishment. From this point of view, autonomy is a condition of moral responsibility. Personal autonomy requires certain minimum capacities such as (i) discernment regarding the act to be performed; (ii) the ability to act specifically, and (iii) the power to distinguish the consequences. Certain neurotechnologies can drastically transform the personality in such a way that it can be affirmed that the act in question does not belong to the individual because it is inauthentic.

implications of genetic testing. Luxembourg: European Community Official Publications Unit. 26 p.

[20]) Bublitz, J. C., y Merkel, R. (2009). Autonomy and authenticity of enhanced personality traits. Bioethics, 23(6), p. 360.

[21]) idem ant.

According to the report of the aforementioned group of neuroscientists, the increase in human capacities, in addition to undermining the authenticity of the person, will produce effects on social norms, by posing problems of equitable access to technologies and generating new forms of discrimination. At present, different armies of the world are already discussing the possibility of providing their forces with improved mental abilities (the super intelligent agents), in order to better anticipate the combat configuration and more skilfully decipher the data streams. In civil life, the possibility of connecting a brain to the internet through an interface would raise the possibility of generating super-humans. This circumstance, if it is not based on medical advice to cure pathologies, could lead to the existence of a new social category, which would be distinguished from the rest by its enhanced human qualities. This artificially enhanced biology is ethically reprehensible, even recalls a feature of Nazi infamous medical experimentation, and demands the Law to regulate the issue.

No State which claims to be respectful of human rights can exercise the power to coercively manipulate the mental states of its population. Cognitive freedom is a multidimensional concept, difficult to define due to its complexity. Bublitz recognizes at least three "interrelated but not identical dimensions" of cognitive freedom. They are: (i) the freedom to change your mind or choose to do so, along with the means by which such change is made; (ii) protection against interventions in other minds to defend mental integrity, and (iii) the ethical and legal obligation to promote cognitive freedom. These three dimensions configure cognitive freedom as a complex right that involves some assumptions made up of negative and positive freedoms. Among the former, we find the freedom to decide on one's own cognitive domain in the absence of obstacles, barriers or prohibitions, whether governmental or not. Secondly, we have the freedom to exercise the right to mental integrity in the absence of restrictions or violations by third parties, such as corporations, criminal agents or even the government. Among the positive freedoms, Bublitz mentions the power to act in total control of mental privacy.

III.b. The right to mental privacy

Considering the current state of technology, it is possible to obtain an extraordinary level of personal information from the data trails that we leave on a daily basis, from geographical locations to consumption of goods and services patterns. A 2017 study suggests that certain mobility patterns, such as those obtained from people who carry smartphones during their daily activities, can be used

to diagnose the first signs of cognitive decline resulting from Alzheimer's disease.[22]

The algorithms used to target advertising, calculate insurance premiums or match couples or potential partners on internet sites, would be considerably more accurate if they were based on our neural information. Neural data refers to the activity patterns of our neurons associated with certain states of attention. Neural devices that connect individuals' brains to the Internet, open the possibility of tracking or manipulating the mental experience of an individual. This is the reason why our neural data shall be protected by the law. Consequently, it is proposed that in relation to neural data, each owner expressly states their willingness to share them, regardless of the device from which they do so. This opt-in procedure must be safe and secure, including information regarding who will use the data, for what purposes and for how long, similar to what is required at present in relation to personal information. Among the issues in need of legislative pronouncement, we find the limitation of the possibility of giving up one's neural data or accepting the incorporation of certain data into the brain in exchange for financial rewards.

Neuroscience has shed light on the study of the brain and on certain mental processes that follows the understanding of the structure and function of the brain. It gives us an idea of the mental processes underlying human behaviour, whereas the Law is primarily concerned with regulating the externalizations of those conducts. Neuroscientists have been attempting to depict the results of neuroscience through legal norms, in order to review legal standards, norms and rules, for further precise formulation. More accurate, the neurobiological approach to legal norms and consequences provides and enhances new legal effects by modifying the rules that govern the interaction between classic norms and neuroscience. However, we have to bear in mind that according the state of the art, there are huge differences in the brains of individuals, and there is no direct comparison of mental functions and some kind of standard law enforcement. This is a fundamental challenge in neuroscience.

The proposed right to mental privacy would protect individuals against unauthorized third-party intrusion into their brain data, preventing the unauthorized collection and leakage of such data. With the increasing availability of consumer-grade brain-computer interfaces connected to the Internet[23], more and more people are becoming users of neurological devices.[24] The brain

[22]) A. Nieto-Reyes, R. Duque, J. L. Montana, y C. Lage, C., Sensors 17, 1679 (2017), op. Cit.

[23]) This refers to the dynamic exchange of information that occurs between the customer and a company. Structuring the customer interface refers to following the three types of exchanges and interactions that can take place: (i) face to face; (ii) personal but remotely; and (iii) electronics.

[24]) Shuster, Arthur y Cappelletti, Adriana (2017), Cognitive liberty Protecting the right to neuroenhancement, University of Western Ontario Medical Journal, US. Available at http://www.uwomj.com/wp-

information of an individual registered in neurological devices can be accessed without the owner's notice. This type of violations at the neural level can be more dangerous than conventional ones because they would bypass the level of conscious reasoning, leaving people without any protection to prevent them from having their mind read.

Brain waves would thus be protected not only as personal data, but also as generators of data or sources of information. In this sense, protection should cover not only data from the conscious brain but also data that is not stored under the individual's voluntary control, such as data obtained while sleeping. Paul Wolpe suggests that in the face of fear State oppression, a line should be drawn that limits the State meddling in the use of mind-reading technologies:

> "The skull must be designated as a domain of absolute privacy. No one should be able to probe an individual's mind against their will. We must not allow it with a court order. We must not allow it for military or national security. We should renounce the use of technology in coercive circumstances, even though its use may serve the public good. "

The main idea of the above statement is that any mind-reading technique constitutes a fundamental affront to human dignity. The Law should deal with the activity of neurons, since they constitute the support of our thought and mind. In sum, neuronal activity could not be extracted from the brain without the consent of the individual and neither could it be used commercially. The mind is the person and the activity of his neurons. Both belong to each of us exclusively, unless we decide to share them.[25] From now on, my home *and my mind* are my castle.

III.c. The right to mental integrity

The right to mental integrity, also known as the right to mental health, not only protect the individual against mental illnesses, but against illicit and harmful manipulations of people's neural activity through unwanted uses of neurotechnology. As the latter becomes integrated into the digital ecosystem and neural computing mathematical models enter the infosphere[26], mental integrity is

content/uploads/2015/09/v84no1_05.pdf april 2020.

[25]) Travieso. Juan Antonio, In search of lost privacy, Ed. La Ley, (2019). Ed. La Ley, Year LXXXIII No. 56, Buenos Aires Argentina, 03/22/2019. There the author mentions that in the case Carpenter v. In the United States, it was claimed that unauthorized entry into digital cell phone data pierces the wall of privacy with painstaking and organized intrusion into private affairs. How much more - we add - if the access is the data of the neuronal activity.

[26]) The infosphere is a neologism composed of two words: information and sphere. It refers to an environment such as the biosphere, populated by information entities called inforgs. While an example of an information sphere is cyberspace, the infosphere is not limited to online environments.

threatened whenever protective measures are not implemented. The recognition of this new right will protect people against forced intrusion and alteration of their neuronal processes.

The growing field of memory engineering represents a primary challenge for the right to mental integrity. There are already several techniques that will serve in the future to selectively design, boost, or erase memories from a person's mind. For example, Nabavi and his colleagues[27] used an optogenetics technique to erase and later restore selected memories through the application of an optical laser stimulus that selectively strengthens or weakens synaptic connections.[28] Although the level of experimentation in humans has not yet been reached, these findings have enormous potential for the treatment of diseases such as Alzheimer's or post-traumatic stress disorder. However, its negative applications could be aimed at mental manipulation and brainwashing. In the long term, they could be used by surveillance and security agencies in order to selectively erase memories perceived as dangerous or inconvenient from people's brains, a subject that today is close to reality.

Thus, the recognition of this right will grant specific protection against interventions enabled by neurotechnology that involve an unauthorized alteration of the nervous system of a person, causing harm. The cognitive capacity of a person is based on an efficient neural organization that allows to obtain the best result with the minimum neuronal activity. According to one study, intelligence depends more on neural organization than on the volume of active neurons at the time of cognition.[29] The violation of the right to mental integrity would be caused by two coexisting factors: (i) direct access and / or manipulation of neuronal signaling; and that (ii) such access is not authorized by the informed consent of the neuronal signal generator.

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[27]) Nabavi S, Fox R, Proulx CD, Lin JY, Tsien RY, (2014), Malinow R. Engineering a memory with LTD and LTP. Nature ; No. 511, ps. 348–52.

[28]) Mentioned in Lenca, Marcello and Andorno, Roberto, Towards new human rights in the age of neuroscience and neurotechnology. Life Sciences, Society and Policy 13, p. 5 Published online (26/04/2017), available at https://doi.org/10.1186/s40504-017-0050-1 .

[29]) Erhan Genç et al., Diffusion markers of dendritic density and arborization in gray matter predict differences in intelligence. Nature Communications, Volume 9, Article number: 1905 (2018). doi:10.1038/s41467-018-04268-8 . This study was led by neuroscientists Erhan Genç and Christoph Fraenz, from the Ruhr-Universität Bochum, in the German state of North Rhine-Westphalia. He used a specific neuroimaging technique to obtain information about the wiring of the brain at the microstructural level. The results are published in the journal Nature Communication. The researchers analyzed the brains of 259 men and women in perfect health and aged between 18 and 40 years. They used the orientation dispersion of neurites (extensions of neurons) and image density. This method allowed them to measure the amount of dendrites in the cerebral cortex, that is, extensions of nerve cells that cells use to communicate with each other in the performance of intelligence. All participants completed an IQ test. Subsequently, the researchers combined all the collected data and found that the smarter a person is, the fewer dendrites there are in their cerebral cortex.

Recently, some Chilean experts moved the debate on mental integrity into the legal arena. Chile aspires to become the first State in the world to legally protect the "neuro-rights" of its citizens. Lawmakers are expected to pass a constitutional reform blocking any technology that seeks to "enhance, weaken or violate" people's mental integrity without their consent. The initiative was approved by the Senate and its main objective is to modify article 19, number 1, of the Fundamental Charter (Bulletin No. 13,827-19), to protect integrity and mental indemnity in relation to the advancement of artificial intelligence. Opposition Senator Guido Girardi, one of the bill's sponsors[30], is concerned about technology -whether algorithms, bionic implants or certain other devices- that could threaten people's essence, their autonomy, their freedom and their free will. The text of the project remained as a single article, under the following wording:

> "Scientific and technological development will be at the service of people and will be carried out with respect to life and their physical and mental integrity. The law will establish the requirements, conditions and restrictions for its use in people, especially protecting brain activity and information about it".

While the Commission's report stated:

> "The constitutional consecration of the right to neuroprotection derives from the need to protect human dignity against the use of new techniques, especially with regard to the protection of the 'human brain', a concept that is not exhausted only in a physical dimension but rather expands towards its dimension of mental potentiality that surrounds the mysteries of human existence and it is for that reason that it must have the maximum fundamental Jus-protection ". [31]

III.d. The right to psychological continuity

In addition to the rights to privacy and mental integrity, the perception that each individual has about his own identity, can be at risk from inappropriate uses of neurotechnology. The right to psychological continuity shall be affirmed in order to preserve the personal identity and the continuity of the mental life of any individual, against possible external alterations carried out by third parties without their consent. As personal identity consists of experiencing oneself in time as

[30]) The project was prepared by the Commission Challenges of the Future, Science, Technology and Innovation, chaired by Senator Guido Girardi, together with experts from academic entities and Rafael Yuste, who coordinates the Brain project (Brain Research through Advancing Innovative Neurotechnologies) and the group Morningside, comprising 25 leading law and ethics neuroscientists.

[31]) France 24, "Neuroderechos", Apuesta pionera de Chile para legislar el futuro, 06/05/2021, available at https://www.france24.com/es/minuto-a-minuto/20210505-neuroderechos-apuesta-pionera-de-chile-para-legislar-el-futuro .

the same person, psychological continuity constitutes a special instance of the right to identity, focused on neuroscience. Its recognition as a right aims to avoid the induced alteration of neuronal functioning, so that personal identity is not altered by third parties through the misuse of neurotechnology without the knowledge or consent of the owner.

As neurotechnologies develop and people gain access to new capabilities, individual identity can be significantly altered and therefore needs to be protected. The identity of the person has been defined by numerous authors. Sessarego, for example, affirms that "*personal identity is the set of attributes and characteristics that allow the person to be individualized in society*".[32] These characteristics include both biological and cultural elements.[33] Identity is made up of physical and mental integrity, along with the sense of self-consciousness, that is, the ability to choose our actions. The right to personal identity is recognized by the Argentine block of constitutional rights.[34]

Another legal aspect threatened by the misuse of neurotechnologies is individual responsibility, since they could clearly alter people's sense of identity and consciousness. People could be led to behave in such a way that later, they would not recognize such behaviours as their own. The basis to invoke the ignorance of the own actions can occur in cases in which machine learning and brain interface devices generate a faster-than-normal sequence between intention and action, using something like the present "autocomplete" function from computers, leaving no room for any kind of human reflection. Similarly, if a person can remotely control certain devices through his/her thinking, or if several brains are connected for collaborative work, the understanding of who we are and where we are operating will be affected.

At present, when a person faces brain surgery, the informed consent forms are concerned with mentioning the main physical risks, but not the possible effects that the device to be implanted may cause on the patient's mood, personality or conscience. Science is currently going through experimental phases, consequently the possible negative consequences are not yet fully known. This is the reason why the debate must surpass the ethical and reach the legal field.

Brain stimulation could cause involuntary alterations in the psychological continuity of the person, ultimately affecting the identity of the individual. Several cases have been reported in the

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[32]) Fernández Sessarego, C., (2002), Derecho y Persona, Ed. Grijley, Lima, Perú, p. 67.

[33]) Moriconi, Alejandro (2011), La identidad personal. Un derecho que aguarda su pleno ejercicio. Revista IN IURE, Año 1. Vol. 1. La Rioja, Argentina, p. 37 .

[34]) CN, art. 75(19) protection of cultural identity and plurality; American Convention on Human Rights, art. 5 (1) personal integrity and physical, mental and moral identity; Convention on the Rights of the Child, art. 8 right of the child to preserve his identity, including nationality, name and family relationships, in accordance with the law without unlawful interference.

scientific literature in which deep brain stimulation has produced changes in behaviour, such as increased impulsivity and aggressiveness or changes in sexual behaviour. Similarly, memory engineering technologies can affect personal identity by selectively deleting, altering, adding, or replacing individual memories relevant to self-recognition as a person.

Beyond the medical-scientific chapter, advances in the field of neuroscience offer new and more efficient possibilities of producing non-consensual personality changes. For example, brain implants can be vulnerable to attacks by third parties who wish to exert malicious control over the user's brain activity. This risk of modifying a person's brain activity through the unauthorized use of neurological devices has been defined as brain-jacking. Its negative consequences can include theft of information, cessation of stimulation, drain of implant batteries, induction of tissue damage, and deterioration of motor function, among others. These are examples of ordinary violations of privacy and/or intimacy in their neurotechnological versions. However, other possible consequences of a brain robbery could be produced without violating mental privacy and integrity, namely the assumptions of alteration of impulse control, modification of emotions or affection, induction of pain and modulation of the reward system.

One of the less studied aspects of psychological continuity is the one that explores the emotional-affective dimension of the individual affected by any unauthorized changes brought by neurotechnology.

III.d.1.Psychological continuity and the relevance of emotions

Social psychologists and neurobiologists have argued that cognition (in the sense of understanding, representation and justification) and emotion are not easily separated. Some even consider such a division obsolete[35]. Recent discoveries in neurobiology are bringing to debate a more integrated, mixed approach to understanding the relationship between cognition and emotion. This approach is based on the fact that emotions are closely related to consciousness as well as to cognitive perception and perception through the senses[36]. Martha Nussbaum calls emotions "*evaluations or value judgments*". She sees emotion as part of the cognitive process[37]. In other

[35]) Haidt, Jonathan, (2001),The Emotional Dog and Its Rational Tail: A Social Intuitionist Approach to Moral Judgment', *Psychological Review* 108; Raymond J. Dolan, 'Emotion, Cognition, and Behavior', *Science* 298.

[36]) Emma Hutchinson and Roland Bleiker, 'Theorizing Emotions in World Politics' *International Theory* 6 (2014),
p.496.

[37]) Nussbaum, Martha C. (2001), *Upheavals of Thought: The Intelligence of Emotions* (Cambridge University

words, emotions influence our understanding of the world and, therefore, the decisions we make.

Legal practitioners and legal theorists rarely deny the importance of emotion altogether. Nevertheless, they hold the established view that law must be based on reason and that emotion has no place in it. Gerry Simpson refers to Kant in emphasizing the dominant orthodox, post-Enlightenment division of the mind into "*an instrument for calculation and the chambers of passion*". Moreover, he points out the tendency "*to regard emotion as unimportant and secondary*"[38]. Pierre Schlag has written superbly about the misplaced (or irrational) commitment to reason in the American legal tradition. His criticisms apply equally to international law[39].

Emotional aspects of the use of artificial intelligence require serious discussion and thought. Professor of International Relations Rose McDermott believes that understanding the role of human emotions in decision making is essential to building an effective and balanced policy toward the cyber domain[40]. For instance, International Humanitarian Law makes use of the "reasonable military commander" standard when evaluating the principle of proportionality. This standard against which that decision is to be evaluated is that of a person with all the experience, training, and understanding of military operations that is vested in a "reasonable military commander." [41] This *reasonable* commander is so not because of a lack of emotion, but rather because of their capacity for human emotion, empathy, compassion, and understanding of the importance of human dignity. From the perspective of the opponents to lethal automatic weapon systems, emotion is necessary in time of war for meaningful human control. This example illustrates the involvement of emotion in all issues of Law. International lawmaking and law enforcement are aimed at combating global threats to human health, ensuring safe and adequate food, regulating warfare in the most humane possible way and they are now drawing a line to the use of neurotechnologies. In doing so, the laws that are passed and enforced are not solely determined by rational facts and data. Law affects and contributes to emotions, and emotions, in turn, affect the perception of the Law[42].

Press, p.4.

[38]) Simpson, Gerry (2015). The Sentimental Life of International Law' *London Review of International Law* 3(1), pp.10-11

[39]) Schlag, Pierre (1998) *The Enchantment of Reason* (Duke University Press).

[40]) McDermott, Rose (2019). Some Emotional Considerations in Cyber Conflict' *Journal of Cyber Policy* 4(3).

[41]) Henderson, Ian & Kate Reece (2018), Proportionality under International Humanitarian Law: The "Reasonable Military Commander", Vanderbilt Journal of Transnational Law, May 16, ps. 845-6, available at https://www.transnat.org/post/proportionality-under-international-humanitarian-law-the-reasonable-military-commander-8221

[42]) On the impact of law on emotion, see Minow, Martha, (2015), Forgiveness, Law and Justice, California Law. Martha Minow, 'Forgiveness, Law, and Justice,' California Law Review 103, p.1627.

The reluctance to acknowledge the influence of emotion because of fears -perhaps justified- that vague, subjective, ephemeral feelings might threaten the objective, tangible, rational foundations of international law is, in our view, an unwillingness to accept the world as it is. We must recognize that emotions are not prejudices and departures from truth that must be eradicated. They must be understood and embraced as a central component of informed decision-making[43].

Finally, the right to psychological continuity is also an important issue in the context of national security, where mandatory personality change interventions could be justified in the light of strategic objectives. Brain interventions that reduce the need for sleep are already in use in the military, and it's easy to imagine interventions that make soldiers more belligerent or courageous. In 1999, a committee of the European Parliament called for a global ban on research

> "that seeks to apply knowledge of the chemical, electrical, (...) or other functioning of the human brain, to the development of weapons that can allow any form of manipulation of human beings".[44]

In all the aforementioned situations there is a common pattern: the unauthorized modification of the cognitive-emotional-affective dimension of the individual, and consequently, a violation of the right to psychological continuity is produced.

IV. CONCLUSIONS

We have seen the growing importance of neurotechnologies applied to solving specific problems. Firstly, the BRAIN Initiative constitutes the touchstone of these advances and although there is still a long way to go, the possibility of mapping the human brain will radically change our vision and understanding of what it means to be "human".

Secondly, we focused on certain problems that arise when considering the new intersections between technology and neuroscience. We emphasized that privacy and integrity, the perception of one's own self, the greater physical and mental capacities that a person can acquire, and the risk of transferring prejudices to the algorithms of programs, are threats that clearly arise from the improper application of neuroscience, regardless of other certainly beneficial possibilities. In response to these potential abuses, the reaction of the Law is aimed at regulating, from a participatory,

[43]) Saab, Anne (2021), Emotions and International Law,' ESIL Reflections 10:3.

[44]) Commented in Shuster, Arthur y Cappelletti, Adriana (2017), Cognitive liberty Protecting the right to neuroenhancement, University of Western Ontario Medical Journal, US. Disponible en http://www.uwomj.com/wp-content/uploads/2015/09/v84no1_05.pdf , april 2020.

comprehensive, integrative and multidisciplinary perspective those unwanted but foreseeable consequences.

The new neuro-rights proposed tend to respond to these challenges. Some answers accommodate classical freedom concepts to the possibility of acting on neural activity, such as cognitive freedom, privacy, and integrity. Others start from entirely new assumptions, such as the psychological continuity of the person. What for decades was pure science fiction is now presented as a possibility. The proposal to affirm neurospecific human rights in response to emerging advances in neurotechnology is coherent and constitutes a logical continuation of the development of human rights theory. The Law of the 21st century are due to intertwine classical and modern rights with other genetically specific rights, in response to advances in genetics and genomics. Some of them are already established in the Universal Declaration on the Human Genome (1997), the Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine (1997), and the International Declaration on Data Human Genetics (2003).[45] The Convention is the only international legally binding instrument on the protection of human rights in the biomedical field. It draws on the principles established by the European Convention on Human Rights, in the field of biology and medicine. It is a framework Convention aiming at protecting the dignity and identity of all human beings and guarantees everyone, without discrimination, respect for their integrity and other rights and fundamental freedoms with regard to the application of biology and medicine. It sets out fundamental principles applicable to daily medical practice and is regarded as such at the European treaty on patient's rights. It also deals specifically with biomedical research, genetics and transplantation of organ and tissues.

We are at the start of the discussion, almost at the beginning of a career of which we ignore its full length. There are not yet even different perspectives or competing schools on these issues. The need to enact legislation to preserve humanity and the very nature of what we refer as human is a key element, and we should be sure not to alter its very essence, made up of reason and emotion.

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[45]) Declaración Universal sobre el genoma humano y los derechos humanos, UNESCO, Conferencia General, 11/11/1997. Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine (ETS No 164) was opened for signature on 4 April 1997 in Oviedo (Spain). The provisions of the Convention are further elaborated and complemented by Additional Protocols on specific subjects. Available at https://www.coe.int/en/web/bioethics/oviedo-convention . Declaración Internacional sobre los Datos Genéticos Humanos, UNESCO, 16/10/2003.

REFERENCES

.Bublitz, J. C., & Merkel, R. (2009). Autonomy and authenticity of enhanced personality traits. Bioethics, 23(6), 360–374.

.Bublitz, J. C. (2013). My mind is mine!? Cognitive liberty as a legal concept. In E. Hildt (Ed.), Cognitive enhancement (pp. 233–264). Dordrecht: Springer.

.Bublitz, J. C., & Merkel, R. (2014). Crimes against minds: On mental manipulations, harms and a human right to mental self-determination. Criminal Law & Philosophy, 8(1), 51–77

.Erhan Genç et al., Diffusion markers of dendritic density and arborization in gray matter predict differences in intelligence. Nature Communications, Volume 9, Article number: 1905 (2018). doi:10.1038/s41467-018-04268-8 .

.Fernández Sessarego, C., (2002), Derecho y Persona, Ed. Grijley, Lima, Perú, p. 67.

.Glannon, W. (2008). Stimulating brains, altering minds. Journal of Medical Ethics, 35(5), 289–292.

.Gomez Abajo, C. (2017). La inteligencia artificial tiene prejuicios pero se pueden corregir, El País, Sección Economía, España, 28/08/2017, en internet https://retina.elpais.com/retina/2017/08/25/tendencias/1503671184_739399.html.

.Julia Angwin and Jeff Larson, Bias in Criminal Risk Scores Is Mathematically Inevitable, Researchers Say, en ProPublica, 30/12/2016. En internet https://www.propublica.org/article/bias-in-criminal-risk-scores-is-mathematically-inevitable-researchers-say.

Minow, Martha, (2015), Forgiveness, Law and Justice, California Law. Martha Minow, 'Forgiveness, Law, and Justice,' California Law Review 103, p. 1627.

.Moriconi, Alejandro (2011), La identidad personal. Un derecho que aguarda su pleno ejercicio. . Revista In Iure, Año 1. Vol. 1. La Rioja, Argentina, ps. 34-41 .

.Mullane, M. Eliminar los sesgos de los algoritmos, E-Tech, International Electrotechnical Commission, 06/2018 https://iecetech.org/issue/2018-06/Eliminating-bias-from-algorithms disponible abril 2020.

.Nabavi S, Fox R, Proulx CD, Lin JY, Tsien RY, Malinow R. Engineering a memory with LTD and LTP. Nature (2014); No. 511, ps. 348–52.

Saab, Anne (2021), Emotions and International Law,' ESIL Reflections 10:3.

.Shuster, Arthur, y Cappelletti, Adriana (2017). Cognitive liberty Protecting the right to neuroenhancement, University of Western Ontario Medical Journal, US. Disponible en http://www.uwomj.com/wp-content/uploads/2015/09/v84no1_05.pdf .

.Travieso, Juan Antonio. (2019). En busca de la privacidad perdida, Ed. La Ley, Año LXXXIII Nº 56, Bs. As. Argentina, 22/03/2019.

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