

Mental integrity protection in the neuro-era. Legal challenges and philosophical background

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ABSTRACT: Several neurotechnological devices that are in use today can both collect signals from the brain electro activity and send impulses to the brain. Thus, it is possible to intervene on brain activity in order to modify it and to transform it into usable and reproducible signals. This new kind of man-machine connection is going to have a deep impact on legal categories. This paper focuses on the notion of mental integrity and the consequent changes within its semantic field. What provides the guiding thread is the current debate on personal identity and autonomy of Deep Brain Stimulation patients. The conclusion outlines the possible philosophical background of the issues at stake.

KEYWORDS: Law and Neuroscience; mental Integrity; DBS and Identity; DBS and autonomy; individuality

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1. Introduction

The neurotechnological devices that are in use today are no longer only directed to monitoring brain activity. They are used both to intervene on brain activity in order to modify it, or to decode it in order to transform it into usable and reproducible signals. Accordingly, a new kind of man-machine connection has been created, based on electro brain activity.

These devices can be both intrusive – as in the case of surgical implantation of electrodes in the brain – and nonintrusive – as long as they use the electro brain activity detectable on the scalp. Generally speaking, the intrusive ones are devices for neuro-modulation and, presently, they are used for treatment of some neurological diseases (like Parkinson’s Disease) or also for treatment of severe psychical disorders (like some kinds of depression). The non-intrusive ones are a kind of prosthesis, which can be used both for computer games and to control objects, like steering a wheelchair.

Putting it somewhat roughly, one can classify the brainware devices into two main categories. The first one embraces those devices that are used to collect signals coming *from* the brain, like in the

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Brain Computer Interface system (BCI).¹ The second one embraces those devices that send signals to the brain, like in *Deep Brain Stimulation (DBS)* or in *Transcranial Magnetic Stimulation (TDM)*.²

The development of research – astonishingly rapid, indeed – has produced at least two main outcomes. On the one hand, it has implemented production and commercialization of devices that are less invasive and more precise and performant. On the other hand, it has brought about a hybridization of the technologies in which the devices used to send signals and stimuli to the brain can also, simultaneously, collect and forward as data the signals coming from the brain.

Of course, it is not surprising at all if the different issues arising from these brainware devices have become subject of a longtime debate among physicians, engineers, IT specialists, on the one hand, and bioethicists, on the other hand.³ Nevertheless, the technological implementation of the new outcomes have shed light on new issues, which are interesting also from a legal point of view. Indeed, the uses of the new devices seem to affect personal identity and individual autonomy in a no trivial way.

In this paper, I will firstly outline how bioethicists, in particular, discuss these two topics in the debate about *DBS* technologies and their developments.⁴ Secondly, I will try to show that the different issues at stake pertain to the fundamental right to mental integrity as connected to both human health and moral freedom. At the end, I will come to what I believe to be the philosophical issues at stake.

2. Deep Brain Stimulation

Deep Brain Stimulation (DBS) is a treatment for specific movement disorders and neurological disease. It consists in continuously giving electrical impulses into a small brain area via electrodes implanted into the target location.⁵

Typically, it is used for *PD* patients who are not responsive to drug treatments anymore. In the last decade, this method has been used or experimented in the treatment of other neurological diseases,

¹ That is signal acquisition and digitalization, and signal processing by means of features acquisition and algorithmic translation; J. WOLPAW, E. W. WOLPAW (eds.), *Brain–Computer Interfaces: Principles and Practice*, Oxford, 2012; B. CUSACK, K. SUNDARARAJAN, R. KHALEGHPARAST, *Neurosecurity for Brainware Devices*, in C. VALLI (ed.), *The Proceedings of 15th Australian Information Security Management Conference, 5-6 December, 2017*, Perth, 2017, 49–56.

² P. FOLEY, *Deep Brain Stimulation for Parkinson’s Disease: Historical and Neuroethical Aspects*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, Dordrecht, 2015, 561–587; M. CHRISTEN, S. MÜLLER, *Editorial: The Clinical and Ethical Practice of Neuromodulation – Deep Brain Stimulation and Beyond*, in *Frontiers in Integrative Neuroscience* 11, 2017, article 32; J.-P. LEFAUCHER et al., *Evidence-based guidelines on the therapeutic use of repetitive transcranial magnetic stimulation (rTMS)*, in *Clinical Neurophysiology*, 125, 2014, 2150–2206.

³ C. INEICHEN, M. CHRISTEN, *Analyzing 7000 texts on deep brain stimulation: what do they tell us?*, in *Frontiers in Integrative Neuroscience*, 9, 2015, article 52, point out that papers on the topic were more than 7000 already in 2014.

⁴ I will focus only on therapeutical or auxiliary use of those devices. Therefore, I will not examine the widely discussed topic of their uses for enhancement.

⁵ B. SCHMITZ-LUHN, C. KATZENMEIER, C. WOOPEN, *Law and ethics of deep brain stimulation*, in *International Journal of Law and Psychiatry*, 35, 2012, 130–136.

like epilepsy,⁶ for psychiatric disorders, like Tourette Syndrome or Major Depression,⁷ for disorders like Anorexia⁸ or for some kinds of addiction.⁹ Of course, it could be also used for mental enhancement or mood modulation.¹⁰

The neurosurgical implant of electrodes is combined with the subcutaneous implant of an impulse generator, usually placed in the chest. In the traditional *open-loop DBS* implants, the patients themselves control the release of impulses and the degree of the stimulation.¹¹ In the new *closed-loop DBS* implants, an algorithm controls the impulses.¹²

Even if its functioning mechanism is not completely clear yet,¹³ *DBS* seems not to cause collateral effects, other than drug treatments usually do, and the range of its applications is going to widen more and more and so will the issues at stake, as two well-known leading-cases can testify to.¹⁴

A sixty-two-year-old Dutch *PD* patient provides the first example.¹⁵ In order to recover his motility control, he underwent a *DBS* implant operation. The treatment was successful, because the patient did not suffer from motor impairments anymore. Nevertheless, he began to develop manic disorder and serious personality changes that caused his becoming mentally incompetent and unable to live

⁶ J. AMADIO, N.M. BOULIS, *Brain Implants as Closed-Loop Systems: Risks and Opportunities*, in *AJOB Neuroscience*, 6, 2015, 14–15.

⁷ M. SYNOFZIK, *Deep Brain Stimulation Research Ethics: The Ethical Need for Standardized Reporting, Adequate Trial Designs, and Study Registrations*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, Dordrecht, 2015, 621–633; T. BEEKER, T.E. SCHLAEPFER, V.A. COENEN, *Autonomy in Depressive Patients Undergoing DBS-Treatment: Informed Consent, Freedom of Will and DBS' Potential to Restore It*, in *Frontiers in Integrative Neuroscience*, 11, 2017, article 11; M. FIGEE, D. DENYS, I. GRAAT, *The application of deep brain stimulation in the treatment of psychiatric disorders*, in *International Review of Psychiatry*, 29, 2017, 178–190.

⁸ H. MASLEN, J. PUGH, J. SAVULESCU, *The Ethics of Deep Brain Stimulation for the Treatment of Anorexia Nervosa*, in *Neuroethics*, 8, 2015, 215–230.

⁹ B. SCHMITZ-LUHN, C. KATZENMEIER, C. WOOPEN, *Law and ethics of deep brain stimulation*, cit., *passim*.

¹⁰ M. SYNOFZIK, T. E. SCHLAEPFER, J. J. FINS, *How Happy Is Too Happy? Euphoria, Neuroethics, and Deep Brain Stimulation of the Nucleus Accumbens*, in *AJOB Neuroscience*, 3, 2012, 30–36. It is worth mentioning that *DBS* devices controlled by an algorithm are increasingly used for psychiatric patients S. GOERING et al., *Staying in the Loop: Relational Agency and Identity in Next-Generation DBS for Psychiatry*, in *AJOB Neuroscience*, 8, 2017, 59–70.

¹¹ P. FOLEY, *Deep Brain Stimulation for Parkinson's Disease: Historical and Neuroethical Aspects*, cit., *passim*.

¹² J. AMADIO, N. M. BOULIS, *Brain Implants as Closed-Loop Systems: Risks and Opportunities* answer the question raised by F. GILBERT, *A Threat to Autonomy? The Intrusion of Predictive Brain Implants*, in *AJOB Neuroscience*, 6, 2015, 4–11, whether automated predictive implants (*PDI*) are a threat for personal autonomy, by proposing an analogy with other closed-loop medical devices, such as insulin pumps. However, the analogy holds only to a certain extent, because the physiological production of insulin seems not to be connected with brain activities that underpin autonomous decision-making. On this topic, see also A. LAVAZZA, *Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis*, in *Frontiers in neuroscience*, 12, 2018, article 82.

¹³ P. FOLEY, *Deep Brain Stimulation for Parkinson's Disease: Historical and Neuroethical Aspects*, cit., 564.

¹⁴ M. CHRISTEN, S. MÜLLER, *Editorial: The Clinical and Ethical Practice of Neuromodulation – Deep Brain Stimulation and Beyond*, cit., *passim*.

¹⁵ L. KLAMING, P. HASELAGER, *Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence*, in *Neuroethics*, 6, 2013, 527–539: 534. cite the case reported by A.F.G. LEENTJES et al., *Manipuleerbare wilsbekwaamheid: een ethisch probleem bij elektrostimulatie van de nucleus subthalamicus voor ernstige ziekte van Parkinson*. *Nederlands Tijdschrift voor Geneeskunde*, in *Nederlands Tijdschrift voor Geneeskunde*, 148, 2004, 1394–97. The same case is mentioned also by T. GALERT, *Impact of Brain Interventions on Personal Identity*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, cit., 407–422.

on his own anymore. When *DBS* was turned off, he recovered his insight and his mental competence, but his motor impairments became worse. Since the psychiatric symptoms caused by *DBS* were not treatable by means of drugs, the two options were either to disable *DBS* and to admit the patient in a nursing house or to continue *DBS* and to admit him in a psychiatric institution. While the *DBS* implant was turned off, the patient decided to continue the *DBS* treatment and to be admitted in a psychiatric institution.¹⁶

The second example is provided by the effects of a *DBS* treatment on a patient suffering from Tourette Syndrome. A year after having received the implant, he developed a dissociative response when the amplitude of stimulation was increased. During an experimental setting, in consequence of increased amplitude he crouched in a corner, covering his face with the hands, and spoke with a childish voice repeatedly insisting that he was not to blame. He kicked his feet if any equip member tried to approach him, because he was afraid of being thrown into the basement. After the signal amplitude was decreased, he recovered his insight again, but was unable to recall what had happened. He only reported to have been overwhelmed by bad childhood memories.¹⁷

3. Identity and autonomy: the two topics of discussion

Neither these cases nor many others challenge the efficacy of *DBS* treatment in its several therapeutic uses.¹⁸ Rather, they shed light on the reasons why connecting directly and continuatively the brain with an external controlled device has raised a wide debate on possible issues concerning personal identity and autonomy.

It is worth noting that the conceptual tools used in the frame of the current discussion about vegetative states or Alzheimer's Disease have been adapted to cope with these new challenges. Differently from what happens in a neurodegenerative disease, the changes caused by implanting a device can be sudden instead of gradual and with a considerable range of reversibility.¹⁹

First, I will shortly analyze the issues concerning personal identity and then the ones concerning autonomy. Although they are intertwined, different contributions focus on them separately in many cases.

¹⁶ «According to Dutch health law, judicial authorization in a psychiatric hospital is only possible if the harm cannot be averted by interference of a person or institution. Additionally, a treatment plan focusing on removing the harm that is responsible for the patient's hospitalization is required by law. The harm, i.e. the patient's altered personality and the behavior resulting from this alteration, could have been averted or removed by turning off the *DBS*. Hence, none of these legal requirements was fulfilled» L. KLAMING, P. HASELAGER, *Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence*, cit., 534–35.

¹⁷ I. GOETHALS et al., *Brain Activation Associated with Deep Brain Stimulation Causing Dissociation in a Patient with Tourette's Syndrome*, in *Journal of Trauma & Dissociation*, 9, 2008, 543–49.

¹⁸ Cfr. ad es. F. BAYLIS, "I Am Who I Am": *On the Perceived Threats to Personal Identity from Deep Brain Stimulation*, in *Neuroethics*, 6, 2013, 513–526.

¹⁹ L. KLAMING, P. HASELAGER, *Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence*, cit., *passim*. On the reversibility topic, A. PACHOLCZYK, *Ethical Objections to Deep Brain Stimulation for Neuropsychiatric Disorders and Enhancement: A Critical Review*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, cit., 635–655.

3.1. DBS and personal identity

3.1.1. The conceptual frame

Without going back too far in the past, a special issue of *Neuroethics* 2013 focusing on brain-implants is worth mentioning. In their articles, several authors proposed and outlined different notions of personal identity in order to answer the question whether *DBS* causes alterations in personal identity.²⁰

On the one hand, it has been claimed that the effects reported by *DBS* patients could be evaluated as causing an altered personal identity so long as personal identity is seen as an experienced psychological continuity persisting in time. From a legal point of view, the Dutch patient provides a paradigmatic example for an interruption of the psychological continuity that is supposed to underpin the capacity of consent for treatment.²¹

On the other hand, some authors have criticized this notion of personal identity as inadequate to face the issues at stake. They compare the static psychological continuity with the notion of a dynamic intersubjective narrative identity, where the self-narrative is integrated by the narratives provided by the people one is living with. From this point of view, the only possible threat against patients' personal identity is when they cease to experience themselves as co-authors of their own life narrative.²²

A couple of years later, the *Handbook of Neuroethics* dedicated a whole section to discussing the topic of personal identity in the *DBS* debate. For example, in their contribution, Mackenzie and Walker aimed to determine which paradigm could better provide an account for both the sensations reported by *DBS* patients, who claim not to recognize themselves anymore or to feel self-estranged, and the possibility that they continue weaving into the larger whole of their identity the threads of their life.²³ They analyzed three notions of personal identity, which are *numerical identity* – like psychological or biological continuity – *practical identity* – where the reasons of our decisions and choices de-

²⁰ J. CLAUSEN, *Bonding Brains to Machines: Ethical Implications of Electroceuticals for the Human Brain*, in *Neuroethics*, 6, 2013, 429–434.

²¹ L. KLAMING, P. HASELAGER, *Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence*, cit., *passim*. According to some scholars, the notion of identity as psycho-physical continuity underpins the notion of *forensic personal identity*, that is the idea of personal identity, which is used by the law and in legal contexts M. SCHECHTMAN, *Getting our stories straight: Self-narrative and personal identity*, in D.J.H. MATHEWS, H. BOK, P.V. RABINS (eds.), *Personal identity and fractured selves: Perspectives from philosophy, ethics, and neuroscience*, Baltimore, 2009, 65–92; T. GALERT, *Impact of Brain Interventions on Personal Identity*, *icit.*, *passim*; J. CHANDLER, *Mind, Brain, and Law: Issues at the Intersection of Neuroscience, Personal Identity, and the Legal System*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, cit., 441–458.

²² F. BAYLIS, *"I Am Who I Am": On the Perceived Threats to Personal Identity from Deep Brain Stimulation*, cit., *passim*.

²³ C. MACKENZIE, M. WALKER, *Neurotechnologies, Personal Identity, and the Ethics of Authenticity*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, cit., 373–392. Their thesis is shared also by E. GODDARD, *Deep Brain Stimulation Through the "Lens of Agency": Clarifying Threats to Personal Identity from Neurological Intervention*, in *Neuroethics*, 10, 2017, 325–335.

termine *who we existentially* are – and *narrative identity* – which they consider to be the best when coping with a diachronic building and re-constructing of personal identity.²⁴

3.1.2. Deflating perspectives

Many scholars have raised objections if not to deny the issue altogether, at least to seriously limit its relevance. Their claim is that, even if medicine should not be subdued to technology, it cannot be deviated from its goals by pure speculations. Therefore, bioethics issues about identity changes should not be overstated and, in any case, they are not more justified than the issues connected to the side effects of drug therapies.

Françoise Baylis has claimed that what patients experience is not an identity change, but an adaptation to their new condition, which could imply a change in their personality rather than in their personal identity.²⁵ From this point of view, discussions about identity or self are irrelevant for *DBS*.²⁶ Other scholars have made a distinction between debating on what personal identity is in general terms and presuming that the theoretical notions provided in the debate are immediately applicable on a practical level. Indeed, an alteration of personal identity – whatever that means – can be caused not only by a therapeutic treatment, but also by the disease itself.²⁷

In order to try and provide a more complete picture of the issues involved, there is clinical data worth mentioning. For example, an increasing ratio of suicides of *DBS* patients suffering from drug therapy resistant depression has been reported.²⁸ Moreover, some neurosurgeons who regularly implant *DBS* devices warn not to diminish the significance of patients' reports about the changes that they experience.²⁹

Nevertheless, there are scholars who warn against the risk that the identity debate may become a threat for the development of this kind of therapy.³⁰ Some of them, without denying the cases of *DBS* patients declaring not to feel to be themselves anymore after the implant, promote the idea of deflating the «*DBS* causes personality changes» bubble.³¹

²⁴ It is my view that this variety of possible paradigms is a reason not to introduce a new human right to psychological continuity as proposed by M. IENCA, R. ANDORNO, *Towards new human rights in the age of neuroscience and neurotechnology*, in *Life Sciences, Society and Policy*, 13, 2017, article 5.

²⁵ F. BAYLIS, *"I Am Who I Am": On the Perceived Threats to Personal Identity from Deep Brain Stimulation*, cit., *passim*.

²⁶ F. BAYLIS, *"I Am Who I Am": On the Perceived Threats to Personal Identity from Deep Brain Stimulation*, cit., *passim*.

²⁷ A. PACHOLCZYK, *Ethical Objections to Deep Brain Stimulation for Neuropsychiatric Disorders and Enhancement: A Critical Review*, cit., *passim*.

²⁸ S. GOERING et al., *Staying in the Loop: Relational Agency and Identity in Next-Generation DBS for Psychiatry*, cit., *passim*.

²⁹ D. CYRON, *Mental Side Effects of Deep Brain Stimulation (DBS) for Movement Disorders: The Futility of Denial*, in *Frontiers in Integrative Neuroscience*, 10, 2016, article 17; S. EICH, O. MÜLLER, A. SCHULZE-BONHAGE, *Changes in self-perception in patients treated with neurostimulating devices*, in *Epilepsy & Behavior*, 90, 2019, 25–30.

³⁰ S. MÜLLER, M. BITTLINGER, H. WALTER, *Threats to Neurosurgical Patients Posed by the Personal Identity Debate*, in *Neuroethics*, 10, 2017, 299–310.

³¹ F. GILBERT – J.N.M. VIAÑA – C. INEICHEN, *Deflating the "DBS causes personality changes" bubble*, in «*Neuroethics*», 2018, <https://doi.org/10.1007/s12152-018-9373-8> (last visited 09.12.2019).

Additionally, Paul Foley noticed that, even if changes are possible, they should not necessarily be negative. Side effects, like euphoria, increased vitality, sense of power – which are often reported and which could be produced by the patients themselves by increasing the stimuli – seem to be more negative for other people than for the patients themselves.³² For example, this was the case of a *PD* patient who, after an eighteen months' stimulation, not only had improved his motor control, but had also recovered his vitality and experienced a more general desire of changing his life style. On the other hand, his wife, whose whole life revolved around the care given to her husband for seven years, went into depression.³³

3.1.3. Some legal profiles

The notions of identity used to outline the conceptual frame of the cases discussed above and the kind of transformations or changes, which can follow a *DBS* treatment, do not directly correspond to the meaning that identity acquires, in our legal system, as a *right*, that is the right to personal identity.

As the Italian philosopher of law Giorgio Pino has clearly pointed out, the right to personal identity is the right to be oneself both with regard to the one's own life choices and projects and with regard to an appropriate correct external representation of one's own personality. Therefore, as a *right*, personal identity is a particular determination of the more general inviolable right to personal freedom and is connected to the values of personal dignity, equality, free development of one's own personality and personal autonomy.³⁴

The cases and the issues reported above seem to be more connected with the mental balance of the *DBS* patients. Therefore, from a legal point of view, if a fundamental right is affected or challenged by those treatments and their consequences, it seems to be the right to *mental integrity* rather than the right to personal identity. As is well known, according to the 3rd article of the *Charter of Fundamental Rights of The European Union*, «Everyone has the right to respect for his or her physical and mental integrity». Also the Italian Constitutional Court has ruled that mental integrity, on a par with physical integrity, is a constitutional protected interest connected with the right to health, as set out in art. 32nd of the Italian Constitution.³⁵ Additionally, in the current debate, it has also been claimed that «mental integrity rights stand to prevent from harm, absolutely conceived, but to prevent to a disproportionate relative harm compared to the potential therapeutic benefit».³⁶

Nevertheless, some problems remain. Indeed, even if the laws and jurisprudence concerning biological damage could cover the reported phenomena,³⁷ understanding whether a court of law can rule

³² P. FOLEY, *Deep Brain Stimulation for Parkinson's Disease: Historical and Neuroethical Aspects*, cit., *passim*.

³³ F. KRAEMER, *Me, Myself and My Brain Implant: Deep Brain Stimulation Raises Questions of Personal Authenticity and Alienation*, in *Neuroethics*, 6, 2013, 483–497.

³⁴ G. PINO, *L'identità personale*, in S. RODOTÀ, M. TALLACCHINI (eds.), *Ambito e fonti del biodiritto*, vol. I, Milano, 2010, 297–321: 316.

³⁵ Corte Cost. – 11/07/2003, n 233.

³⁶ M. IENCA, R. ANDORNO, *Towards new human rights in the age of neuroscience and neurotechnology*, cit., *passim*.

³⁷ According to Italian jurisprudence, harm to psycho-physical integrity affects the whole relational life of an individual. See, f.i., Tribunale sez. XIII – Roma, 13/04/2017, n. 7454; Tribunale sez. XII – Roma, 06/09/2017, n.

that they represent a mental harm for a *DBS* patient or not is no easy task. According to the Italian State Council, a mental harm is a pathological alteration of somebody's physiological balance based on scientific evidence.³⁸ Without mentioning anything else, scientific evidence of alterations or disturbances reported by *DBS* patients is precisely what is at stake. Of course, this does not lead necessarily to deny the existence of these changes, but it suggests more prudently that the measuring criteria have not been properly established yet.³⁹ The difficulty of implementing empirical measurements may be actually alimeted by the complexity of the theoretical issues.

3.2. DBS and autonomy

3.2.1. Self-control and capacity to decide

As we have seen, in *DBS* patients, the issues related to personal identity are strictly intertwined with the sphere of personal autonomy.⁴⁰ In the current debate, this notion seems to imply at least three profiles. They are the control of one's own movements, actions or behavior, the capacity of self-determining in acting, pursuing one's own interests in accordance with one's own values, the capacity to make relevant decisions such as consenting to initiate or to continue a therapy.

On the one hand, *DBS* treatments seem to have less side effects on the autonomy of patients than on their identity. The therapy allows *PD* patients to recover control both over their movements and their behavior and choices to a certain degree. For example, in patients suffering from drug resistant depression, but capable to consent, *DBS* can reduce symptoms like anhedonia or decrease of energy and allows them to recover their ability to act according to their own interests.⁴¹

On the other hand, as the case of the Dutch patient shows, the possibility that *DBS* affects one's capacity to take relevant decisions on the basis of one's own ability to understand and remember relevant information cannot be excluded.⁴² Even without necessarily reaching such a dramatic level, some doubts about the real preservation of personal autonomy in deciding can arise from the possible *DBS* side effects.

The case of a *DBS* patient suffering from obsessive-compulsive disorders provides a concrete example.⁴³ Because the inefficacy of the treatment, the doctor decided to interrupt the electrostimulation, although the patient asked to continue it because it gave her a feeling of happiness and

16618; Corte appello sez. III – Roma, 08/08/2017, n. 5342; Cassazione civile sez. III – 28/02/2017, n. 5010; Cassazione civile sez. III – 24/10/2017, n. 25109.

³⁸ Consiglio di Stato sez. IV – 15/05/2018, n. 2888.

³⁹ D. CYRON, *Mental Side Effects of Deep Brain Stimulation (DBS) for Movement Disorders: The Futility of Denial*, cit., *passim*. About the criteria needed to detect changes in *DBS* patients' self-perception, see S. EICH, O. MÜLLER, A. SCHULZE-BONHAGE, *Changes in self-perception in patients treated with neurostimulating devices*, in *Epilepsy & Behaviour*, 90, 2019, 25–30.

⁴⁰ S. GALLAGHER, *Deep Brain Stimulation, Self and Relational Autonomy*, in *Neuroethics*, 2018, <https://doi.org/10.1007/s12152-018-9355-x> (last visited 09.12.2019).

⁴¹ T. BEEKER, T.E. SCHLAEPFER, V. A. COENEN, *Autonomy in Depressive Patients Undergoing DBS-Treatment: Informed Consent, Freedom of Will and DBS' Potential to Restore It*, cit., *passim*.

⁴² L. KLAMING, P. HASELAGER, *Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence*, cit., *passim*.

⁴³ M. SCHERMER, *Health, Happiness and Human Enhancement—Dealing with Unexpected Effects of Deep Brain Stimulation*, in *Neuroethics*, 6, 2013, 435–445.

made her feeling better. Without considering the vanishing of any clear cut between therapy and enhancement, one could think that the patient's capacity to make a sound decision about continuing the therapy has been altered.⁴⁴ If «Being autonomous means leading one's life in accordance with one's own choices, that is, choices that are based on the values and goals we endorse after deliberation», the space for rational deliberation seems to have failed in this case.⁴⁵

3.2.2. New fronts

The deepest concerns about the possibility of preserving personal autonomy arise as a consequence of the progressive development and diffusion of a new *DBS* device generation, the so-called *closed loop* devices. In the traditional *open loop* devices, stimulation is provided by an impulse generator powered by a battery and the signal goes only from the device to the brain. *Closed loop* devices are bidirectional, because they give impulses to brain areas and at the same time detect and collect the signals produced by brain activity. Therefore, the stimulation can be varied and adapted to the present physiological condition of the interested brain areas. The regulation of this complex of interactions seems to be very close to the natural mind-body regulation complex and is provided by an algorithm, which automatically releases the impulse that is suitable for the patient's physiological condition.⁴⁶

This technology uses the advances made in the field of Brain Computer Interface (*BCI*). Generally speaking, the research in this branch aims to develop devices that use electro brain activity to control objects, like prosthetic limbs, or to perform activities, like playing video games.⁴⁷

The kind of technology that assists the second generation devices, on the one hand, and the fact that they can work in a completely automated way, on the other hand, have raised the greatest concerns and the most burning issues.⁴⁸ Scholars have already debated on the possibility of brain-hacking in case of *BCI*.⁴⁹ Nowadays, the debate is about the possibility to program the devices for other goals or

⁴⁴ On the relationship between *DBS* and mental integrity with regard to enhancement, see also A. NISCO, *La tutela penale dell'integrità psichica*, Torino, 2012, 138–149. On the relationship between *mental integrity* and *moral enhancement*, see F. FOCQUAERT, M. SCHERMER, *Moral Enhancement: Do Means Matter Morally?*, in *Neuroethics*, 8, 2015, 139–151.

⁴⁵ F. FOCQUAERT, M. SCHERMER, *Moral Enhancement: Do Means Matter Morally?*, cit., 145. For a discussion of their thesis, H. MASLEN, J. PUGH, J. SAVULESCU, *The Ethics of Deep Brain Stimulation for the Treatment of Anorexia Nervosa*, in *Neuroethics*, 8, 2015, 215–230.

⁴⁶ S. GOERING et al., *Staying in the Loop: Relational Agency and Identity in Next-Generation DBS for Psychiatry*, cit., *passim*, rightly point out both that our conscious activities are underpinned by several unconscious activities of bodily self-regulation and that our sense of agency includes also our trusting other people.

⁴⁷ J. WOLPAW, E.W. WOLPAW (eds.), *Brain-Computer Interfaces: Principles and Practice*, cit.; A.E. HASSANIEN, A.T. AZAR (eds.), *Brain-Computer Interfaces Current Trends and Applications*, Switzerland, 2015; C. GUGER, B. ALLISON, J. USHIBA (eds.), *Brain-Computer Interface Research A State-of-the-Art Summary 5*, Switzerland, 2017; D.J. MCFARLAND, J.R. WOLPAW, *Brain-computer interface use is a skill that user and system acquire together*, in *PLOS Biology*, 16, 2018, e2006719.

⁴⁸ Cfr. ad es. E. KLEIN, C.S. NAM, *Neuroethics and brain-computer interfaces (BCIs)*, in *Brain-Computer Interfaces*, 3, 2016, 123–125.

⁴⁹ M. IENCA, *Neuroprivacy, neurosecurity and brain-hacking: Emerging issues in neural engineering*, in *Bioethica Forum*, 8, 2015, 51–53; M. IENCA, P. HASELAGER, *Hacking the brain: brain-computer interfacing technology and the ethics of neurosecurity*, in *Ethics and Informatic Technologies*, 18, 2018, 117–29.

functions than the ones for which the patients have given their informed consent. According to some scholars, this would be a violation of one's cognitive liberty, which could be seen as the updated version of freedom of thought.⁵⁰

In order to limit the risks of being manipulated as much as possible, and to preserve the right to autonomy and to privacy also in this new field, an Italian author, Andrea Lavazza, has claimed that devices should incorporate, by design, systems that «(a) can find and signal the unauthorized detection, alteration, and diffusion of brain data; (b) be able to stop any unauthorized detection, alteration, and diffusion of brain data». It is his view that this is the only possible way to preserve *mental integrity*, that is «the individual's mastery of his mental states and his brain data so that, without his consent, no one can read, spread, or alter such states and data in order to condition the individual in any way».⁵¹ Other scholars, like Ienca and Andorno, have suggested including the right to mental privacy and cognitive liberty among a new set of human rights, which may stand up to the neurotechnology challenge.⁵² It is worth mentioning that in this context, the meaning of mental integrity is starting to overlap the one of unaltered mental state, so that one's interest in mental integrity is the «interest in not having at least some of his mental states intentionally altered by others in certain ways».⁵³

3.2.3. Dystopias?

Another link between the use of neurotechnological devices and personal autonomy, which is meaningful for the legal system, is provided by the possibility of using those devices to treat criminal offenders, as a means of voluntary diversion to avoid incarceration.⁵⁴ Clearly, the theoretical back-

⁵⁰ «Cognitive liberty is a term that updates notions of 'freedom of thought' for the 21st century by taking into account the power we now have [...] to monitor and manipulate cognitive function. Cognitive liberty is every person's fundamental right to think independently, to use the full spectrum of his or her mind, and to have autonomy over his or her own brain chemistry» W. SENTENTIA, *Neuroethical Considerations: Cognitive Liberty and Converging Technologies for Improving Human Cognition*, in *Annals of the New York Academy of Sciences*, 1013, 2004, 221–228: 222–23.

⁵¹ A. LAVAZZA, *Freedom of Thought and Mental Integrity: The Moral Requirements for Any Neural Prosthesis*, cit., 4.

⁵² M. IENCA, R. ANDORNO, *Towards new human rights in the age of neuroscience and neurotechnology*, cit., *passim*. On the topic, with regard to the criminal law, see also J.K. BUBLITZ, R. MERKEL, *Crimes Against Minds: On Mental Manipulations, Harms and a Human Right to Mental Self-Determination in Criminal Law*, in *Philosophy*, 8, 2014, 51–77; J.C. BUBLITZ, *Cognitive Liberty or the International Human Right to Freedom of Thought*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, cit., 1309–1333; J.N. CRAIG, *Incarceration, Direct Brain Intervention, and the Right to Mental Integrity – a Reply to Thomas Douglas*, in *Neuroethics*, 9, 2016, 107–118; J.C. BUBLITZ, «The Soul is the Prison of the Body» – *Mandatory Moral Enhancement, Punishment & Rights Against Neuro-Rehabilitation*, in D. BIRKS, T. DOUGLAS (eds.), *Treatment for Crime: Philosophical Essays on Neurointerventions in Criminal Justice*, Oxford, 2018, pp. 289–320.

⁵³ D. BIRKS, A. BUYX, *Punishing Intentions and Neurointerventions*, in *AJOB Neuroscience*, 9, 2018, 133–143: 133.

⁵⁴ Specifically on this topic, see J. RYBERG, *Predictive Brain Devices, Therapeutic Activation Systems, and Aggression*, in *AJOB Neuroscience*, 6, 2015, 36–38; D. HÜBNER, L. WHITE, *Neurosurgery for psychopaths? An ethical analysis*, in *AJOB Neuroscience*, 7, 2016, 140–149; R. MACKENZIE, *Deep Brain Stimulation for Psychopaths—A No Brainer*, in *AJOB Neuroscience* 7, 2016, 137–139; J. RYBERG, *Deep Brain Stimulation, Psychopaths, and Punishment*, in *AJOB Neuroscience* 7, 2016, 168–169. On the more general topic of brain interventions on criminal offenders, see D. BIRKS, T. DOUGLAS (eds.), *Treatment for crime: Philosophical essays on neurointerventions in criminal justice*, cit. *passim*; D. BIRKS, A. BUYX, *Punishing Intentions and Neurointerventions*, cit., *passim*; A. LAVAZZA, *If*

ground for this kind of use is a special prevention theory of punishment. Therefore, the notion of personal autonomy is already limited if not totally compromised by the aim to pursue social defense or rehabilitation by means of biological interventions.

On the one hand, one could relegate this kind of intervention to a distant dystopian future, both because of legal reasons, at least in connection with our legal system, and because of technical reasons, given the complexity of applying and tuning the devices.⁵⁵ On the other hand, neither are insurmountable obstacles. Further advance in research could provide less invasive, more manageable and more efficient devices. Moreover, some scholars have already proposed – along the same lines as in chemical castration – the use of tools for brain stimulation in order to inhibit certain impulses or to recondition certain neurological patterns.⁵⁶

4. Integrity and individuality

There is no doubt that the issues raised by using neurodevices, more or less stably connected with the brain, are going to increase. Even from the limited point of view provided by the use of devices for DBS, it is easy to foresee that the uninterrupted technological development is going to disrupt the banks provided by mere therapeutic aims and to affect those notions that are synthesized by the concept of integrity.

The idea of integrity shapes the properly constitutive feature of individuality, because only what is integral – what is not fragmented, not divided, not disjointed, not dispersed – can be properly called individual. Only what is not disjointed because of its individuality can have its own identity and autonomy in relating to itself and to somebody else or something else.

Mental integrity protection raises a crucial issue in a context, in which the use of neurotechnology is an irreversible achievement that is going to get more solid and increase further. What comes into question is the proper constitution of individuality, its way of being-something and of being-that in the era in which technique does not only reproduce reality, but produces a virtual one that has concrete effects, very real indeed, on individuals and society.

This is not an ethical or legal issue anymore, but an ontological one, or better, it is an ethical or legal issue *because* it is an ontological one: what else is the target of law if not what “really” is?

To sum up, concerns are distributed on three levels at least. The following pages aim to briefly outline the issues at stake in these different levels. The first level (4.1.) is provided by the urge of a legal protection of mental integrity, the second one (4.2-4.3) is generated by the way in which neurodevices affect the constitution of individuality, the third one (4.4.) is given by the relationship between natural and technical processes.

Criminal Intentions Are Nonvoluntary, Mandatory Neurointerventions Might Be Permissible, in *AJOB Neuroscience*, 9, 2018, 154–156.

⁵⁵ A. PACHOLCZYK, *Ethical Objections to Deep Brain Stimulation for Neuropsychiatric Disorders and Enhancement: A Critical Review*, in J. CLAUSEN, N. LEVY (eds.), *Handbook of Neuroethics*, cit., 635–655.

⁵⁶ T. DOUGLAS, *Nonconsensual Neurocorrectives and Bodily Integrity: a Reply to Shaw and Barn*, in *Neuroethics*, 12, 2019, 107–118.

4.1. Protecting mental integrity in the neurotechnological era

Recently, Ienca and Andorno have claimed that the notion of mental integrity needs to be reconceptualized. In the neurotechnological era, its meaning can not be restrained to the original care for mental health.⁵⁷

As we have seen, this notion is articulated and complex.

Mental integrity is an articulated notion because it involves different aspects. On the one hand, when personal identity comes into question, the main issues concern the determination of those psychological borders that allow each individual to be recognizable by herself or by other people throughout his or her life. On the other hand, when personal autonomy comes into question, the problematic trait is provided by cognitive liberty and the possibility of conditioning both the will-forming process and the execution of one's own intents.

Mental integrity is also a complex notion because the above mentioned aspects are always intertwined, although not always in a clear way. On the one hand, the notion of agency, that is the feeling of being the author of one's own choices, decisions and acts, is used in order to provide some contents for the notion of personal identity. On the other hand, the notion of cognitive liberty implies the existence of an inviolable identity core of the subject, in relation to which something can be said to be external or extraneous to the subject's own will.

Because of the articulation and complexity of mental integrity, this notion calls for at least three levels of protection.

Where *DBS* or *BCI* technologies are used to treat or to assist people suffering from diseases or bodily handicapped, the possible issues connected with informed consent are twofold. On the one hand, they concern the contents of the informed consent. As we have seen, the side effects or consequences of a treatment are not always predictable enough. Therefore, it is not sufficiently clear what one is giving consent to. The personality changes that are reported in some cases have a significant bearing on the patients' personal and relational life. However, these changes seem neither to be comprehensible into a sufficiently stable and shared theoretical frame nor to be connected to any objective parameter. On the other hand, simply assuming that a treatment does not affect (in a positive or negative way) the capacity to consent and personal autonomy of the patient seems to be highly questionable because of the possible changes in personality induced by the treatment itself.

On another level, concerns also arise regarding privacy and personal data protection. It has to be granted that the devices do not detect or collect or transmit data without the patient knowing it. However, the data flow occurs constantly, in real time and cannot be monitored by the patients themselves. Consequently, new devices are controlled by software, often connected to a network. Clearly, the need of privacy and data protection becomes more and more pressing, provided that collecting, analyzing and selling big data is a worldwide business.⁵⁸ If personal data of one's brain activity is collected for scientific research, anonymity has to be granted.

⁵⁷ M. IENCA, R. ANDORNO, *Towards new human rights in the age of neuroscience and neurotechnology*, cit., *passim*.

⁵⁸ P. KELLMEYER, *Big Brain Data: On the Responsible Use of Brain Data from Clinical and Consumer-Directed Neurotechnological Devices*, in *Neuroethics*, 2018, <https://doi.org/10.1007/s12152-018-9371-x> (last visited 09.12.2019).

The mental privacy issue is likely to emerge in manifold, significant ways in the near future. Advances in *BCI* technology are going to make possible the transformation of electro brain activity signals into words on a computer screen.⁵⁹ This technology has been developed to help people who cannot communicate anymore, like patients suffering from locked-in syndrome. Yet, one cannot exclude its application in other contexts, like a job interview. Mindreading seems not to be a dream anymore, but is becoming reality, which is likely to turn into a nightmare.⁶⁰

The third level of mental integrity protection concerns individual's will both in the development of volitions and in their fulfillment. The possibility of an external interference, perhaps via remote-controlled interconnected devices, cannot be excluded.

As concerns the first kind of process, some scholars propose or foresee the use of brain activity controlling devices in treatment of criminal offenders, whereas others warn about the risk of *brain-hacking*. Presently, they seem to be projections out of a dystopian future, but nobody knows it for sure. It is worth mentioning that the debate about treatment of criminal offenders via neurointerventions is getting more and more intense.⁶¹

Possible interventions on the second kind of process are by far more concrete via *BCI* technology. Only ten years ago, it was possible to claim that neurosecurity was not an issue at that time, but it would be an important concern in the future.⁶² According to recent research, the data packets that allow the remote control of objects, tools or machineries via *BCI* devices can be intercepted and manipulated.⁶³ Users could face the critical situation of being requested to prove that a possible damage or harm caused by some object or machinery was not an effect of an impulse generated (willingly or not) by their brain.⁶⁴

⁵⁹ O. IJINA et al., *Neurolinguistic and machine-learning perspectives on direct speech BCIs for restoration of naturalistic communication*, in *Brain-Computer Interfaces*, 4, 2017, 186–199; H. AKBARI et al., *Towards reconstructing intelligible speech from the human auditory cortex*, in *Scientific Reports*, 9, 2019, 874.

⁶⁰ S. SAMUEL, *Facebook is building tech to read your mind. The ethical implications are staggering*, in *Vox*, <https://www.vox.com/future-perfect/2019/8/5/20750259/facebook-ai-mind-reading-brain-computer-interface> (last visited 17.09.2019).

⁶¹ D. BIRKS, A. BUYX, *Punishing Intentions and Neurointerventions*, cit., *passim*; D. BIRKS, T. DOUGLAS (eds.), *Treatment for crime: Philosophical essays on neurointerventions in criminal justice*, cit., *passim*; G.G. ENCK, A.L. SAUNDERS, *Mental Integrity and Intentional Side Effects*, in *AJOB Neuroscience*, 9, 2018, 166–168; S. LING, A. RAINE, *Neurointerventions in Offenders: Ethical Considerations*, in *AJOB Neuroscience*, 9, 2018, 146–148; N. MARTINEZ-MARTIN, *Punishment and Rehabilitation in the Use of Neurointerventions for Criminals*, in *AJOB Neuroscience*, 9, 2018, 152–53; A.C. PALK, *Mandatory Neurointerventions Could Enhance the Mental Integrity of Certain Criminal Offenders*, in *AJOB Neuroscience*, 9, 2018, 150–52; A.B. SHNIDERMAN, L.B. SOLBERG, *Mandatory Neurointervention: A Lesser Evil Than Incarceration?*, in *AJOB Neuroscience*, 9, 2018, 148–49; P. VALLENTYNE, *Neurointerventions: Punishment, Mental Integrity, and Intentions*, in *AJOB Neuroscience*, 9, 2018, 131–32; T. DOUGLAS, *Nonconsensual Neurocorrectives and Bodily Integrity: a Reply to Shaw and Barn*, cit., *passim*; L. KIRCHMAIR, *Objections to Coercive Neurocorrectives for Criminal Offenders – Why Offenders' Human Rights Should Fundamentally Come First*, in *Criminal Justice Ethics*, 38, 2019, 19–40; E. SHAW, *The Right to Bodily Integrity and the Rehabilitation of Offenders Through Medical Interventions: A Reply to Thomas Douglas*, in *Neuroethics*, 12, 2019, 97–106.

⁶² T. DENNING, Y. MATSUOKA, T. KOHNO, *Neurosecurity: security and privacy for neural devices*, in *Neurosurgical Focus FOC*, 27, 2009, E7.

⁶³ B. CUSACK, K. SUNDARARAJAN, R. KHALEGHPARAST, *Neurosecurity for Brainware Devices*, cit., *passim*.

⁶⁴ R. YUSTE et al., *Four ethical priorities for neurotechnologies and AI*, in *Nature News*, 551, 2017, 159.

4.2. Devices and “dividual”

Beyond the undeniable usefulness of neuro-devices such as neuro-modulators and neuro-prostheses, something deeper seems to be at work below the surface of the phenomena we have analyzed. To put it in a few words, what is at work here is a growing split between the ideation center and the fulfillment medium whose entanglement substantiates the agent’s individuality.

When a certain brain activity can be transformed into an impulse that can activate machinery via computer, the psychophysical unity of the subject, seen as the entity to which certain acts are ascribed, vanishes. The same happens, when *PD* patients recover control over their bodily motility, but do not feel to be themselves anymore, they feel being acted on rather than being the agent.

Automatic regulation of stimulation or data flow relieves patients and allows them not to think about the therapy while doing everyday things. On the other hand, it prevents them from maintaining and exercising even that (very little) amount of control, which consists in having to decide each time whether to take the prescribed dose of medicine or not. Although some scholars claim that our behavior is for the most part steered by automatic processes, which we are unaware of, those automatisms are not induced by an external intervention, they are not something different from the individual entity that each of us is.

Because of this being “dividual”, one is always subject to a possible or actual intervention performed by somebody else or something else, to the extent that one may think that somebody or something detects or takes over one’s own thoughts. Of course, one can object that the diseases or impairments themselves, for which the neuro-devices are being developed, consist precisely in a split between the systems for ideation and action, for control and execution. In addition, one can claim that these devices allow for recovering the unity broken by the pathology. Nevertheless, the way in which any medium works in order to recover unity is to put together a compound of elements that remain distinct rather than become an integrated individuality.

Research should not be interrupted nor researchers mistrusted. It is possible and desirable that technological advance should reduce more and more the gaps in the connection areas between organism and machine, between mind and algorithm. However, it is worth considering that what an individual properly owns will always be transferred to something else than the individual herself. In fact, as long as we are dealing with artifacts, the unity is provided by using a medium (i.e., something which is in-between), by something that maintains separated the elements it connects, because it is put *between* them.

4.3. Rethinking individuality

Considering that the gaps may never be bridged, another perspective is worth being taken into account. No artificial reconstruction of the connections that pathology or trauma have interrupted would ever be possible if a certain capacity of individuals were not already at work. This is the individuals’ capacity to relate to themselves or to the world *also* via something else, such as a medium.

However trivial this may sound, the suitability of a medium for a given goal is not the effect of the medium itself, but it is already predisposed, preformed and prefigured in what the medium is employed for. Conversely, possible dysfunctions of the medium are clues that it does not perfectly suit that prefiguration and a hiatus persists between the medium and that predisposition. This property

of the medium plays a central role in enquiring into the ontological constitution of the individual whose mental integrity is established as a right. Indeed, what appears to be questionable is a certain idea of the acting individual that sometimes emerges from the theory and practice of law. It is the idea according to which relationships and connections are something into which an individual goes as an active or passive subject.

Relationships and connections seem to pertain to an additional frame external to what an individual is in herself or on her own. One can go into relationships and connections precisely because of their structural exteriority. Therefore, those aspects, in regard to which one goes into relationships and which are condensed in the idea of subjective capacity, are assumed to be already given and formed before and independently of any relationships with something “other”, an individual or a thing.

In using neurodevices, relationships with something that is “other” than the person herself are re-constitutive precisely of the capacity to have relationships in its manifold aspects. However, this would not be possible, if this predisposition to be capable of establishing relationships were not already at work on both sides of individuality, the one of identity and that of autonomy.

Ironically, the development of *neurodevices* seems to put into light the essential features of individuality. The individual is neither the entity who is isolated and indifferent to any relationship nor the one who is not affected by a split, but the one who does not lose her relationship capacity even in the case of the deepest and hardest splits because the “otherness” is not something she goes into relationship with but is constitutive of her own self.

Preserving and protecting mental integrity is the same as preserving and protecting this structural being-in-relationship-with of each individual. This could be the criterion for evaluating neurodevices and for establishing possible constraints to their use.

4.4. At the source of an ambivalence

To sum up, neurodevices have a twofold effect. On the one hand, they seem to yield individuals to something, which is as external as possible from themselves. On the other hand, they can bring to light the most essential feature of individuality itself. The source of this ambivalence can be brought into light thanks to one of Aristotle’s intuitions about the relationship between nature and technique.

In the second book of his *Physics*, Aristotle writes that «generally art (*techne*) in some cases completes (*epitelein*) what nature (*physis*) cannot bring to a finish, and in others imitates (*mimēisthai*) nature». ⁶⁵ The two operating ways of art – to complete (*epitelein*) and to imitate (*mimēisthai*) – are very different both in their presuppositions and in their effects.

In order to complete what nature cannot do by itself, it must be admitted that the space in which the *techne* sets out and develops its activity is not an effect of its operating and of its planning.

If the activity of the *techne* is bringing to a finish, what art encounters as something unfinished precedes the art itself in at least a twofold way. On the one hand, the operations of the *techne* are obviously preceded by the things on which they are implemented. The objects of the art intervention

⁶⁵ ARISTOT., *Phys.*, II, 8, 199 a 15–16, in W.D. ROSS (ed.), *Aristotle’s Physics*, Oxford, 1936; ARISTOTLE, *The Complete Works of Aristotle. The Revised Oxford Translation*, ed. by J. BARNES, Princeton, Digital Edition 2014. On this topic, F. CHIEREGHIN, *Dall’antropologia all’etica. All’origine della domanda sull’uomo*, Milano, 1997.

need to be already “given”. On the other hand, these things, these “givens” have prefigured in themselves – in their revealing themselves as unfinished, as to-be-completed – also the direction towards which they tend to overcome their incompleteness.

In order to effectively help nature, the *techne* should embrace also ends that it has not established by itself and that it cannot dispose of or master. Art cannot perform this task without being able to pay attention to something that cannot be reduced to a mere effect of both its operating and its planning capacity.

Through *mimēsthai*, the *techne* performs something completely different. In order to understand this distinction, it is worth clarifying the way in which art imitates nature by taking it as a model. When *techne* acts like nature, it does not restrict its operating only to reproduce the different natural processes according to its own modalities. Moreover, what the *techne* imitates is the “self-normativity” of nature, according to which nature is not previously subject to ends and goals established and imposed by something else than nature itself. Thus, art imitates nature in its not having to account for its processes to nothing else than itself, in its not having to ascribe them to anything else than itself.

The mimetic act performed by the *techne* is making itself and its specific “normativity” the only possible model of knowing and doing. Therefore, no other ends and processes are possible than the technical ones. Everything is seen as a possible material that can be modified and manipulated to pursue and fulfill ends, which can be always varied, none of them being in itself more or less relevant, preferable or necessary than the others.

Nature itself becomes something that art can totally master. The more art manages to figure out and reproduce fragments of those natural processes it makes use of, the more it substitutes the reality it is imitating, to the extent that nature itself is seen as an “artifact”, as something regulated by the same schemes that are specific for art.

By mentioning this distinction outlined by Aristotle, one cannot ignore the conceptual distance between the Greek notions of *physis* and *techne*, on the one hand, and the contemporary notions of nature and technique, on the other hand⁶⁶. Nevertheless, Aristotle’s remark could play a heuristic role in order to cope with the theoretical and practical issues at stake in the debate about the use of neurodevices.

The distinction shows the conceptual roots of the above mentioned issues. On the one hand, neurodevices are useful tools in helping where “natural” equipment is lacking or not available anymore. They complete nature. Thus, they have as condition, end and limit something that is not reducible to the potential or actual effects of their employment. On the other hand, by means of their more and more efficient mimetic performances, they can provide by themselves a measure and a “normativity” of the processes they imitate, which go beyond any “natural” standard. In addition, by transforming

⁶⁶ «*Techne*, does not mean “technique” in the sense of methods and acts of production, nor does it mean “art” in the wider sense of an ability to produce something. Rather, *techne* is a form of knowledge; it means: know-how in, i.e., familiarity with, what grounds every act of making and producing. It means knowing what the production of, e.g., a bedstead, must come to, where it must achieve its end and be completed» M. HEIDEGGER, *On the essence and concept of φύσις in Aristotle’s Physics B, I*, in W. MCNEILL (ed.), *Pathmarks*, Cambridge, 1998, 183–230: 192. On this topic T. GLAZEBROOK, *From φύσις to Nature, τέχνη to Technology: Heidegger on Aristotle, Galileo, and Newton*, in *The Southern Journal of Philosophy*, 38, 2000, 95–118.

those processes into a codified “artifact”, they make them manipulable and usable for the most disparate goals.

This two-sponged potentiality of neurodevices opens up the space in which law is pushed to provide suitable protection tools for the different interests that are at stake each time. Being aware of it does not provide any evaluation criteria nor any decision guidelines. However, it allows us to realize that any employed legal tool or any provided legal solution will necessarily reflect a clear stance regarding those two possibilities, and that they will have to take on the burden of this responsibility.

Essays