

## **Neuroethics : an introductory to the field preventing the harm generated by neurotechnological advancements , and ensuring the protection of the nature of human species.**

**Magistere degree: Mokdad Kahina<sup>1</sup>**

<sup>1</sup>Algiers 2 University (Algeria).

**The E-mail Author:**[kahina.mokdad@univ.alger2.dz](mailto:kahina.mokdad@univ.alger2.dz)

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### **Abstract:**

Neuroscience advancements provided insights into brain structures and functions, Specifically with the human brain project which has contributed highly to understand how the brain works and despite the fact that neuroscientific is used to treat brain diseases these novel discoveries arise new ethical questions; because such innovations can be used to enhance the capacities of healthy individuals in order to perfect their abilities, additionally to monitoring the brain process, and modifying the brain functions and consequently modifying the personal identity of the person. All this led to the emergence of neuroethics which is an empirical research to questions concerning consequences of neuroscience progress.

**Keywords:** Neuroethics, ethical issues, ethics, brain, neurotechnology.

### **1-Introduction**

In recent years of the twenty first century , neuroscientists have become highly interested in moral behavior , cognition , emotion and all what is linked to the human brain. And thanks to this research in neuroscience , enormous progress and innovations have appeared .

In sum, new knowledge derives constantly from neuroscience advances and studies, as the knowledge of the functioning of the different brain's lobes peculiarly those related to social behavior moral cognition , and ethical reasoning .

However these advances neurotechnologies arise new ethical problems , as deep-brain stimulation, brain implants, pharmacological enhancement of cognition, memory attention , learning and more other faculties of the human brain and body , which may affect the person's autonomy , privacy , and self-identity because such techniques can alter extremely and neuroethics is the new discipline which studies these functions.

which studies these issues and the ethical problems arising from what we can do to the brain with the new progress and development of neurotechnologies , specifically when we know that various new neurotechnologies enable the researcher to monitor , manipulate and modify the human brain processes . That is why in this paper, we ask the question: what is the meaning and significance of neuroethics , what is its relation with neuroscience research? and for responding to this , we have considered the question of the emergence of this field ; additionally to its meaning and importance as a discipline with regard to the main neuroethical issues in neuroscience advances to know what is the role of neuroethics, and is it a central field and should it be integrated

with brain research. This article illustrates the typical concerns of neuroethics .

## 2- An overview on the rise of neuroethics

### 2-1-Origin and development of neuroethics

Neuroethics is a new ethical specialty and had been a part of Bioethics . The term “ Bioethics ” appeared in 1927 , it has been claimed that its first Utilization was by the German Fritz Jahr in the article " Bio-ethics . Reviewing the ethical relations of human towards animals and plants ( "Jahr .F , P228 ) .

After that it has been used by the American biochemist and oncologist Van Rensselaer Potter in 1971 , in his book entitled : Bioethics : Bridge to the future , he used the term bioethics to describe the combination of ethical values and biological facts (Potter , Van Rensselaer., 1988 ,p.70). He proposed the term global bioethics which comprises two fundamental areas that are : medical bioethics and ecological bioethics , knowing that Potter was influenced by Aldo Leopold’s line of thought that expected for a new ethical basis of human conduct by developing an ecological ethic “ Land ethic ” linked to the ecosystem and natural environment that human depend on , and which must be protected in order to preserve the human survival. ( Potter., Van Rensselaer., 1988 ,. P.13 ) Later on at George town university the term “ Bioethics ” was applied specifically to medical problems , and the director of the center of bioethics Leroy Walters expressed clearly and definitely that “ bioethics ” is the branch of applied ethics which studies practices and developments in the biomedical fields” ( Potter , Van Rensselaer , 1988 ., P71 ).

Since then , various articles and studies werewritten by researchers and scientists of different disciplines using the concept of bioethics referring to the field that deals with what joins biomedical science and clinical research to ethical concerns ( Illes .J., Bird . S-J ., 2006 , P P 511 –514 ).

-3-

Science with the new millennium focuses on the brain research to understand the underlying mechanisms of the human brain and exploring the basics of biological psychology in order to have a detailed knowledge of the different cell's roles in the nervous system , and how the human brain produces cognition and behavior and thus discover the neural basis of personality, and such knowledge will allow the researchers to intervene in the human brain as they want , so by penetrating in the complex human organ the researchers may detain the power to manipulate system nervous functions easily, thus modern developments in brain science and recent advances in neuroscience field have led to considerable moral issues and serious new ethical questions (Roskies.A ., 2002 , P P 21 – 23 ) giving rise to a new concept “neuroethics” which is linked to the interdisciplinary of different bio and neuromedical disciplines, studying the human brain, its functions and the mental processes including the activities taking place in the mind such as thinking, learning, deliberating decision making, elaborating, reasoning , and all what refers to the cognitive emotional any motivational

processes in addition to the extensive investigation of the neuro degenerative diseases of the nervous system. And according to this, the twenty first century can be called the era of neuro ethics and brain science, because of the importance of ethics in health care in a world over whelmed by technology and characterized by a speed advancing neuro technologies and tools used to study, investigate and intervene in the structure and functioning of the human brain which may implies a particular ability to control the brain mechanisms and will permit to modulate the person's behavior in specific ways fact that will -4-

transform our world and thus will amplify new neuroethical problems , due to that and for that cause it is obviously central to combine the work of humanists and scientists and give a lively attention and interest to ethical social aspect of brain sciences research , specifically when we know that neuro technologies and science continue to become more and more strength and particularly with the incredible potential of neuro technologies to improve the brain functions and mental health such the use of electro encephalography (E E G) the magnetic resonance imaging (M R I), positron emission technology (P E T) or magne to encephalography (M E G) and different neurological devices which can detect brain activity on a mille second with the indication of where exactly in the brain the activity is produced (Altimus ,C., Helmer-Wegman .,E.,Raver, S.,2021P08) and such techniques have become more wide spread in medical research .

Neurological devices are powerfull tools that are used both to treat neurological diseases mental and physiological disorders affecting the central nervous system and the peripheral nervous system , and moreover for enhancing functions such as, the capacity for memorization , the way we work and learn , and more. (Ibid., P03)

## **2-2-Neuroethics : a conceptual approach**

Neuroethics differs from the scope area of bioethics, because it focuses on the research about brain functions, the speed progress of brain imaging techniques brain implants, neuro-enhancing drugs and the ethical dilemmas raised by the application of neuroscience findings, the examination of what is right and wrong , what can be good or bad about the manipulation of the human brain. -5-

So it is distinct in particular from bioethics , so as while bioethics seeks to consider the good and bad consequences in biomedical research and clinical practice , and considerate what can be right or wrong about treatments of science 'neuroethics ' is concerned only on the brain and nervous system

So it deals with the complex organ which controls our feelings, reasoning, activities , behavior , emotions, intelligence and every processthat regulates

the human body (**Mathews, D-J-H , 2007**).

Neuroethics is an autonomous field which is concerned with our consciousness, Self-identity , moral behavior sand all the characteristics that can define the Personality ,and behavior of an individual , sincethe brain is the ‘’organ of individuality’’ (**Ibid ., P 07**) and these are the features that brain science tryto change ,modify and enhance using advancing neurotechnologies over time. Serious problems and ethical challenges emerged from the applications of brain science findings , and technological progress in neurosciences , knowing that neurosciences is the study of the structure functionsof the brain, it is conceived as an interdisciplinary approach and research emanating from biology , chemistry , medicine , physics , mathematics and psychology( **Beugré., D-C , 2018., P 8** ) .

Neurosciences as a field is investigating the human brain and all what links to it. This discipline seeks to extend our knowledge of the human brain mechanism’s and how it generates decision in social contexts.

William J. Becker and RusselCropanzano conceive the task of neurosciences as the area which reveals relevant facts about how implicit attitudes can influence explicit attitudes and have also the power to influence behavior , and -6-

moreover, they have important effect on other unconscious processes (**Becker.,W- J , Cropanzano , R ., Sanfey . A-G , 2001., P 941**)

Current developments in neurosciences research raise ethical concerns , not only regarding to the dilemmas of the acceptability of the application of neurological devices and the alterations that they engender but also because of their great impact on the personal identity. And from such ethical issues appeared the field of neuroethics.

The basis of neuroethics was first proposed as a reaction to ‘’ walking ’’ in the new bornby Anneliese Pontius , in her article termed : ‘’Neuro-ethics of walking in the new born’’ . She gives on ita description of the neurological effects of walking exercises and stimulation for new born infants and the potential impact and implication on their neuroanatomical maturational phases negative long-termconsequences .(**Pontius, A – A , 1993**) since its appearance in 2002,neuroethics has become an institutionalized field Just after the congress of SanFrancisco organized by Stanford university and which focuses of the analysis of the ethical and socialimplications with the revolution going on in brain sciences. (**Neuroethics mapping the field 2002**).

The researchers in that congress explain what neuroethics is about and what is its goal, purpose and role in neurosciences research and the field ofneuro-technology .

William Safire in the congress of the university of California , organized by Dana foundation gives the term ofneuro-ethics , and advocates that it concerns the

examination of what is right or wrong about treatments, enhancement and manipulation of the human brain, moreover neuroethics for Safire is “the study of ethical, legal and social questions emerging from scientific discoveries about the brain” (Safire, W., vision for a new field of “neuroethics” In: Marcus S-J 2002).

For Judy Illes and Thomas Raffin neuroethics is a new bioethical discipline emerged from the consequences in brain and neurological sciences (Illes, J., Raffin, S. J., 2002) and it is linked to the field studying the neurobiology of decision making, the application of innovative neurotechnologies, the prediction of the future brain disorders and diseases, the scientific power to manipulate the human brain by external interventions in addition to the various investigations to understand the neurobiological mechanisms that results from mind process, such as freedom of brain enhancement, free choice, moral behavior, the sense of responsibility, consciousness and more other (Illes, J., 2017, P P 09-10) fact that leads neuroscientists to actively encourage the association of neurosciences with philosophy, specifically with ethics.

Neuroethics as a discipline, is an area of ethics, it deals with inspecting defining and promoting “the good of neuro scientific research” and its applications in society (Becker, K et Al., 2007, P 31.)

This young field focuses upon science its conduct and applications in society and as we know science innovations is a main driver of improved human welfare but because of the speed revolution of neuroscience techniques and their impact on human will being the discipline of neuroethics seems to be necessary in order to examine, critique, analyze and guide neuroscience practices. (Becker, K et Al., 2017, P 32).

Moreover the importance of ethics in science research, specifically in brain research and the field of neurotechnologies, is not limited to a self of rules and standards, ethics is more than this, it goes beyond simple boundaries, by involving conscious judgment and right choices in all aspects of neuroscience research, it is proactive, and neuroethicists seek to act in a socially responsible manner.

That is why the integration of ethics in neuroscience is fundamental and incorporating ethical inquiry in the practice of neuroscience is capital, further more, ethics integration is a reflective practice that reflects the ability to enhance scientific and ethical rigor. (Chiong, W, 2020, P 156).

Neuroethics is thus imperative owing to the fact that modern neuroscience have enabled understanding higher brain functions with increasingly power full and so sophisticated techniques allowing easier manipulation of the human brain (Purves, D et AL, 2004, P P 24 – 25).

### 3- Neuroethics categories and neuroethical issues of neuroscience

### 3-1- The ethics of neuroscience or ethical challenges in neurotechnology

This field seeks to answer various ethical questions. This branch for the philosopher Adina Roskies can be divided into two subdivisions.

The first deals with what she termed “the ethics of practice” which concerns peculiar human rights such as brain privacy because with the advancement of neuro technology, it has become possible to acquire and get specific and precise information about an individual’s brain activity. In addition to this, the ethics of practice includes serious questions as informed consent in brain research, specially when the person lacks the capacity to give consent, or is affected by neuro degenerative disease, psychiatric disorder and such impairment that after his cognition and thus make him unable to make good decisions or choose what is the best for him (Roskies .A., 2002).

The second part of the ethics of neuroscience deals with the ethical implication -9-

of neuroscience which refers to the high progress and advancements in neuroscience and the ethical issues emerging from the usage and the applications of neuroscience discoveries and their potential impact on society, as the pharmaceutical advances and interventions in the brain by the use of psychotropic drugs as a way to improve memory, intelligence and creativity, or using new devices to control electronically the brain, additionally to the utilization of neuro enhancement technologies to enhance individual’s cognitive and physical abilities.

Such advancements will engender serious questions and dilemma that is why according to Adina Roskies it is fundamental to think how to better use the neuroscience knowledge and which ethical criteria might be applied in the practice of neuroscience. (Roskies ., A., 2002 P P 21-23).

Neil Levy asserts that neuroethics is referring to two operations, the first one concerns the ethical reflection on the new neurotechnologies and devices produced by neuroscience and brain research, so its interests centralizes on the applications of neuro scientific knowledge.

The second area of this new field refers to the ways in which the knowledge arising from neuroscience and recent progress of neurobiological studies highlight ancient philosophical questions, such as the nature of morality, the meaning of responsibility, the losses of self-control and soon. (Levy ., N. 2008, p 02).

And if biomedical knowledge predicts to transform our understanding of life, neuro scientific discoveries promise to modify the meaning of “to be a thinking being and to reveal the structure and function of the human mind”, so the new neuro technologies generate new ethical dilemma that require new concepts and new ways of thinking. (Levy ., N, 2008, P P 01-07).

-10-

For Neil Levy, neuroscience provides insightful information about ethical

concepts. And as neuroscience advances continue to progress by the development of neurobiological research, it is very important to connect these neurobiological advancement and neuroscience progress with neuroethical consideration and basic guidelines and regulation should be in place for such studies, in order to protect the human being, and the human brain.

### **3-2- Neuroscience of ethics or neuroethics in scientific research**

Neuroscience of ethics concerns the study of philosophical notions, like personal identity free-will, self-control, responsibility in the light of neuroscience findings, in addition to the study and investigation of the brain base of moral cognition and how decisions are made in the brain and all what is linked to ethical reasoning. This field studies the impact of the new neurotechnologies over time on the human being and how may these new advancement alter the human brain (Roskies, A, 2002).

In other words the neuroscience of ethics is an area of study that seeks to respond to ethical issues, as are we really free when we choose our decisions and responses? or are we unconsciously conditioned by our neuronal networks? so our neuronal networks are they controlling our acts and decisions? (Figueroa, G, 2016, P 04).

In spite of the fact that researchers demonstrate that the natural activity of the human brain is to take decisions and responsible of every thought, every feeling and judgment does this mean that when an individual confronts moral dilemmas, he deliberates, takes decisions according to the neuronal and neuroanatomical structures of his nervous system? knowing that the ethical judgment as Greene Joshua points can be guided by the extra-conscious neurochemical modification because as he asserts after his exploration in 2001 (Stanford encyclopedia of philosophy) concerning

-11- scanning people's while they made sequences of moral decision in different situations, that the human brain acts in accordance to different parts of the brain as the affective, sensitive, intuitive areas and does not respond to the rational area (Greene, J.D; 2014, PP708-711), as in the context of the philosophical trolley problem.

This branch concerns the exploration of neuronal roots of moral cognition and the investigation of the neurobiological mechanisms constituting the basis of ethical reasoning. According to this Judy Illes asserts that 'neuroethics is a discipline that reasoning. According to this Judy Illes asserts that 'neuroethics is a discipline that systems' (Illes, J, 2007, P 57), and he talks specifically about empirical neuroethics which is an approach based on experimental work dealing with thought visualization using different neuroimaging techniques, as the utilization of electroencephalography (EEG), functional magnetic resonance imaging (fMRI), and magnetic encephalography (MEG) which revealed detailed information about the brain and consequently offer the power for the researchers to monitor the human brain function to manipulate its structure and thus modify it permanently (Giordano, J., et al, 2016, p 33).

### 3-3-Neuroethical issues in neuroscience advances and neurological research

The high progresses of neuroscience and neurotechnology hold great promise in mental health and offer effective treatments to prevent brain disorders and make-innovative treatments against neurodegenerative diseases and develop sophisticated tools allowing the identification of brain cell types in order to determine their roles in health and disease, and consequently maximize the identification of moral pathologies and act on them precociously by using scientific methods. And it is obvious that the application of the new neurotechnologies to prevent and treat brain disorders and

-12- neurodegenerative diseases is for the security of people and currently advances techniques allow the development of new therapeutic devices. However, such neurological devices as well as the application of the neuroscientific advances raise neuroethical issues.

One of the neuroethical problems emerging from the utilization of the new neurotechnology concerns the application of neuroimaging techniques which are as Thomas Fuchs says important for the exploration of the human nervous system and the investigation of the brain functions, and may be used to infer with the explorations and discovery of neurobiological knowledge with human value individuals unconscious attitudes and predispositions to specific behavior and mental disease but in the same time he warns about the danger of taking conclusions about human behavior based only on probabilistic covariance because neuroimaging techniques show only fragmentary aspect of the biological processes so this doesn't illustrate the whole, in addition to the fact that their interpretation are depending on experimental design and the choices of the researcher makes and all this may affect the results ( **Fuchs, T., 2006 P P 600 – 601** ).

Another ethical problem refers to brain enhancement. The development of psychotropic drugs and devices to improve cognitive and behavioral functions.

The use of Prozac and other similar drugs as the methylphenidate to treat person's with deficit attention and abnormal behavior or enhance intellectual skills and prevent memory discursions but all this raise serious ethical problems because it can be possible to use these drugs to enhance persons with normal capacities and thus shape the human mind. Enhancement of cognition, mood memory in healthy persons is now a fact of life ( **Farah, M J, . 2002** ).

-13- And in this way, every person would be clever and have a higher memory and be better than normal, but the use of neuroenhancement for healthy individuals will have a great impact on the human brain and society as a whole, because such neuroenhancers will modify obviously mechanisms and processes of cognition, emotion and behavior and will create inequity in society specifically if neuroenhancement technologies will be just available for the wealthiest people and

there is the difference between treatment and enhancement in the purpose of attaining high intellectual performances and specific capacities.

Broad issues emerge from neuroscience advances as reading and controlling Minds and consequently changing the human brain functions , in addition to the mechanization of the self , memory manipulation , experiencing with human brain tissues , brain implants , brain privacy for which “ a philosophically reflexive neurobioethics plays an important role in the discussion of a number of normative issues raised by brain research” (Salles , A , evers ., K , farisco., M , 2018) .

#### **4- Neuroethics , an ethical guidelines insuring the protection of human nature**

Neuroethics plays significant role in guiding the advance of neurotechnology, by establishing a set of ethical standards that promote the safe use of neurotechnology, it provides a regulatory framework for guiding brain science development in a way that benefits society as whole and protecting the rights and welfare of the human and ensure that the research is conducted responsibly .

It explores the ethical implications of using neurotechnology devices to enhance cognitive functions and ethical issues related to transhumanism which is seeking to produce the man of the futur a ‘posthuman’ being who will potentially possess enhanced intelligence, extended lifespan by novel genes and greater physical strength

So it is clear that as technology advances we are observing the development of Intelligent robots that can do activities that were once believed to require human

-14-

intelligence , creativity and which are actually performed by artificial intelligence and innovations in robotic and artificial intelligence are paving the way for a future where these machines will have a major role in our daily lives.

And when technological innovations may hold the promise of enhancing our lives, they also carry the potential for significant risks , possibly the threatening of our society and leading to unforeseen consequences .

the implications of neuroethics extend beyond individual cases and touches on broader societal values and ethical issues related to transhumanism.

Neuroethics is concerned with the impact of new neurotechnologies , it addresses ethical considerations in the funding of neuroscience research and advocates for the protection of human rights in the context of brain science , it examines the ethical implications of AI in relation to human cognition. That is why neuroethics will be vital in shaping a future where neurotechnologies are used responsibly and equitably while fostering innovation.

#### **Conclusion**

Neuroethics is a new academic discipline that explore the development of neuroscientific investigation into the human brain, and studies the ethical implication of neuroscience advances it is an extremely important field because it shed light about the impact these new technologies on human brain and society as a whole. And as it is

shown by the past technology advancement can really be a double-edged sword .

Effectively , the expanding progress of neuroscience findings and the power to control and modify brain mechanisms can alter irreversibly the personal identity if the research and interventions are not restricted by ethical guidelines .

Consequently , neuroethics which is a sub-discipline of neurophilosophy is very -15-

essential in the context of brain research because the application of the advancements that the field of neuroethics can highly guide the study of how neuroscientific research can generate situation in which ethical standards are being challenged , and it is clear that the field of neuroethics can highly guide the study of how neuroscientific research ought to realize what is benefit and good for the person . Neuroethics should guide innovative progress in neuroscience by developing practical guidelines and deeply reflection that explores new ethical norms.

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-16-

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