

# DIRITTI COMPARATI

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## **NEUROSCIENCE AND LAW IN A NUTSHELL**

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The term neuroscience is currently used to refer to a bundle of disciplines which study the relationships between human brain, mental activity, and behavior. Promising to explain operations of the mind in terms of the physical operations of the brain, neuroscience has received great attention by the scientific, legal and philosophical communities. The international legal debate has focused especially on possible uses of neuro-techniques for forensic purposes. The greatest enthusiasm has been displayed in the United States, where a worldwide-discussed case law has developed, and wide initiatives, such as the Law and Neuroscience Project funded by Mc Arthur Foundation, have been launched. The peculiarity of acquisition of scientific evidence in US proceedings, where the onus to bring scientific evidence before the courts is on parties, is probably one of the reasons why the US is leading the way. Interest in the legal implications of neuroscience has developed also in the European context, where various projects have recently been launched. One of them is the European Association for Neuroscience and Law (EANL), led by the University of Pavia (Italy) and involving neuroscientists, legal scholars, and ethicists from UK, Italy, Belgium, Germany, France, The Netherlands, Spain, and partnerships with US, Canada

and Australia. The purpose of these projects is mainly to discuss the implications of new neuroscientific findings on different legal systems in a comparative, interdisciplinary and international context. This article briefly describes the current hot topics at the interface between neuroscience and the law.

**Neuroscience And Criminal Responsibility.** Following the advancements of neuroscience, the question “Are people more than their brains when committing a crime?” is no more rhetorical. The case of Phineas Gage became a classic of neuroscience, since it revealed that behavior is not just the direct product to our personality and will, but the biology of our brain plays a crucial role. Phineas P. Gage was a US railway worker. While compressing gunpowder with a tapering iron in 1848, he was victim of an explosion. The more than 1 meter long rod pierced his cranium and exited on the other side. Gage miraculously survived the injury. Yet the trauma utterly changed his behavior: although he was responsible and good-tempered, he became unpredictable, driven by immediate passions. Gage had lost large parts of his ventromedial prefrontal cortex.

Thanks to brain imaging techniques, we are today allowed to see the brain and to analyze his functioning within the clinical context. As a result, the widespread belief to be able to predict a behavior or find a correlation between brain and actions cleared the way to a wide debate about possible impacts of neuroscience on criminal law. This issue can be approached in several ways. One holds that neuroscience could over time dissipate ancient illusions such as free will and that the criminal law’s retributive aims should be replaced with deterrence, prevention and treatment (Greene&Cohen, 2004). Another view, conversely, incorporates neuroscientific discoveries within pre-existing legal categories and considers the idea of criminal responsibility as a sort of “folk-psychology enterprise”, that depends fundamentally on mental states as a partial explanation for human mind. Even though it is clear that the brain enables the mind, we should consider that there isn’t a real clue yet about how this

happens, or about the connection between brain and action (Morse, 2007). Whatever the approach, it should be noticed that neuroscience seems to have an incredible ability to make the complex simple, especially when its outcomes are reported to the general public through vivid and colored images of brain. This aspect sounds very attractive to the law.

Brain imaging involves extremely complicated mathematical and scientific operations, but the way in which the results of experiments are communicated to the public through media and journals could make the people believe that we are already able, or very close, to overcome difficulties in explaining old questions of how people think and behave. Several studies focused on juror decision making in insanity defense cases provide examples of how this situation can create biases when neuroimaging evidence are presented to jurors. Other studies are focusing on psychopaths, people who often commit crimes because of their lack of empathy and regrets, and represent a big social problem. Neuroscientists are trying to clarify the nature of psychopathy as a mental illness in order to find new effective treatments.

Civil and Tort law. Brain imaging techniques might offer us the opportunity to access other people's pain, by making it visible, and to some extent, measurable. Personal injury lawyers of plaintiffs who suffer from chronic pain or fibromyalgia have been pushed to develop and implement legal strategies to tackle the challenge of representing people who experience pain, when the basis for their pain experience cannot be proven by tests already considered objective such as x-ray scans. One of the latest news concerns a patent on pain detection, entitled "Objective Determination of Chronic Pain in Patients". This was recently conferred to Dr. Robert England, an orthopedic surgeon in California, whose method involves the use of Functional Magnetic Resonance Imaging (Camporesi&Bottalico, 2011). Another potential relevant chance allegedly offered by neurotechniques is to identify biomarkers for anxiety disorders like Post-Traumatic Stress Disorder (Engdhal et al.,

2010). This would lead not only to better treatments, but also to an objective assessment of these mainly psychological-based disorders, with clear implication for the determination of compensatory damages in tort -and criminal- cases.

**Brain-Machine Interfaces.** Neuroscientists have eagerly anticipated the possibility of using brain signals to control artificial devices, and, today, concrete bases have been posed to achieve that goal. Recent advancements in Brain Machine Interfaces (BMI) research promise to lead to the development of new therapies and cures for patients afflicted by neurological disorders. They could be allowed to regain mobility through a variety of neuroprosthetics, i.e. devices that harvest brain electrical activity to coordinate the contractions of a robot (Nicoletis, 2011). An international legal and ethical debate has been immediately triggered about possible implications of BMI on society and legal systems. The problem of informed consent for people who suffer from locked-in syndrome, the uncertainty of future implications for the patients' brain, the redefinition of the biological and mental boundaries of any individual are some of the latest cutting-edge issues. This is an effect of what the recent MIT White paper calls "the Third Revolution": the convergence of life sciences, physical sciences, and engineering in health services, biological research and society. BMI may promise to pave the way to a new era, and a wide interdisciplinary debate about it will be the key to creating a flexible, and informed, regulatory environment surrounding its development.

**End-of-Life Decisions.** Brain imaging techniques may now enable us to refine our comprehension of the residual activity found in a person's brain when no organized neural activity seems to be present. Disorders of consciousness have been traditionally diagnosed on the basis of externally observable behaviors alone. Nonetheless recent studies indicate that patients who are diagnosed with vegetative states may retain more awareness than their clinical assessments suggest (Owen et al., 2008).

Pharmacological Neuroenhancement is another hot-topic currently

drawing the attention of the legal community. In 2009, the scientific journal *Nature* published the results of an informal online poll asking whether readers attempted to sharpen “their focus, concentration, or memory” by taking stimulant drugs. About 20% of respondents replied in the affirmative. Competitive anxieties felt in the workplace or in college life seems the trigger for this tendency. Legal scholars and bioethicists are studying how society should respond to the growing demand for cognitive enhancement, taking different positions on whether that response must start by rejecting the idea that enhancement is a ‘dirty word’ (Greely et al., 2008). Furthermore, during the last decade deep brain stimulation has become an extensively used method for the treatment of advanced Parkinson’s disease, leading to striking improvements in motor function and quality of life of patients. Ethical and legal questions are arising, in the light of a possible future regulation of these techniques. Yet being those invasive procedures, the assessment of risks and benefits around technical safety raises complex questions. Another concern is about who should receive this kind of treatment and how having electrode in the brain could impact on public health policy and regulation.

Neuroscientific findings promise to identify better diagnostic hallmarks for mental disorders and to improve our capacity of both evaluating their severity and assessing the intensity of physical pain. Connecting our mind to machines, neuro-technologies will be allegedly able to extend our physical boundaries.

What about the role of law in this context? Many scholars have maintained that neuroscience cannot, at the state of the art, modify the law. Methods for comparing individual and population responses to the stimuli are lacking, and there are fundamental differences between a clinical setting and the lab. Furthermore, the term ‘neuroscience’ is not ontologically unique, since it refers to a variety of disciplines that have different possible applications and impacts onto the forensic context.

There is, however, no denying that brain imaging is a powerful tool,

whether used for medical or legal purposes. This raises the question whether the law should consider the emergence of these new technologies as a new challenge for regulators. Probably it should. Discussing about the right regulatory environment raises a variety of generic well-know issues within the interface of law and science, but new policy implications might emerge with regards to neuroscience. Law traditionally has a strong country-based connotation, especially with reference to civil and criminal procedures. Nonetheless, science has a transnational dimension and, when confronted with issues raised by its advances in this global era, legal solutions are less jurisdiction-bound than ever before. Promoting an international lively collaboration between legal scholars and neuroscientists is therefore crucial.