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Neurolaw & Neuroethics: Natural Consequences to Advancements in Neuroscience Literacy

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Historical Background

It has been the last four decades that have brought significant research to brain development. The 1970's led to advancements in neuroscience such as the PET scan (Positron Emission Tomography) and the CAT scan (Computerized Axial Tomography). The 1990's added the fMRI Scan (Magnetic Resonance Imaging). Because of the new technologies, scientists were finally able to see images of the working brain in humans [1-3]. The new technologies were groundbreaking as they afforded science the opportunity to study the brain in a functioning state, rather than post mortem [3]. Previously, the only certainties of the human brain were the location, size, and shape of the brain's regions as brain study was previously limited to only using cadavers [2]. Specifically, the new technology provided opportunities for imaging and analyzing which parts of the brain were engaged during specific tasks having a direct correlation to human learning and understanding [1]. The new technologies brought attention to neuroscience at the federal level, a critical component to increasing revenue for research and inciting public awareness.

The Decade of the Brain

Prompted by the Congress and House Joint Resolution 174, President George H. W. Bush declared the 1990's the Decade of the Brain in an attempt to incite public awareness of the benefits derived from the recent advancements in brain research stemming from the newest available technology (www.loc.gov/loc/brain). President Bush requested that the people of the United States observe the Decade of the Brain with appropriate programs, ceremonies, and activities [4]. In his proclamation, he stated: July 17, 1990.

The human brain, a 3-pound mass of interwoven nerve cells that controls our activity, is one of the most magnificent and mysterious-wonders of creation. The seat of human intelligence, interpreter of senses, and controller of movement, this incredible organ continues to intrigue scientists and layman alike.

President Bush explained the importance of brain research to the American public and especially for those suffering from Alzheimer's disease, Parkinson's disease, spinal cord injuries, depressive disorders, epileptic seizures, Huntington's disease, the muscular dystrophies, and other life-threatening disorders (www.loc.gov/loc/brain).

Continuing with his proclamation, Bush explained: July 17, 1990.

Research may also prove valuable in our war on drugs, as studies provide greater insight into how people become addicted to drugs and how drugs affect the brain. These studies may also help produce effective treatments for chemical dependency and help us to understand and prevent the harm done to the preborn children of pregnant women who abuse drugs and alcohol. Because there is a connection between the body's nervous and immune systems, studies of the brain may also help enhance our understanding of Acquired Immune Deficiency Syndrome.

The Decade of the Brain brought an increase in federal research dollars and money from private foundations and industries to aid in the multidisciplinary efforts of scientists and healthcare professionals. Many studies regarding the human brain have been planned and conducted by scientists at the National Institutes of Health and the National Institute of Mental Health (www.loc.gov/loc/brain).

The combination of federal monies designated for brain research and the advancements in imaging technology led to an explosion of literature and attention in the media [2]. For the first time, there was the ability to not only access and study the behaving brains of healthy people, but also the financial and political support to do so [5]. At this time, the focus of neurologists was

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on understanding how the brain functions. The application of brain activity to other disciplines such as education or law was not on the forefront of the research agenda. Nevertheless, other professionals from various fields began to take notice of how the work of neurologists may inform their practice.

The next decade continued to improve scientists' abilities to research brain development and function. In 2007, a team of Harvard scientists developed Brain bow, a neuroimaging technique used to distinguish individual proteins in the brain using fluorescent proteins [6]. In 2013, a team from Stanford developed CLARITY, a neuroimaging technique used to make the brain transparent in order to study the structural aspects of proteins, amino acids, cellular structures, nucleic acids, and neurotransmitters [7]. Two-photon imaging, light sheet microscopy, and other instruments were considered quantum leap technology for evaluating how the brain encodes information. In addition, enhancements and refinements to the fMRI Scan enabled scientists to map brain activity of complex functions such as language, emotion, and decision making [8].

The NIH Brain Initiative

As a result of continuous advancements and successes in the field of neuroscience, in April of 2013, President Barack Obama announced a $100 million dollar federal proposal named Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative [8]. The BRAIN initiative was the result of the early work of the Kavli Foundation, the Gatsby Charitable Foundation, and the Allen Institute for Brain Science and their efforts in mapping brain structure and function [8]. A collaborative partnership between the National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), U.S. Food and Drug Administration (FDA), the Intelligence Advanced Research Projects Activity (IRAPA), non-federal partnerships, foundations, institutions, universities, and industries existed to fiscally and publicly support such efforts [9] (www.braininitiative.nih.gov).

Obama (2013) explained the NIH BRAIN Initiative saying:

There is an enormous mystery waiting to be unlocked, and the BRAIN Initiative will change that by giving scientists the tools they need to get a dynamic picture of the brain in action and better understand how we think and how we learn and how we remember. And that knowledge could be will be transformative.

The BRAIN Initiative's goal at its inception and remains today is to create a current picture of the brain that shows how individual cells and complex neural circuits interact during brain activity so that a more complete understanding of the brain exists for the betterment of society particularly regarding knowing how to effectively treat, cure, and prevent brain disorders and mental illnesses [8]. The field of neuroscience can have significant implications for the development of society [10].

Public Awareness

With breakthrough technology, an increase in federal monies dedicated to its research, and political support, the field of neuroscience has expanded and attracted public interest (https://www.sfn.org) [1,3]. Professional organizations have been formed with the mission of advancing scientific exchange, supporting the neuroscience community, educating and engaging the public, and advocating for the field (http://www.sfn.org). The Society for Neuroscience (SfN) was founded in 1969 and today is the largest professional society made up of scientists, doctors, and researchers whose main focus is the study of the brain and the nervous system. As of 2018, SfN's membership is at 36,000 with members living in 95 different countries. Through their work, they have released eight core concepts as a framework for bridging the gap between the disciplines and informing pedagogy. Dubinsky et al. [11] describe the core concepts developed by SfN as the "big ideas in the field for nonscientific audiences without sacrificing scientific accuracy, a problem that has plagued prior efforts to bridge directly between neuroscience and education".

Neuroethics

As neuroscientists' understanding of the brain, brain structure, and executive functioning increased, ethical implications arose. Neuroethics examines ethical issues stemming from society's continuously evolving and increasing ability to monitor and influence brain function [8] (www.americanbar.org).

Neurolaw

Neurolaw is the field of interdisciplinary study that explores the effects of discoveries in neuroscience on legal rules and standards. According to the American Bar Association (2018), "the last 30 years have seen an explosion of research on neuroscience and behavior, and the growing field of neurolaw attempts to translate these advances in brain science into law and policy." Because both the field of neuroscience and the legal landscape continues to evolve, the application and interpretation of the new information can be challenging.

Many U.S. District Judges in America are fascinated with, yet skeptic of, bringing neuroscience to the courtroom. Senior U.S. District Judge Jed S. Rakoff, a founding member of the MacArthur Foundation Project on Law and Neuroscience, described some judges' perspectives during a lecture titled Neuroscience and the Law: Strange Bedfellows at the 2015 Society for Neuroscience convention. Rakoff [10] explained, "Over the past century there have been too many instances in which the brain science of the time was too readily accepted by the courts and then proved to be much less useful." In other words, in the past, when courts embraced brain science, some decisions were foolish and unethical.

For example, the practice of eugenics or the sterilization of women who were found to be "feebleminded" and/or "promiscuous" was a result of brain science and the misconception that certain traits were inheritable [10]. Another example of inaccurate neuroscience in court rooms is the once highly popular practice of lobotomies, or severing the prefrontal cortex of the brain. Historically speaking, from about 1940-1960, approximately 170,000 procedures were performed. Some lobotomies were court ordered while others were products of coerced consent. About 5% of the patients died as a result of the survey and others lives were significantly altered as they lost emotional and rational functioning [10].

Perhaps one of the most widespread concepts in past case law is known as the Durham Rule. A 1954 U.S. Court of Appeals said that a criminal defendant cannot be convicted if his or her actions were the result of mental disease or defect (Durham v. United States). The criminal defendant did not need to have a medical diagnosis to use this defense. The Durham Rule was the result of Freudian psychoanalysis which has limited scientific validity [10]. After 1972, most federal and state courts did not recognize this rule as most believed it was too broad and subjective in nature.

Many judges believe that neuroscience has not yet reached a point that it can be introduced with much scientific validity. Rakoff [10] says that neuroscience has advanced to the point that courtrooms can make generalizations to determine overall approaches and policies, but ultimately law (as a field) needs to be cautious.

Examples of Case Law Involving Neuroscience

The Eighth Amendment to the Constitution says that punishments must be fair and cannot be cruel and unusual. The U.S. Supreme Court ruled that a mandatory life sentence without the possibility of parole was against the Eighth Amendment (Miller v. Alabama; www.americanbar.org). As a result, the same ruling was retroactively applied to over 2,000 cases (Montgomery v. Louisiana; www.americanbar.org).

At times, brain instruments developed by neuroscientists have made their way into the courtroom. During the sentencing hearing for convicted murder Grady Nelson, the defense presented qEEG evidence suggesting that Nelson had brain abnormalities such as unusual neural activity caused by traumatic brain injury. The jury sentenced Nelson to life imprisonment rather than the death penalty reporting that neuroscientific evidence was persuasive [12].

Other times, neuroscience technology is declared inadmissible because judges find the instrument to lack sufficient scientific evidence. For example, in the trial of United States.

Semrau, the defense attempted to introduce fMRI lie detection evidence in an attempt to prove that the defendant's billing errors were honest mistakes and he was not trying to defraud Medicare.

Future

While the disciplines of neuroscience and law continue to evolve and intersect, many institutions are creating interdisciplinary areas of study with a focus on neurolaw. Neuroscience may not yet be at the position to effectively and consistently inform case law, but society may want to prepare to embrace the latest breakthroughs that are just a research study away.

References

1. Jensen E. Brain-based learning: The new paradigm of teaching (2nd ed). Thousand Oaks, CA: Corwin Press.
2. Sousa DA, editor. Introduction. In: Mind, brain, and education neuroscience implications for the classroom. Bloomington: Solution Tree Press; 2010. p. 2-24.
3. Weber Mellett BA. The perceived impact on the mind, brain, and education science component infused into an induction program. 2012.
4. Project on the Decade of the Brain. Presidential Proclamation 6158. 1990.
5. Varma S, McCandliss BD, Schwartz DL. Scientific and pragmatic challenges for bridging education and neuroscience. Educational Researcher. 2008;37(3):140-52.
6. Livet J, Weissman TA, Kang H, Draft RW, Lu J, Bennis RA, et al. Transgenic strategies for combinatorial expression of fluorescent proteins in the nervous system. Nature. 2007;450(7166):56-62.
7. Chung K, Wallace J, Kim SY, Kalyanasundaram S, Andalman AS, Davidson TJ, et al. Structural and molecular interrogation of intact biological systems. Nature. 2013;497:332-7.
8. Insel TR, Landis SC, Collins FS. The NIH BRAIN initiative. Science. 2013;340(6133):687-8.
9. The BRAIN Initiative. What is the BRAIN Initiative? 2018.
10. Rakoff JS. Society for Neuroscience. (2015, October 3). Neuroscience and the Law: Strange Bedfellows.
11. Dubinsky J, Roehrig G, Varma S. Infusing neuroscience into teacher professional development. Educ Res. 2013;42(6):317-29.
12. Miller G. Brain exam may have swayed jury in sentencing convicted murderer. 2010.