

A Review Of Neurolaw And Its Contribution To The Judiciary

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Abstract: Neurolaw is an interdisciplinary research program which aims not only to re-examine the axioms of law but also to enrich it in term of methodology and evidence. Although historically there are cases of application of neuroscience in the legal sphere, rapid growth has been recorded only after 1990. The radical debate in the field is between two perspectives i.e. neuroscience will show that we don't have free will and this will lead to non-assignment of responsibility for actions including legal one and secondly, that neuroscience will show that humans have free will and thus there will be no changes in the legal system. In, this paper we will migrate from these theoretical arguments, to access the infield contribution of neuroscience to the legal system i.e. neurolaw.

Index Terms: Brain Imaging, Freewill, Law, Neurolaw, Neuroscience.

1.INTRODUCTIN

The process of scientific explanations for natural phenomenon tends to become axioms for various activities in the humanities, and the law is not immune to this process. Neurolaw[1] is an interdisciplinary research program which aims not only to re-examine the axioms of law but also to enrich it in term of methodology and evidence. Although historically there are cases of application of neuroscience in the legal sphere whenever it was required, rapid growth has been recorded only after 1990. There was lesser publication in the field, but after 1990 seminars, conferences and workshops have been organized by different universities and institutions and significant growth has been registered in terms of publication after 2004. Scientists and scholars of law sit together to find out possibilities of application of neuroscience in the field of law, especially in evidence laws. MacArthur Foundation launched its projects to study the intersection of neurolaw and ethics and for this \$10 million grant was given to study better to know the greater possibility of neuroscience in the field of law and ethical questions thereof[2]. One of the objectives was to integrate both subjects and prepare a future roadmap for further actions. This was followed by forty projects dedicated to multiple issues both theoretical to the practical aspect of neuroscience and neurolaw[3]. Research data will provide a clear picture of the application of neuroscience in the field of law and also answer all the relevant ethical questions. The corporate world is already taking help of neuroscience and psychology in developing their products and services; in 1990 neuroscience, cognitive neuroscience, social psychology was used in evidence gathering so that complex legal problems can be solved. Initially, there were so many objections were made regarding the use of neuroscience, cognitive neuroscience in evidence collection as results and methods were significantly accurate, but with the advancement of science and technology especially in brain imaging[4] and psychophysics, we have different methods to map human brain and behavior with significant accuracy. Case laws are also opening new aspects of neurolaw and its application. Future regulations and public

utility services will be developed with the help of neuroscience so that they can better offer the best services to the public.

2 LITERATURE REVIEW

It is the old quest of human beings to impart justice in the true sense and while imparting justice there are so many barriers i.e. absence of evidence or low value of evidence but as a legal assumption accused gets the benefit of the doubt and therefore many a time victim fails to get justice only because of a legal technicality. Neuroscience can help legal sphere in evidence gathering as evidence which is gathered with the help of neuroscience and cognitive neuroscience are now almost perfect. Before this many a time culprit was getting success in befooling lie detector machines but it is almost impossible to be fool methods which are used in brain mapping as we know that for every emotion there is a fixed slot in the brain and when we respond to a particular question relating to a particular emotion only that part will be active and we can easily map that thing and we can bring the results in readable soft and hard copy. There is plethora of cases where neuroscientific finds could help in understanding legal issues precisely. In western juridical system[5], lots of cases take help of neuroscientific evidence in imparting justice. Together neuroscience and neurolaw could help to develop a better and effective legislative and legal framework and also better procedural laws and an organic setup to address legal issues in real time. Now scientists have knowledge of relation of human brain with different organs of the body, therefore, we are now able enough to fix relation and this helps in brain mapping of an individual; it also informs about the proper functioning of the human brain and malfunction of it and timely information could help thousands of people in getting proper treatment. Neuroscience is taken as a revolutionary field of study and it also acts as a bridge between a different branch of knowledge. With the advancement of knowledge and help of both software and hardware now scientists have knowledge of the functioning of the human brain and are quite able to repair and alter it. Infect now scientists are trying to develop artificial intelligence with the help of neuroscience. Neuroscience has revolutionized medical science and now it is promoting

interdisciplinary studies and it is helping legal field in solving complex litigation problems. Before defining other aspects of neurolaw, we must focus on the prominent question that must be solved are as follows: Who is authorized to study and analyze images of human brains? What procedure must be used to map the human brain and health issues if any? Whether principles of neuroscience are applicable to a person having a brain tumor or brain injury? Whether there is any scope of rehabilitation of a subjected person or whether there are appropriate laws on the rehabilitation of subjected person? To what extent we can rely on software (programming) and hardware for brain mapping? Whether machines which are to be used for brain mapping are hack free? Whether mental impairment could force someone to commit a crime? If yes, then whether that person is responsible for his actions as he is having no knowledge of his actions like an insane. With the advancement of neuroscience, there are a new set of complex questions i.e. free will, nature of guilt, the capacity of a person to commit a crime, culpability etc. burden to prove its point is on neuroscience as neuroscience has to prove its value so that the legal system can take help of it and prosecute criminals. To understand the human behavior is one of the inquiries in the field of law and psychology, our future depends upon the knowledge of human behavior so that we can ensure that people can enjoy their rights without interference and law and order will not be an obstacle in the enjoyment of their rights. Attorney J. Sherrod Taylor[7] was taking help of his medical jargon in the courtroom and his book brain and spinal cord injury 1997 especially attracted the attention of the jurist as this book were of immense importance for law practitioners. Different courts are taking help of neuroscience in imparting justice before its culprits were escaped because of lack of evidence or genuineness of evidence etc. The Royal Society defined neuroscience and law in its report described neuroscience as relatively a new field of interdisciplinary studies having medical science (Especially studies of the human brain and nervous system) at the center. This report was focused on the scientific approach to studying the functioning of the human brain, nervous system and how these things affect the decision-making ability of an individual. However, there is no hard-dividing line between neurolaw and other scientific streams i.e. cognitive psychology, or psychiatry; there is overlapping of the subject matter. New brain scan evidence is accepted by the corporate world to develop their products and services and in the judiciary as evidence i.e. France, USA, etc. Neuroscience is an immersing interdisciplinary field and has multiple benefits which are as follows: early detection of brain dysfunction; the behavioral study could prevent serious crimes; it can help the corporate sector to design products and services as per customer requirements; it can also help the government to know whether their policies are actually appreciated by the citizens and ; it could also help in studies to know the impact of education and social media. The expert opinion is defined under Section 45 of the Indian Evidence Act and these experts are known as neuroscientists, neuropathologists, neurosurgeons, neuropsychologists,

neuro consultant and neuroradiologists. There are so many technics/methods for brain scan/mapping which is used for evidence collection and this evidence has played a significant role in imparting justice. USA and France have proper regulations on neurolaw and brain scan/mapping there are some official companies having expertise in the domain of neuroscience and criminal psychology Government, as well as private attorney, are taking help of these experts and these companies have played a significant role. There are so many companies which are providing lie detector services using fMRI [8] but the oldest two companies are Cephos Corp and No Lie MRI [9]. These companies offer the best services to their clients i.e. government, attorney and companies, etc. these companies are a pioneer in providing fMRI services to their clients and updated labs and experts to analyze reports properly. We know that technologies are not errored free and perfect machines have to come even though we can rely on the finding of the reports. The techniques used by these companies are more advanced than the polygraph test and is safer in terms of health. There are some countries where they are not relying on evidence [10] based on neuroscientific research, therefore, judges [11] have to take cognizance of it and they have to apply it with a reasonable case so that courtroom can become temples of justice. Study of neuroscience is growing from its origin and in the last decade, rapid growth has been seen. Following (figure) record maintained by the Mac Arthur Foundation of Research Network in law and Neuroscience. It does mean that government and other agencies, attorney and individuals have an interest in it and there is a big debate over it i.e. its limitation and contribution, etc. Seminars, conference, and workshops are also contributing to the growth of quality literature on neurolaw.

3 CONTRIBUTION TO JUDICIARY:

Indian judicial system has taken serious cognizance of this rapidly growing science in the criminal adjudication mechanism [12]. The case State of Maharashtra v Sharma [13] a proof that Indian Judicial system has played a proactive role in the implementation of neuroscience in law. This was a case of murder and women was convicted on the basis of brain mapping/scan [14] as circumstantial evidence [15]. This was a highly disputed decision and was criticized by the legal community. Prof Hank Greely of Sandford University criticized judgment of the state of Maharashtra v Sharma as BEOSP [16] mechanism is not unanimously approved by scientists of the world and results are not 100% accurate therefore there should be corroborative evidence to proof viewpoint/findings on the basis of BEOSP. The critical study could be beneficial for these studies as more criticism will help to know the

loopholes and knowledge of all these could help scientists to develop a perfect machine for brain mapping [17]. There are some defenses are also available i.e. insanity and brain death where brain scanning will not produce desired results but in case of fake defense of insanity, a brain scan can be a useful tool to fix liability of the culprit. The following picture clearly state behavior of a murderer and a normal subject and brain scan clearly stating that worm red and yellow colors indicating high brain activation and blue and black colors are showing low activation. The above picture helps judicial officials in fixing liability. Functional magnetic resonance imaging [18] (fMRI) measures activities of the Human brain and with the help of computer software generates brain images of active regions that are activated with the help of machines what an individual think, react or performs anything.

4 BRAINELECTRICAL OSCILLATION SIGNATURE PROFILING (BEOSP)- EVIDENTIARY VALUE:

Brain Electrical Oscillation Signature Profiling technique was developed in the year 2003. BEOSP techniques are available at three places in India Mumbai, Chandigarh and Gandhinagar. More than 300 subjects have undergone brain electrical oscillation signature profiling test to check the evidentiary value of their statement made as suspects in different cases. Suspects were summoned under Section 4519 of the Indian Evidence Act 1872. Particular techniques were considered and were the basis of judgment and judgments were given by proper following a system of BEOS and results were analyzed qualitatively. Neuroscientific methods like fMRI and BEOS are new techniques which are helping judiciary in the investigation process. These techniques have been used on more than 300 subjects but there was no single case where these techniques were the sole basis of the decision. According to section 45 of the Indian Evidence Act 1872, there is scope of expert opinion on different subject especially science and art; that is why it open gateway to introduction of neuroscientific methods in the investigation process, technically finding on the basis of BEOS or other techniques of neuroscience is good as it helps investigation agency to collect information and collect other corroborative evidence which helps court to decide a case. BEOS is not a panacea for all the problems, court takes help of it only in a specific case where material evidence is not available and there is no further hope to get material evidence i.e. cases like terrorism, mafia, high profile scams etc. where because of fear will not come out and will not speak the truth. BEOS techniques[20] would be of great help in these cases. The old practice of the courtrooms is now changing now we have digital courts, many countries have introduced paperless litigation system and other countries are planning to be paperless governance and judicial system. India is also promoting this campaign as this will reduce global warming too less paperwork means less cutting of trees means more oxygen and less carbon in the environment.

This will also promote transparency in the judiciary [21] and will help in reducing corruption. Promotion of new technology in the judiciary is also part of the government of India's digital India campaign and BEOS techniques have placed India at global perspective as use of BEOS in the case the State of Maharashtra v. Sharma was discussed world widely and was taught and discussed in the classroom as well as courtrooms²². India was the first country to introduce controversial technique BEOS (Brain Electrical Oscillation Signature) in a very famous case State of Maharashtra v. Sharma. In this technique, BEOSP suspect is to undergo an examination that contains references to the series of things to be remembered. This BEOSP remembrance action as per the electrical oscillations is known as "signature" of the experience. "Experimental knowledge" is known to be the awareness of the remembrance thus the experimental knowledge is based on a test which measures remembrance. The machine measures remembrance through the electrical oscillation of the brain. The evidence on the basis of BEOS is not sole to convict someone; it is one of several pieces of evidence which are brought before the court, this help investigation and directs investigation agency where to focus to get further (corroborative) evidence thus there is no conviction solely on the basis of BEOS test. The defendant has some rights which are mentioned under the constitution of India and other acts. The subject needs to wear a cap like an instrument with 32 sensors and have to close his eyes and have to listen to statements which are designed by the experts, subject need not to respond to all asked questions. These questions are of three different categories as relevant, neutral and control. The first category i.e. neutral contains some baseline questions, the second category contains controlled questions related to private information and final are pertinent questions which are related to the investigation[23]. BEOSP technique is working on the principles of the electrical response of subject's baseline which are monitored and recorded by computers with the help of complicated software and hardware and experts are able to read and interpret data obtained through BEOS computer machines. BEOS can easily detect the difference between conceptual and experimental responses. Experimental knowledge is one's personal knowledge gained through experience. Every case is unique for BEOS technique. Theoretically in conscious state human beings are able to manipulate information but in case of deep sleep and unconscious state as an intoxicated person has no control over his senses and whenever any question asked to him subject gives right answer as in that state that person is not able to control his statement but in case of BEOS whatever subject responds for that response a certain portion of mind is responsible and accordingly whether subject is in conscious state or able to control his thoughts his responses can be easily recorded and explain to the judges so that they can frame certain opinion about the case. Functional Resonance Imaging (fMRI) is another brain based lie detection system. This brain detection technique helps us to know whether subjects are lying or trying to deceive when

subjects are to answer a set of questions framed by the experts[24]. In this mechanism subject's neural data is read by the experts by measuring blood flow to different parts of the human brain; it helps experts to distinguish whether subjects are trying to deceive or their behavior is normal[25]. The basic idea behind is that our brain is divided into different parts and each part is responsible or we can say respond to a particular emotion/feelings and whenever whatever we feel a certain part of the human brain gets activated and blood flow to that area increases by reading increased blood flow to that area we can easily quantify what kind of emotion is that i.e. if subject will speak lie a particular part of human brain will respond and the same for the truth. According to studies if the subject has no knowledge of countermeasures then results would be 100% and if the subject has knowledge of countermeasures techniques than accuracy[26] (Deception) would be less than 77%. A study by Kozel shows that trained subjects can deceive this machine when they steal a ring on camera but as soon, they had knowledge of the fact that there is camera recording every event then again results are pretty good. Subjects are instructed to answer when they are under the scanner as if they did not steal any item. The studies find out that 90% of the time item was found stolen. Whoever the findings are based on persuasive argument as to the usefulness of the techniques. Although this technique is not 100% accurate and can be befooled easily by following some countermeasures techniques, however despite potential limitations this technique has been entered in the courtrooms of different countries[27]. It is difficult to find exact statistics[28] on the application of neuroscientific evidence in the courtrooms. But it has been noticed that courts are gradually trying to rely on neuroscientific evidence[29]. Why courts are promoting evidence based on neuroscience? There are so many reasons of it, one of the reasons is alternative are not available and hope, judicial officers are having hope that with the help of good insights from neuroscience can help to answer some of the hard and perennial questions law routinely faces[30]. These questions are as follows: Are subjects being responsible for their behavior? Is Subject responsible for his behavior? How competent is the subject? What does the subject remember? How accurate is this subject's memory? etc. Surely, the importance and application of neuroscience to law depend on the exact context and legal issues. Neuroscientific evidence is one of the best kinds of evidence and it helps in getting further corroborative evidence. There are other kinds of evidence but neuroscientific evidence help is of good values and aid to courtrooms so that justice can be imparted in real sense. Buttressing— by increasing juror confidence in a conclusion to which other, non-neuroscientific evidence already independently points (such as in the context of “diminished capacity” determinations); Challenging— by calling into question or contradicting either other evidence in a case or

a relevant legal assumption (such as those reflected in certain evidentiary rules); Detecting— by identifying the existence of legally relevant facts (such as injuries, lies, or pain); Sorting— by separating people into useful categories (such as those most likely to respond to drug rehabilitation); Intervening— by providing new methods to achieve legal goals (such as through pharmacological interventions that would help to reduce recidivism); Explaining— by illuminating decision pathways with information that may lead to more informed and less biased decisions (such as in the context of third-party punishment [TPP] decisions).

5 CAUTIONS AND APPREHENSIONS

Neuroscience is an interdisciplinary field which connects science to subjects of humanities[31]. It is an emerging field of studies and no one can claim to understand the functioning of human mind as researchers have found that human mind is extremely complex and there are so many hidden secrets in it as how it performs and how it work and store information and react to a different situation differently and how it starts malfunctioning that is why there are possibilities of erring at any stage of it mapping[32]. We cannot reject it as well as a human can easily control their emotions to defeat lie detector but it is little difficult to defeat their mind as they have no idea how it works and what part of human brain get active to a particular situation i.e. at the time of aggression or at the time of joy[33]. It is up to judges whether they are assured about the genuineness of machine results and expertise of neuroscientist. If the answer to this is yes, they may take help of neuroscience as many a time judges find no other way except to take help of neuroscience as it helps in the evidence gathering and it also helps in getting further corroborative evidence that may help in a case proceeding in imparting justice. Brain imaging got popularity through tv shows like CSI (US TV Show) as this show glorified brain mapping in solving different complex problems and popularly it is known as “CSI effect”. Society has developed a negative sense of uses of technology and is not able to understand the value of scientific evidence but with the advancement of society, people will be more aware of the uses of technology and will not be impressed by the science fiction and technology[34]. Stephen J. Morse an American professor of law described the abuse of neuroscience as a pseudo-disease called “Brain Overclaim Syndrome”[35]. He gave emphasis on claims made about people having diminished responsibility or no responsibility for their actions as those actions were accused by “the brain”, where the science could not support such causal claims[36].

6 CONCLUSIONS

The law is not meant to impart justice only one is its character in to stop crime and maintain a status of harmony in the society. It has been seen that most deterrent laws are failed to stop crimes that are why researchers are trying to

find new areas to control human behavior so that they stop committing a crime in society. The different mechanism has been tried but no satisfactory results come out. There is one challenge also that courtroom needs to prove the genuineness of their decisions otherwise there will be a state of chaos[37]. Neurolaw is based on scientific principles of medical science, neuroscience, psychiatry, psychology, etc. that is why results are very much accurate and one may justify findings of brain mapping and it could be easily proved in the courtroom. There is a good thing that by studying human brain we could provide treatment to many patients who are facing brain diseases and distress problems. The second good thing is we can predict happening of a future event and could stop that event. "The Minority Report is a 1956 science fiction short story by American writer Philip K. Dick, first published in *Fantastic Universe*. In a future society, three mutants foresee all crime before it occurs. Plugged into a great machine, these "precogs" allow the Precrime Division to arrest suspects prior to any infliction of public harm"[38]. The same with the help of neuroscience now we are able to find out who can commit a crime with the help of brain mapping and could stop future crime by providing some medicines and psychiatric therapy[38]. Neuroscience and law are mixed blend that paved the way for neurolaw in 1990. There are two categories of this first theoretical and second is practical [35]. Neuroscientists are working on both front and now lawyers and attorneys are working on the applicability of neuroscientific data so that courtrooms get more accurate and fairer justice system [38]. Now with the growth of literature of neuroscience, this advanced field of studies can be beneficial to mankind by providing better technological support in terms of evidentiary value so that justice could once again triumph.

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