

L.K. Arenova\*

*Karaganda University of the name of academician E.A. Buketov, Kazakhstan  
(E-mail: super.hamka@mail.ru, Scopus ID 57211988742)*

## **Neurolaw: trends and perspectives in crime investigation**

The article discusses new achievements of neuroscience in legal relations in general and in particular in the practice of investigating certain types of crimes, the possibility of using such scientific knowledge as an interdisciplinary field. In modern society, there is an active surge of research in psychology, medicine, biology, physiology, physics, and other sciences of the natural and exact cycle, which has formed a direction defined as neuroscience. Neuroscience provides scientific ideas about the functioning of the brain and about the mechanisms of mental activity, reaction of the brain to phenomena, events, and actions. The indications allow us to assert that the implementation of a public interdisciplinary approach is carried out both in the actual research and practical activities, the particular relevance of which is observed precisely in the field of rights and legal relations. The leading approach to the study of issues related to the trends and prospects of neurolaw is the system-activity approach and the method of analyzing state legislation in this area. As a result, the article presents reasonable provisions that allow to use the interaction of two spheres – neuroscience and law – and offers a more accurate, comprehensive approach to legal analysis and the establishment of legal norms and standards. Consideration of neuroscience research as a new scientific approach, and their integration into the field of law and legal relations, allows us to solve a number of basic legal problems, which include formation in modern Kazakhstani legal science of such a scientific and practical direction as neurolaw, which is in line with modern international scientific interests; the possibility of using such an interdisciplinary area as neurolaw in lawmaking, as well as in the practice of effective investigation of certain types and groups of crimes and judicial activities, to achieve judicial truth; ethical aspects of legitimate extraction of information from the brain of the examined person.

*Keywords:* neuroscience, neurolaw, crime investigation, lawmaking, brain function, interdisciplinary approach, neuroscience research methods, modernization of legal norms, investigation efficiency, Brain Fingerprinting, hidden information in the brain, legitimacy of extracting information from the human brain.

### *Introduction*

The article discusses, along with the results of modern scientific research in the field of medicine, biology, psychology, physiology, and a number of technical and engineering sciences, the possibility of their use, both in the legal field in general, and in the framework of the investigation of certain types of crime in particular.

It should be noted that the modern development of society, precisely, the last thirty years, can be defined as the activation, surge of research, the development and implementation of knowledge of natural and exact sciences, biology, physiology, a complex of psychological, psychiatric and medical knowledge, physics, mathematics, which formed a direction defined as neuroscience, which gives scientific ideas about the brain and, most importantly, about the work of the brain, the mechanisms of mental activity, the brain's reactions to phenomena, events, and actions.

The above allows us to assert that the scientific community is implementing an interdisciplinary approach to both theoretical and practical activities.

The complex of results of such research is used in a number of applied sciences, such as economics. It also opens up wide opportunities for the use of neurosciences in law and legal relations, especially in lawmaking and criminal proceedings and practical activities in the investigation of serious crimes.

Neuroscience, as a modern scientific direction, contributed to the formation of a new conceptual apparatus, based precisely as a result of brain research at the interdisciplinary level.

In this sense, an example from the sphere of economic sciences of the 70s of the XX century regarding the expansion of economic models is indicative. Through this, the concepts of “thinking and intuition”, “emotions”, “reasoning” were included in economic theories, which play a significant role in the decision-making process not only for financial analysts but also in the behavior of people in the field of economic relations in general, which includes into the subject of microeconomic science [1; 249].

---

\*Corresponding author's e-mail: [super.hamka@mail.ru](mailto:super.hamka@mail.ru)

Subsequently, as a result of such studies, a fundamentally new scientific approach was formed, an innovative theory in economic sciences that makes it possible to study human behavior in economic relations, which began to be called neuroeconomics.

In this regard, it can also be noted that in 2002, Israeli psychologists Daniel Kahnemann and Amos Tversky were awarded the Nobel Prize for discoveries in the field of economics, just for prospect theory and decision making under uncertainty, which demonstrates the effectiveness and necessity of implementing and using the achievements of neuroscience as a modern scientific approach [2; 180].

The above also determine the relevance of the new scientific approach in the sciences of the legal cycle, not only at the level of theoretical knowledge. Also, to a greater extent, for the modernization of rule-making activities, considering the perception and understanding of the occurring phenomena, legal norms and attitudes by a person, as well as the effectiveness of investigating various in their own way the severity of the crimes.

### *Experimental*

During the research the following methods were used: The basis is the general scientific dialectical method of cognition of regular objective activity, based on the unity of cognitive, rational and practical activity, as well as a system-activity approach; theoretical (analysis, synthesis, concretization, generalization, analogy, modeling); empirical (study of international scientific experience in the use of neuroscience research, in particular neuropsychology) method of comparative legal analysis.

The study analyzed the scientific research of leading scientists in the field of neurosciences Baskin H., Oliver R., Tuckera M., Kahneman D., Tversky A., Morse S.J.

### *Results and Discussion*

For more than two decades, since 1991, in international legal practice and scientific discussions, American lawyers Sherrod Taylor and Tyler Elliott proposed and introduced the concept of "neurolaw", which substantiated the need to involve neuropsychologists and neurobiologists in forensic medical examination, based on specific criminal murder cases.

The main position of Taylor and Elliott was that various brain injuries, craniocerebral injuries, are extenuating circumstances, and they should be taken into account in the criminal process [3].

On this basis, the first legal precedent was created in the case of the murder of his wife, committed by 65-year-old Herbert Weinstein. Subsequently, the practice of lawyers increasingly resorted to the considered research methods by neuroscientists, neuropsychologists, and doctors.

However, these studies are already a consequence of scientific and technological progress, the emergence of high-precision brain research tools, and one should refer to earlier observations that indirectly show the need to use the achievements of neuroscience in legal activities and legal relations, due to their large number, accumulated legal experience and current, real practical material. Here, the most indicative case is a case that happened to Phineas Gage in 1848, when, because of an accident, a metal rod with a diameter of three centimeters pierced through his skull. Consequently, Gage injured his left eye, but his personality changed dramatically. Namely, instead of a calm, mentally balanced person, he became a person with bright criminal inclinations and qualities.

In addition to various brain injuries, it is necessary to take into account other disorders of mental states caused by physical diseases, various etiologies, and distress factors that can and do cause cognitive impairment and changes. For example, the impact of such severe viral diseases as a COVID infection that caused a pandemic in the modern world.

The above allows one to more accurately, reliably and fully understand the essence of legal phenomena, events and relationships, where the decisive role in achieving the truth can belong to the introduction and use of knowledge and methods of neurosciences and specialists in this field, as a new aspect of the legal sphere.

Considering the studies of the human brain and their results, it can be noted, that there is a clear and strong relationship between a person's perception of visual, verbal, non-verbal information from the outside and its perception by a particular person or social group.

It must be emphasized, that the perception of various types of information entails its processing in the brain, and thus forms such mental processes as motivation, decision-making, and as a consequence, the implementation of actions that can be both lawful and criminal in nature.

This factor forms a different, new direction in the cycle of legal sciences, determines the effectiveness of legal activity in terms of explaining human behavior as a biological species, and, therefore, makes it nec-

essary to revise the legal norms, current legislation, especially in terms of criminal law and process, investigation technologies crimes.

In addition, the use of neurosciences in economic sciences confirms the need to consider the scientific approach of neurolaw, since economics and jurisprudence are those social sciences that complement each other, ensuring the ordering of the social system of any state.

It should be noted that in the field of international scientific and practical legal activity, attempts are being made to understand and implement neurosciences in the justice process, to use achievements, to establish the truth in court, where it is the judge who evaluates the completeness of the evidence presented by the parties to the process and, guided by law and conscience, makes the final, procedural decision pronounces judgment on behalf of the state.

In our opinion, the use of knowledge and methods of neuroscience, in the legal field is effective and useful, including from the point of view of the accuracy of the data obtained using modern tools and hardware and the accuracy of such indicators is obvious (for example, electroencephalogram (EEG) of the brain, computed tomography (CT), nuclear magnetic resonance (NMR)).

The simplest and most easily accessible method of the above is EEG, the essence of which is to record the bioelectrical activity of the human brain by attaching a grid with electrodes to the human skull, which are designed to record and analyze changes in electrical impulses, potential, waves as a result of activity, activity of the human brain. At the same time, the recorded wave has a certain size, an indicator of activity in a certain period for the perception of certain information.

As an example, the case of Terry Harrington, who was sentenced to life imprisonment in the United States in 1978 for the murder of a watchman, is described. Harrington never admitted his guilt and claimed at all stages of the investigation and trial that at the time of the murder of the watchman, at night, he was in another city. The accusation was based on the testimony of witnesses and traces of gunpowder on the sleeves of his clothes. After serving 23 years in prison, Harrington asked the court to allow him to present as evidence the results of an electroencephalogram of his brain as a result of which Harrington was released as an innocent person who presented evidence of his innocence.

The created applicant occurred due to the fact that, in relation to the convicted Harrington, experimental studies were carried out using an electroencephalograph, where he was shown photographs from the scene of the murder of the watchman. As a result, it was found that Harrington's brain did not show activity reactions, that is, his brain did not react to the active wave, as the brain of the person who performed the actions should have reacted, and in the photograph of the concert where the convict was, on the contrary, the activity reaction was strictly recorded.

In this regard, it should be noted that the human brain, as a biological species, is evolutionarily created in such a way that it independently makes decisions when the individual does not yet know about it, that is, the decision, like a brain impulse, reaches the human consciousness in 5–7 seconds, and the person does not realize this. The brain makes a decision, gives an impulse to consciousness, and a person only voices it, that is, the brain cannot lie as it acts automatically.

This discovery, a long time ago, was made in the late 70s by Benjamin Libet in the USA in the field of neuroscience, and was confirmed at a later date, in particular in 2009, by Kuhn and Brass regarding unconscious decision-making, that is, only by the brain, without conscious human participation [4; 42].

The use of methods and approaches of neuroscience in the investigation of crimes, and in general in criminal proceedings, in rule-making activities highlights a number of theoretical and practical issues and defines new tasks that should be resolved precisely by the interdisciplinary field of neurosciences and law.

To justify the need to take into account the achievements of neuroscience in law, as well as the formation of such a scientific approach as neurolaw, one can cite such an example as bringing to criminal responsibility for financing terrorist and extremist activities of minors from the age of 14. Considering this fact, it can be objectively determined that the financing of terrorist activities is certainly a serious crime, and requires severe sanctions. However, the subject of such a crime, a person who has reached the age of 14, requires a more accurate approach, taking into account the knowledge of neuropsychology, developmental psychology, biology, medicine and other cognitive sciences.

This is due to the fact that a person of such an age group does not fully own all social, legal, and political rights; cannot have his own financial or / and property benefits; is an emotionally and intellectually immature person who is being educated, that is, continuing to teach and form an intellectual, emotional-volitional, and moral system, where the concept of terrorism, terrorist and extremist activities of an ideological, financial or religious nature cannot be properly perceived and processed as information.

It should be noted that neurolaw approach developed by Lawrence Farvel, a professor at the University of Illinois, and called Brain Fingerprinting or “Brain Fingerprints” is currently popular in the United States.

Farvel L. notes that “Brain Fingerprints” is a technology that allows one to determine the hidden information in the brain, through the use of measuring the electrical impulse of a wave of human-made responses (words, sentences, spoken phrases), which are subject to analysis and evaluation of the computer technology in question.

It should be noted, that the reliability of this particular form of research is still undergoing further research, including by L. Farvel himself, but undoubtedly deserves both scientific attention and practical adaptation [5].

Considering this provision, a number of scientific questions arise, as well as points related to the possibilities of sanctions for interfering with the work of the human brain, that is, the ethical aspects of the legitimate extraction of information from the brain of the person being examined.

In this regard, solely for debatable scientific purposes, it is advisable to note that the information contained in the brain can be considered, as personal data protected by law, but still having an important evidentiary value, especially when resolving the issue of guilt-innocence, affecting the interests of a person, his personal rights and freedom.

In this sense, it should be borne in mind that from the standpoint of neuroscience, there are differences between the brain of a guilty person and an innocent person; namely, the details of the criminal act committed by him are stored in the brain of the criminal. Usually known only to him, as the person who committed the criminal acts and guided by certain motives, again known only to him, and accordingly the brain will respond with activity. The brain of an innocent person, that is, who did not commit any criminal acts and does not have a motive for the crime, the neurotraces of the crime cannot be preserved.

The legitimacy of the process of extracting information can only be if the suspect, the accused person, voluntarily agrees to the Brain Fingerprinting research technology.

### Conclusions

Neurolaw, as a scientific approach, can not only make the necessary adjustments to existing legal norms or change them, but also contribute to a more complete and deeper understanding of the brain and mental processes that are the basis of the behavior of any person as a biological species. If this allows a more accurate understanding of human behavior, then it contributes to reasonable and fair legal decisions and legal acts that bring as close as possible to the achievement of truth in the criminal process.

On the one hand, the legal process, as any activity, is carried out, by a person, which means that intellectual, emotional and other forms of reactions and cognitive functions are inherent in the human species, which is undoubtedly reflected in decision-making. On the other hand, the same mental processes and the work of the human brain are also reflected, in the decision on criminal activity.

The above reveals the need for new views on human behavior from the joint positions of neuroscience and law, that is, in the interdisciplinary field, at the intersection of scientific disciplines, their analysis, and evaluation.

Thus, we think it is appropriate to consider:

- neurolaw as a scientific approach that can be used in the practice of investigating serious crimes;
- the possibility of enshrining in the current legislation the norms that allow, within the framework of the relevant forensic examinations, to conduct research to a more complete and deeper understanding of the brain and mental processes underlying the behavior of any person as a biological species.

### References

- 1 Baskin H., Edersheim G., & Price H. (2007). Is a picture worth a thousand words? Neuroimaging in the courtroom. *American Journal of Law & Medicine*, 33, 249.
- 2 Kahneman, D., & Tversky, A. (2000). Choices, values, and frames. Cambridge University Press. (KT). 5. Morse S. J. 2004 New neuroscience, old problems. In *Neuroscience and the law: brain, mind, and the scales of justice* (ed. B. Garland), P. 157–198. New York: Dana Press.
- 3 Goodenough, Oliver R. & Micaela Tucker (2010). Law and Cognitive Neuroscience. *Annual Review of Law and Social Science*, Vol. 6, 61–92.
- 4 B. Libet, Gleason CA, Wright EW, & Pearl, D.K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). The unconscious initiation of a freely voluntary act. *Brain*. 1983 Sep; 106 (Pt 3):623-42. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/6640273>

5 Neurolaw – nowa nauka czy science-fiction? *granicenauki.pl*. Retrieved from <https://www.granicenauki.pl/neurolaw-nowa-nauka-czy-science-fiction26062>

Л.К. Аренова

## Нейроқұқық: қылмыстарды тергеудегі тенденциялар мен перспективалар

Мақалада неврологияның жалпы құқықтық қатынастардағы жаңа жетістіктері, атап айтқанда, қылмыстың жекелеген түрлерін тергеу тәжірибесінде, пәнаралық сала сияқты ғылыми білімді қолдану мүмкіндіктері қарастырылған. Қазіргі қоғамда психология, медицина, биология, физиология, физика және басқа да жаратылыстану және нақты цикл ғылымдары саласындағы зерттеулердің белсенді өсуі аңғарылады, бұл нейробиология деп анықтауға болатын бағытты құрайды. Нейробиология ғылымы ми туралы ғана емес, ең құндысы, мидың қызметі, психикалық әрекеттің механизмдері, мидың құбылыстарға, оқиғалар мен әрекеттерге реакциялары туралы ғылыми түсініктер береді. Бұл ғылыми қоғамдастық нақты зерттеу және практикалық қызметке пәнаралық көзқарасты жүзеге асырады деп айтуға мүмкіндік береді, оның ерекше өзектілігі құқық пен құқықтық қатынастар саласында байқалады. Екі саланың — неврология мен құқықтың өзара іс-қимылын пайдаланудың дәлелді ережелері берілген және құқықтық талдау мен құқықтық нормалар мен стандарттарды белгілеуге неғұрлым дәл, жан-жақты көзқарас ұсынылған. Нейроғылым зерттеулерін жаңа ғылыми тәсіл ретінде қарастыру және оларды құқық пен құқықтық қатынастар саласына бірігуі бірқатар негізгі құқықтық міндеттерді шешуге мүмкіндік береді, олардың қатарына қазіргі қазақстандық құқық ғылымында нейроқұқық сияқты ғылыми-практикалық бағытты қалыптастыруды жатқызуға болады, бұл қазіргі заманғы халықаралық ғылыми мүдделерге сәйкес келеді; құқық сияқты пәнаралық саланы заң шығару қызметінде, сондай-ақ сот ақиқатына қол жеткізу мақсатында қылмыстардың жекелеген түрлері мен топтарын және сот қызметін тиімді тергеу практикасында пайдалану мүмкіндіктері; зерттелетін адамның миынан ақпаратты заңды түрде алудың этикалық аспектілері.

*Кілт сөздер:* неврология, нейроқұқық, қылмысты тергеу, заңшығару, ми қызметі, пәнаралық тәсіл, нейробиологиялық зерттеу әдістері, құқықтық нормаларды жаңғырту, тергеудің тиімділігі, «мидағы саусақ іздері», мидағы жасырын ақпарат, адам миынан ақпаратты алудың заңдылығы.

Л.К. Аренова

## Нейроправо: тенденции и перспективы в расследовании преступлений

В статье рассмотрены новые достижения нейронаук в правовых отношениях, в целом и в частности, в практике расследования отдельных видов преступлений, возможности использования таких научных знаний, как междисциплинарной отрасли. В современном обществе наблюдается активный всплеск исследований в области психологии, медицины, биологии, физиологии, физики, и иных наук естественного и точного цикла, что образовало направление, которое можно определить как нейронауки. Нейронауки не просто дают научные представления о мозге, но, что наиболее ценно, о работе мозга, механизмах психической деятельности, реакциях мозга на явления, события и действия. Указанное позволяет утверждать, что научным сообществом осуществляется междисциплинарный подход как к собственно исследовательской, так и практической деятельности, особенная актуальность которой прослеживается именно в области права и правовых отношений. Представлены аргументированные положения использования взаимодействия двух сфер — нейронауки и права — и предложен более точный, всеобъемлющий подход к правовому анализу и установлению правовых норм и стандартов. Рассмотрение исследований нейронаук, как нового научного подхода, и их интеграция в область права и правовых отношений позволяют решить ряд основных правовых задач, к числу которых можно отнести формирование в современной казахстанской правовой науке такого научно-практического направления, как нейроправо, что является соответствием современным международным научным интересам; возможности использования такой междисциплинарной области, как нейроправо, в законодательной деятельности, а также в практике эффективного расследования отдельных видов и групп преступлений и судебной деятельности, с целью достижения судебной истины; этическими аспектами легитимного извлечения информации из мозга обследуемого лица.

*Ключевые слова:* неврология, нейроправо, расследование преступлений, законодательство, функция мозга, междисциплинарный подход, нейробиологические методы исследования, модернизация правовых норм, эффективность расследования, «отпечатки пальцев мозга», скрытая информация в мозгу, правомерность извлечения информации из мозга человека.