NEUROLAW: IS THE DIALOGUE BETWEEN NEUROSCIENCE AND LAW INEVITABLE?

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ABSTRACT

Research background and hypothesis. Today, more and more discussions arise about the effect of a new science – postmodern, of complex dynamic systems – on the science of law. The law science is encouraged to be open both internally and externally with other sciences. The new science encourages other sciences to seek for dialogue, connection and integration; one example of this is neurolaw. Neurolaw is an association of neuroscience and law science aiming at a clearer understanding and coming closer to the truth than it was before, using the achievements of neuroscience. This is a new association which causes much debate. How can it help the law? Is this just a temporary fashion? These are topical issues for the law science to move towards perfection, and for the neuroscience to be adaptable and very important to other sciences.

Research aim. A conceptual overview of the essence of neuroscience and neurolaw, answering the question about how neuroscience can help the law, and if the dialogue between them is inevitable or just a temporary fashion.

Research methods. Systematic and logical analysis of the relationship between neuroscience and law.

Discussion and conclusions. Neurolaw is an inevitable dialogue between law and neuroscience. This is the integration of the two sciences in order to get a clearer understanding of complex legal issues when we deal with people's destinies, and most important, to answer what is true in a particular case. We cannot say that this is just a temporary fashion, more scientific research is carried out and with the help of this dialogue more cases can achieve the equitable solution. On the other hand, various studies related to the judicial decision-making are important to neurolaw, as they look into how decisions are made, what influences them, etc. Conceptualizing this integration as well as the importance and the scope of the dialogue between these sciences, we can say that law science will inevitably face major changes in this area. The future of this inevitable integration depends on how scientists will be able to communicate and achieve the fairest goals for us.

Keywords: integration, changes, the new science.

INTRODUCTION

Worldwide, scientists are increasingly talking about the influence of postmodernism (new, postmodern science of complex dynamic systems) on law (for example, Milovanovic, 1998; Holz, 2006; Jones, 2008; Patterson, 2008;). The new science "does not divide" the sciences into parts, science is increasingly becoming integral. One of the examples of scientific integrity, when different scientists try to communicate, is the dialogue between neuroscience and law science. This integration has various names – neurolaw, neurojurisprudence, sometimes it is simply called law and neuroscience. In this article, we will use the name of neurolaw talking about the integrated "product" of law and neuroscience. More and more western scientists talk about the dialogue between neuroscience and law (for example, Greene, Cohen, 2004; Aronson, 2010; Jones, Shen, 2012). How is neuroscience important to law and how can it help law? Is this integration inevitable? Can it be just a temporary fashion? These are topical issues because the occurring changes affect the law, and neuroscience becomes more important in various fields. Although neurolaw is a brand new "product", and almost nobody talks about it

Lithuania, this article aims to at least conceptually cover the manifestations this new dialogue. Aiming at "opening" and perfection, expanding the limits of their knowledge, Lithuanian law science needs to know what neurolaw is and how it alters the knowledge of the science of law. Only following this path and understanding the most fundamental basics, without prejudice to innovation, legal scholars in Lithuania could take what is best to understand the importance of neurolaw research. It is very important for Lithuanian jurisprudence to be "stronger" in determining truth and justice.

The aim of this article was a conceptual overview of the essence of neuroscience and neurolaw, answering the question about how neuroscience can help the law, and if the dialogue between them is inevitable or just a temporary fashion.

RESEARCH METHODS

These methods were used to achieve the research aims: systematic and logical analysis of the relationship between neuroscience and law.

RESEARCH RESULTS AND DISCUSSION

Neuroscience: What is it? Methods, devices and their main characteristics. US Society for Neuroscience defined neuroscience as a science seeking to know human thinking, emotions and behaviour. Carrying out research neuroscientists usually try to describe the human brain and tell us what their normal functions are; determine how the nervous system develops and changes over a person's life; look for ways to prevent or cure a number of neurological and psychiatric disorders. Neuroscience in literature is often called in the plural form – Neurosciences. T. M. Spranger (2012) identifies a wide range of research and methods from a variety of areas: biology, medicine, chemistry, physics, psychology, mathematics, computer science, engineering, philosophy, and finally, but certainly not last – the law, which are related to neuroscience. In 1969 the Neuroscience Organization included 500 members, nowadays there are more than 40000 of them. This shows the strong growth of this science. As S. K. Ericson (2011) suggests, life is about the brain. It should be noted that neuroscience is a very broad and rapidly developing science.

What are the main methods and techniques in neuroscience? How can we imagine the brain and explore it? Brain imaging methods and techniques can be divided into two parts (Fantini et al., 2001): functional imaging which typically determines physiological functions; and structural imaging which seeks to identify anatomical information. Functional imaging typically involves: single-photon emission computed tomography (SPECT), positron emission tomography (PET), functional magnetic resonance imaging (fMRI). Electroencephalography (EEG), magneto encephalography (MEG) and electrical impedance tomography (EIT) can also be termed as functional imaging techniques. Structural imaging is usually classified as X-radiation (X-ray), computed tomography (CT), magnetic resonance imaging (MRI) and ultrasound (US).

We will briefly discuss each of them. Using single-photon emission computed tomography (SPECT) provides intravenous radio-based 2D and 3D imaging. The unit provides information on the concentration of radio nuclides in the human body. Positron Emission tomography (PET) can help to monitor cerebral blood flow and tissue metabolism, observing how rapidly radioactive isotopes are absorbed or removed (Webster, 1992). Using functional magnetic resonance imaging (fMRI) we can assess changes in cerebral blood flow and oxygen level, which represents localized changes in the brain induced by the sensory, motor or cognitive tasks. When neurons are active, they use more oxygen and blood quickly focuses in the core part of the brain (Webb, 2003). It should be noted that fMRI is the most advanced method in brain imaging. fMRI well serves as lie detecting judicial process by examining psychopaths, aggressive crimes, and so on. Namely fMRI is most commonly used in the field of law. As T. M. Spranger (2012) suggests, with the help of Electroencephalograph (EEG) brain activity is recorded by measuring the voltage fluctuations caused by ion flow. Neurons are provoked; the electrode gets a small electric strength (power wires are connected to the scalp) at short frequencies within 20–40 minutes. The data is recorded on paper or on a computer screen. With regard to the law, the EEG can usually be used as a lie detector. Magneto encephalography (MEG) is the imaging of magnetic fields induced by the brain activity. The touch-sensitive helmet with 64–304 sensors is placed on the volunteer (Paetau, 2002). Electrical impedance tomography (EIT) is

a technique in which electrodes are attached to the human scalp, so the brain is exposed to different frequency electrical currents causing seizure activity (Tharyan, Adams, 2005).

X-radiation (X-ray) is the X-ray method which carries the basic information and leads to radiographic imaging with X-ray photons passing through the human body (Webb, 2000). Computed tomography (CT) is also based on the properties of X-ray imaging technique that generates cross-sectional brain imaging in 2D and 3D format (Webb, 2000). Magnetic resonance imaging (MRI) provides detailed 2D and 3D atomic structure of brain images using a magnet and radio wave features. Ultrasound (U.S.) is a technique in which sound waves are used in the brain ultrasound, and then the sound waves are sent to the head to get the representation (Webb, 2003).

We tried to structure the main methods and devices which are successfully applied in neuroscience. It is hard to choose the best or the worst ones, in each case the investigators try to select the methods which will be best for them for more accurate knowledge.

Neurolaw – what is it? How can neuroscience help the law? In short, neurolaw (also sometimes referred to neurojurisprudence) is the integration of neuroscience and law, and it is a combined science. This is a science which has been increasingly gaining acceptance in recent years (Aronson, 2010; Goodenaugh, Tucker, 2010). This is an excellent example of an interdisciplinary science. Great interest in neurolaw science is based on the sharp and high-tech development of neuroscience; fast "inclusion" of neuroscience among scientists; the increasing number of neuroscience research questions that relate to law science (Jones, Shen, 2012). Neuroscience and law scientists are increasingly joining forces, for example, MacArthur Foundation Law and Neuroscience Project, the Gruter Institute for Law and Behavioral Research, the Society for Evolutionary Analysis in Law (SEAL). O. Jones (Cookson, 2010) argues that neuroscience is a constantly rapidly growing science. Law is behind and it will inevitably fall behind. A very important question is how much is it behind, and what will be the consequences. O. Jones identifies six ways in which neuroscience changes and shapes law. First, third-party solutions, researchers typically seek to understand how decisions are made, as it is known, what is bad, what is to be convicted, and so on. Second, determination of lies, which is very important in law, a lie can be determined using neuroscience methods, particularly fMRI. Third, mental state: usually in a criminal case a question arises what was the mental state of a suspect in a crime, neuroscience may also help to answer this question. Fourth, memory: usually in witnesses' cases, this issue is very important, as far as their memory can capture certain facts. For example, in the cases it is usually necessary for someone to recognize somebody, so neuroscience knowledge can help to tell us how human memory is able to memorize the faces. Fifth, the teenage brain: neuroscience methods can also determine how the brain during adolescence may react to certain stimuli which will lead to certain behavior, and so on. Sixth, the appeal as the basis of the brain: this is often relevant when considering the death penalty issue. Usually neuroscience analyzes how the brain works during the crime and how it changes. So, these are a few possible areas where neuroscience actually helps law.

Neurolaw is gaining great momentum in the US, but the integrity of the law and neuroscience is increasingly grabbing attention of scientists in other countries, such as Australia, South America, Canada, Finland, Germany, Austria, Japan, Greece, Italy and others (Spranger, 2012). In this article, more attention will be focused on the US ongoing research, their experience in the US because the greatest manifestation of this integration can be observed in this country. Modern science does not have the "walls", it does not want to be limited, and so what is happening in the US is important to Lithuania. We could guess that after a short time new technologies will come to Lithuania and neuroscience will have a significant impact on the knowledge and the law science. This is of course a matter of time, scientists' preparation, quality equipment and so on, and only time will show when it will inevitably be dealt with in Lithuania.

When did the dialogue start? The beginning of the dialogue between law and neuroscience can be considered the 1990 s (Goodenaugh, Tucker, 2010). According to the authors, this science includes the following areas of interest: methods of investigation of pain, memory and truth-telling; evidence of the problems of applying neuroscience knowledge; free will, responsibility, problems of moral judgments and punishments; problems of juvenile offenders; various addiction issues; mental health; influence; emotions and neuro-economy of decision-making

and cooperation. As we can see, the dialogue is completely new, but it is rapidly evolving.

In 2006–2009, the number of cases, where achievements of neuroscience were used, almost doubled in the US. Since 2000 the number of law research papers on the theme of "neuroscience" has increased four times, and in 2008 and 2009 more than 200 research papers published in US mentioned keywords "neuroscience". So it is becoming increasingly interesting to law scientists. More and more neurolaw lectures appear at universities, for example in Vanderbilt University, the University of Colorado, Georgetown University, Mercer University, the University of San Diego, Temple University, Tulane University, Yale University (Jones, Shen, 2012).

When was a neuroscience method used for the first time dealing with a case in court? Only in 2010 fMRI was used for the first time to detect a lie in the US court case (United States v. Semru, 2010). The obtained data was used as evidence. As we can see, even though the dialogue is rapid, but quite recently the courts started using neuroscience techniques to get results as evidence. Earlier (Graham v. Florida, 2010), neuroscience research findings were in the case for the first time and were quoted during the case. Differences between juvenile and adult brain were quoted and treated as evidence. It should be noted that neuroscience is very important for judges' decisions, for example (State v. Nelson, 2010), the judge saw the offender's brain and did not give the death penalty. Generally speaking, there are other kinds (not just criminal) of cases in which neuroscience plays a key role, such as the examination of the contractual relationship (Van Middlesworth v. Century Bank and Trust Co, 2000); clarifying whether a person has truly lost his ability to work (Boyd v. Bert Bell/Pete Rozelle NFL Players Retirement Plan, 2005). Returning to criminal law cases, it can be noted that neuroscience methods or research are of great importance to solve a wide range of issues in criminal cases, such as addressing the issue of punishment reduction (Oregon v. Kinkel, 2002), addressing the question of guilt (People v. Goldstein, 2004).

It should be noted that in terms of the dialogue between neuroscience and law, relationship between moral and law is of great importance. The moral aspect in law is particularly important. It is extremely complex. It is very important how moral decision-making influences juridical decisions. The answer to this makes scientists search for the right answers in neuroscience (for example, Greene et al., 2001). Neuroscience generally deals with moral dilemmas, selecting a wide range of scenarios, observing human brain activity, for example "Trolley problem" (Thomson, 1985): you need to imagine that you are a traffic regulator, clicking through the rails and you send them where it is necessary. Suddenly you see a train pelting at a high speed with no brakes. You notice five workers with headphones standing on one track, you can see that the train will soon hit the workers, but you can still do something – direct the train to other tracks where one of the workers stands and who also does not see and cannot hear the train. That is the moral dilemma scenario. Typically, most people reply that they would save the five workers.

It must be borne in mind that not all scientists are positive about the dialogue between law and neuroscience. Usually scientists look carefully to the alliance of law and neuroscience, but still, as S. J. Morse (2011) notes, it is possible to distinguish four situations in which neuroscience can still help: (1) provide evidence that law regulations based on the "folk" psychology are incorrect; (2) provide data that show the characteristics of a new or reformed law doctrine; (3) provide evidence that will help to make decisions in the case; (4) provide data that will help you more efficiently make decisions, particularly in criminal cases.

J. D. Greene and J. D. Cohen (2004) also agree that there is usually a variety of reactions to the dialogue of neuroscience and law. Some argue that an understanding of human behavior will lead to transformational effect of law; others argue that neuroscience will complement the existing law doctrine with new information. According to J. D. Greene and J. D. Cohen, neuroscience may lead to the transforming effect of law despite the fact that the existing law doctrine can apply the knowledge of neuroscience. On the other hand, looking critically, they argue that neuroscience is unlikely to say something to law which would challenge well-established matters. But they agree that neuroscience will change law, transforming people's moral intuitions about free will and responsibility.

Neuroscience and the law – is it inevitable integration, or maybe just a fashion? Is neurolaw indeed an inevitable "product" of integration? Or is it a temporary fashion? With the emergence of new movements, new approaches, remarkable changes, we do not need to dismiss them immediately, but we also do not need to accept them immediately as the best thing in history. Although we cannot claim

to the best answer, but we will continue trying to find arguments, whether it is in fact an inevitable and significant step forward?

S. K. Ericson (2011) believes that neuroscience cannot offer anything new to criminal doctrine. Some authors believe that attributing human behavior to brain activity causes more conceptual confusion than it is an empirical "coverage" (Pardo, Patterson, 2011). S. J. Morse (2011) argues that a few years ago the dialogue between law and neuroscience was actually viewed more suspiciously, but today there are few people who have doubts about the importance of such a dialogue. This has been confirmed by B. Garland (2004) who argues that the necessary and growing association of law and neuroscience is obvious. Representatives of both the law and neuroscience must find more and more ways to communicate. Neuroscience methods are very important to law. However, it should be noted that both the law and neuroscience researchers are cautious about the application of neuroscience knowledge. For the benefit of both sides, science must be presented, used and discussed. In short, the fact that there is no clear future cannot be the reason to delay the dialogue.

With the exchange and advancement of science, technologies, law science is more likely to benefit from the achievements of other sciences, and even better – the other sciences establish a dialogue that would answer many questions in the area of law. O. R. Goodenaugh and M. Tucker (2010) claim that solid foundation has been laid for this interdisciplinary science for the future: articles and books are written and published, various research centers are established for the representatives of law and neuroscience, various studies are conducted and neurolaw is increasingly taught to students at universities. It is important to note that this interdisciplinary science might not say anything new about the human brain in general, but in law science it will be important knowledge and huge innovations because it is the integration of the two sciences for the sake of cognition of law matters. O. W. Jones and F. X. Shen (2012) argue that US judges are increasingly taught the basics of neurolaw (special courses are developed), and legislators also receive reports on the latest neuroscience achievements. Thus, judges, lawyers, legislators, legal scholars, and all the people are becoming increasingly interested in neuroscience and its knowledge outcomes.

Is this integration really inevitable? It can be said loud and clear, yes. It is inevitable because we believe that neuroscience advances are too important and applicable in law science. Probably it might be argued that it is impossible to move away from more profound knowledge, so law scientists and neuroscientists find more ways to build bridges. Although at a first glance it may seem that for neuroscientists it not so important to carry out studies that are relevant only to law scientists, but we should agree that this integration is important for both sides, since neuroscientists do not know the law aspects as well as law academic representatives, so that is why the studies with particularly sensitive social groups, for example, criminals are interesting and important for neuroscience in order to maximize understanding of the different social groups of people. Scientists of both areas are working towards a common goal – a greater understanding of human thought, emotions and behaviours. Neuroscientists have a lot of knowledge that the law scientists could take over, but the best way is when they conduct joint research raising common questions and discussions. We believe that it is really necessary. Of course, we can guess that this will cause dramatic changes in law. Neurolaw is a new and still rapidly evolving science, the major achievements and progress value as well as the reforms of which will be seen in the future. So far, it is most focused on addressing the problems of criminal law and the judicial process. If it evolves and develops, it will be a great achievement in the interdisciplinary science – finding a way to communicate in two different sciences. S. K. Erickson (2011) is right saying, that the impact of neuroscience on law will be inevitable and dramatic.

CONCLUSIONS AND PERSPECTIVES

Neuroscience is a broad and rapidly developing science of human thinking, emotions and behaviours. Neurolaw is the association of neuroscience and law where scientists seek knowledge using neuroscience techniques. Neuroscience techniques allow seeking for more accurate knowledge of a variety of processes, which is especially important to law, for example, examining pain, memory and truth-telling; problems of evidence; problems of free will, responsibility, moral judgments and punishments; problems of juvenile offenders; different inclination issues; mental health; influences; emotions and neuro economy of decision-making and cooperation.

Neurolaw is an inevitable dialogue between law and neuroscience. This integration of the two sciences seeks a clearer understanding of complex legal issues when addressing people's fates, and most importantly, answering what is true in a particular case. We cannot say that this is just a temporary fashion, more research is carried out, and with this dialogue more equitable solutions can be made in legal cases. On the other hand, various studies are important to neurolaw as they are related to the judicial decision-making, how decisions are made, what influences them, and so on. Conceptualizing this integration as well as the importance and the scope of the dialogue between these sciences, we can say that law science will inevitably face major changes in this area. The future of this inevitable integration depends on how scientists will be able to communicate and achieve the fairest goals for us.

We believe that the dialogue between neuroscience and law will be also inevitable in Lithuania. In order to open up to new knowledge, to be an integral part of other sciences and to develop, Lithuanian law science will inevitably have to consider the pros and cons of this dialogue and to understand the importance of neurolaw research. Legal scholars should be aware that legal science itself does not respond to a wide range of important issues facing both law theory and law practice, such as whether the offender is actually guilty, how the decision is made by the judge, etc. These questions will be addressed by the dialogue between neuroscience and law. We realize that this is a big challenge for the Lithuanian legal practice and theory, and neuroscientists in Lithuania know that they should look for ways to communicate, for suitable instruments and prepare for joint research. Time will tell whether Lithuanian legal science and neuroscience will find ways to communicate. This will lead to enormous changes in the Lithuanian justice system: a key to get closer to the truth and justice, which are very important to each of us.

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NEUROTEISĖ: NEUROMOKSLO IR TEISĖS NEIŠVENGIAMAS DIALOGAS?

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SANTRAUKA

Tyrimo pagrindimas ir hipotezė. Šiandien vis daugiau kalbama apie naujojo postmoderniojo sudėtingųjų dinaminių sistemų mokslo poveikį teisei. Teisės mokslas yra skatinamas būti atviru su kitais mokslais, ieškoti dialogo, jungtis, integruotis. Vienas iš tokių pavyzdžių – neuroteisė. Neuroteisė – tai neuromokslo ir teisės mokslo susivienijimas siekiant aiškesnio pažinimo, didesnio priartėjimo prie tiesos nei anksčiau tai buvo daroma naudojantis neuromokslo pasiekimais. Tai naujas ir daug diskusijų keliantis susivienijimas. Kuo jis gali padėti teisei? Ar tai tik laikina mada? Tai aktualūs klausimai siekiant, kad teisės mokslas judėtų tobulėjimo linkme, o neuromokslas būtų pritaikomas ir labai svarbus kitiems mokslams.

Tikslas – konceptualiai apžvelgti, kas yra neuromokslas ir kas neuroteisė. Atsakyti į klausimą, kuo neuromokslas padeda teisei ir ar šis dialogas tarp jų yra neišvengiamybė, gal tik laikina mada?

Metodai. Sisteminė ir loginė neuromokslo bei teisės santykio analizė.

Aptarimas ir išvados. Neuroteisė yra neišvengiamas dialogas tarp teisės ir neuromokslo. Tai dviejų mokslų integracija siekiant aiškesnio sudėtingų teisinių klausimų pažinimo, kai sprendžiami žmonių likimai, o svarbiausia – norint atsakyti, kas yra konkrečios bylos tiesa. Negalima teigti, kad tai tik laikina mada. Atsiranda vis daugiau tyrimų, mokslininkų, kurie šiuo dialogu daugelyje bylų padeda rasti teisingiausią sprendimą. Antra vertus, neuroteisei svarbūs įvairūs tyrimai, kurie susiję ir su teisėjo sprendimo priėmimu, t. y. kaip priimami sprendimai, kas juos veikia ir pan. Suvokiant šios integracijos, dialogo tarp dviejų mokslų svarbą ir mastą galima teigti, kad teisės mokslas neišvengiamai susidurs su didelias pokyčiais. O šios neišvengiamos integracijos ateitis priklausys nuo to, kaip mokslininkai gebės vis geriau susikalbėti ir siekti pačių teisingiausių tikslų.

Raktažodžiai: integracija, pokyčiai, naujasis mokslas.

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