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TOWARD A DEFINITION OF “NEUROLAW”

FRANCIS X. SHEN, J.D., PH.D.

Thank you to Allie and to Jack and to everyone at the Journal as well for organizing this symposium. There are few things I enjoy more than talking about law and neuroscience, so it is a pleasure to be with you today. I will take a little bit of a different tactic today. Rather than zoom in on one particular thing within the field of law and neuroscience, I will zoom out and ask a definitional question: What is “neurolaw”? What are the contours of the field? What is “in”? What is “outside”? That is what I want to probe a little bit with you today.

In my lab, we study the legal implications of advances in understanding, treating, and changing the human brain. The motto of my lab is “every story is a brain story.”¹ I think that is true. I think the challenge – Adina² just pointed out one of the great examples – is that every story is a poorly understood brain story. Some are understood haltingly and others, not at all. And this leads to difficult questions. What do we do when we have *some* information from neuroscience and related fields but not enough to satisfactorily answer a particular legal question? What evidence do we allow to be introduced to a jury? And so on.

If there is nothing else that I leave you with today, here is the big idea: what unifies the field of law and neuroscience is not a particular method, nor a particular area of law. What unifies this field is a human organ. Sometimes I have heard my neuroscience friends describe the brain not as an organ but as an information processing device, or perhaps not even a device, but as information processing itself.

I am not sure what exactly the brain is. I do not think anyone knows exactly. But whatever it is, it is at the core of the things we care most about. If you do not agree with me about the centrality of brains for everything we do, then the rest of everything I say today will not make any sense. So, I hope

¹ *What We Do: From Lab to Law*, SHEN NEUROLAW LAB, <http://www.fxshen.com/ShenNeurolawLab-Introduction.pdf> (last visited Feb. 26, 2021).

² University of St. Thomas | Minnesota, *University of St. Thomas Journal of Law and Public Policy Neuroscience and the Law Symposium*, YOUTUBE (Dec. 7, 2020) <https://www.youtube.com/watch?v=hwXGJWBAmhQ&feature=youtu.be> at 1:37:55-2:09:40.

you agree with at least the basic premise that the brain is supremely important. Let us now take a journey through the field.

Let's start by returning to our guiding question: What is neurolaw? There is no accepted definition yet.³ Google tells me, and Merriam Webster tells me, that this term does not exist.⁴ So, we must answer it ourselves.

Here is a working definition: neurolaw is the legal use and governance of neuroscientific tools, concepts, and data. When I use the phrase "legal use," I intend for legal to be broad. And "use" means everything from a conceptual shift to an evidentiary tool, to an expert testifying. "Governance" is important too. It is not just that neuroscience has some new information that we might use in the law, it is also that law is a regulator. The FDA, FTC, and so forth in the United States and, internationally, other global bodies govern the use of neuroscientific tools, new concepts, and new data.

With that working definition on the table, I want to touch on three things today. First, I will offer just a few words about why a definition of the field matters. The second part of the talk will provide a sense of the breadth and the depth of law and neuroscience as it is currently playing out. I will give you some snapshots of real cases and then, at the end, a few thoughts on how we might pull all of this together.

I. WHY DOES A DEFINITION OF NEUROLAW MATTER?

I am interested in this question as both an intellectual enterprise and as a matter of practice in thinking about what exactly law and neuroscience is and what value it adds, distinct from things that already exist. I think we have to think about the field being both too narrow and too broad. Too narrow a view, in my opinion, would be to say that neuroscience in law is just about criminal responsibility in criminal sentencing. It would also be too narrow to say that neurolaw is just about government regulation of new neurotechnology, or just about civil litigation of brain injury cases. It is all of those things and more, but it cannot be everything. For instance, there is a world called neuroethics, which thinks about ethical questions. Some ethical questions are related to law, but they are not the same, so it cannot just be the same as neuroethics. We just heard a lot about free will. It cannot be that

³ Kevin Davis, *Millions Have Been Invested in the Emerging Field of Neurolaw. Where is it Leading?*, A.B.A. J. (June 1, 2020) <https://www.abajournal.com/magazine/article/millions-have-been-invested-in-the-emerging-field-of-neurolaw.-where-is-it-leading>.

⁴MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/neurolaw> (last visited Feb. 23, 2021).

every question about free will is a question for neurolaw, in which case you would not need the field. We would just say that philosophy and moral philosophy are enough. It cannot be that every question about the brain implicates the law, or else the field of law and neuroscience would just collapse into neuroscience, neurology, and neuropsychiatry. So, we have to figure out some way to be not too narrow and not too broad.

One more thing we have to ask at the outset is how neurolaw is related to the field of law and psychology. Law and psychology has been around a long time. In fact, if you Google law and psychology you will find that there are societies and edited volumes dedicated to the field. You can go and get degrees in law and psychology. So, is law and neuroscience just law and psychology by a different name? I do not think so. I would suggest to you that one very big difference is the use of neurobiological data. Law and psychology has little to say about epilepsy in the law, for instance. Law and psychology has, as I have described it, nothing to say about the development of biomarkers for early detection of dementia and Alzheimer's disease and the legal implications. There is certainly a lot of overlap with law and psychology, but it is not exactly the same. What about law and psychiatry? Same thing, lots and lots of law and psychiatry, but when you get to law and neurology, hardly anything. Law and neuropsychiatry – nothing.

Why do we not have more interdisciplinary conversations between law and fields such as neurology? Again, that deserves a longer discussion, but I think in large part the practice of psychiatry and the practice of psychology, with some notable exceptions, do not involve a lot of direct brain data. If you know someone who has dealt with depression, substance use disorder, or ADHD, unless there was some suspected traumatic injury, they are not typically getting brain scans. They are not getting blood draws. They are getting a behavioral assessment and a behavioral intervention. They may also be prescribed a drug, so there is some interaction there, but mental disorders are still not frequently discussed in neurobiological terms. That, by the way, is changing. The fields of psychology and psychiatry are changing. And we should keep an eye on those changes because they will have legal implications.

So, let's recap before moving on. I have suggested to you that we do not know exactly what law and neuroscience is, but I think it is not the same as law and psychology. So, there is something here. Rather than trying to find it, just theoretically, I would like to define it from the bottom up. That is, to go through what law and neuroscience looks like on the ground. Maybe that will give us some sense of how we want to define it.

II. THE CURRENT STATE OF LAW AND NEUROSCIENCE

One thing to say at the outset is that there is a really long history of law and neuroscience. I have talked about it, and others have as well. One piece worth mentioning to you, that on this screen (Figure 1) you see sort of going backwards in forty-year increments, attempts to look at violence and the brain, all the way back to Egas Moniz, who won a Nobel prize for creating the prefrontal lobotomy.⁵ You can see the prefrontal lobotomy tool there on the commemorative stamp.



Figure 1

This was really interesting to law – let me give you a quote from a student Note in the Yale Law Journal on the 1948 Assessment of Psychosurgery. Here is what was written: “[p]sychosurgery has startling implications for rehabilitation. Perfection of so relatively simple and inexpensive a rehabilitative technique as a prefrontal lobotomy promises to be a major contribution to the cure of criminals.”⁶ That was 1948. And it is a reminder that we need to be cautious.

It also reminds us that there is a foundational challenge: legal actors have to scrutinize the science independently, but we are not trained in

⁵ Henry T. Greely, *Neuroscience and Criminal Justice: Not Responsibility but Treatment*, 56 U. KAN. L. REV. 1103, 1103 (2008) (“In 1949 Egas Moniz won the Nobel Prize for inventing the procedure commonly known as the prefrontal lobotomy. Within twenty-five years, the procedure was both generally abandoned and widely reviled.”).

⁶ *Toward Rehabilitation of Criminals: Appraisal of Statutory Treatment of Mentally Disordered Recidivists*, 57 YALE L. J. 1085, 1097 (1948).

medicine, neurology, or neuroscience. So how do we, as lawyers, evaluate this? How do we evaluate it, especially when it comes with the credential of a Nobel Prize? The answer: we work together. This field of neurolaw has grown a lot over the last fifteen years. It has been on the cover of *The New York Times Magazine*.⁷ There are more and more articles being published. We just published the second edition of our *Law and Neuroscience* casebook.⁸ Just in the six years since the first edition, there are hundreds and hundreds of new citations. By the way, ninety percent of the material has only been published since 2000. It is a fast-moving field, which raises questions.

Let me give you a sense of the breadth of types of cases. Just from 2020, we see cases involving brain death, the effect of pesticides on the brain, brain injury, the effect of sports concussions on violent behavior, criminal sentencing, and much more. What was once philosophical inquiry – “Did my neurons make me do it?” and “Did my brain tumor make me do it?” – are now, in a lot of contexts, actual court cases. Neuroscience is showing up front and center.

Here is an example. So much has happened since 2017 that this incident is almost, I think, passed from collective memory. At the time, you may recall, in Charlottesville, Virginia, around the University of Virginia, there were protests and counterprotests. White nationalists on the one hand, those protesting their views on the other. James Fields drove a car into the crowd, killing Heather Heyer.⁹ He was age twenty at the time. Through a negotiation in the plea, he was not going to get the death penalty, but the question was, would he get life without the possibility of parole?¹⁰ In the sentencing memorandum that went before the judge, his defense attorneys put neuroscience front and center.¹¹

Contemporary neuroscience proves, argued the brief, that the line of constitutional protection should extend beyond eighteen up to twenty-one. They specifically pointed to the advent of functional magnetic resonance

⁷ See Cover, N.Y. TIMES MAGAZINE, March 11, 2007.

⁸ OWEN D. JONES, ET AL., LAW AND NEUROSCIENCE (Wolters Kluwer 2nd ed. 2020).

⁹ Off. of Pub. Aff., U.S. Dep't of Just., *Ohio Man Sentenced to Life in Prison for Federal Hate Crimes* (June 28, 2019), <https://www.justice.gov/opa/pr/ohio-man-sentenced-life-prison-federal-hate-crimes-related-august-2017-car-attack-rally>.

¹⁰ Denise Lavoie, *Guilty Plea to Hate Crimes in Deadly Car Attack at Rally*, A.P. NEWS (Mar. 27, 2019), <https://apnews.com/article/012289b56fab456daaa47fa9b53aab53>.

¹¹ Def.'s Sentencing Mem. at 1, *United States v. James Alex Fields, Jr.*

imaging (fMRI) evidence. Now, the prosecution had a response and said look, we do not really think the defendant fits into this pattern.¹² This was a strong counterargument, and the evidence did not (and in my view should not) have changed the sentence. But my point in showing this case is that neuroscience is playing a leading role in high stakes cases.

Neuroscience is showing up in many other legal contexts as well. It showed up at the Supreme Court in thinking about whether states could regulate the sale of violent video games to youth.¹³ It has showed up again and again in death penalty cases when the individual who is facing the death penalty committed his or her crime somewhere between eighteen and twenty-one. The argument is that neuroscience has a role to play there.¹⁴

It should be noted as well that neurolaw is much more than criminal law. As an example, let’s consider a fascinating case from the state of Michigan: *Allen v. Bloomfield Hills*. In this case, a train crossing gate goes down - ding ding ding ding! This school bus, for whatever reason, tries to run the crossing guard gate. The train, conducted by Charles Allen, hits the bus. Thankfully, there are no kids on the bus, but the driver gets seriously injured. The conductor of the train, Charles Allen had lasting mental scars, but no significant and lasting “physical” injuries. He was diagnosed with post-traumatic stress disorder. Everyone agreed he had PTSD, and everyone pretty much agreed that the cause of the PTSD was this incredibly traumatic event. The legal question was this: was it *bodily* injury?¹⁵ There is an immunity statute, as there is in most places. It would have to be bodily injury in order for his suit against the City of Bloomfield Hills to go forward.¹⁶ He proffered brain evidence and argued that the brain is a part of the body, and PTSD is

¹² Alan Suderman, *Sentencing looms in Charlottesville attack*, A.P. NEWS (June 23, 2019), <https://apnews.com/article/edbefa173dd7480fb64697aae9a78dc4>; See also

<https://bloximages.newyork1.vip.townnews.com/dailyprogress.com/content/tncms/assets/v3/editorial/0/fa/0fa332bc-742d-587e-9d7a-2f5294378b86/5d1022eed3e11.pdf.pdf>

¹³ *Brown v. Ent. Merch. Ass’n*, 564 U.S. 786 (2011).

¹⁴ *Neuroscience Experts*, DEATH PENALTY INFO. CTR. (June 23, 2020), <https://deathpenaltyinfo.org/news/neuroscience-experts-brain-science-shows-texas-use-of-future-dangerousness-to-sentence-those-under-21-to-death-is-unreliable-unconstitutional>.

¹⁵ *Allen v. Bloomfield Hills Sch. Dist.*, 760 N.W. 2d 811 (Mich. Ct. App. 2008).

¹⁶ MICH. COMP. LAWS ANN. § 691.1405 (West 2020) (Requiring “Governmental agencies shall be liable for bodily injury and property damage resulting from the negligent operation by an officer, agent, or employee of the governmental agency, of a motor vehicle of which the governmental agency is owner....”).

physically instantiated in the brain.¹⁷ Logically, then, PTSD, even without another scratch on the body, is a physical, bodily injury. The district court said no way. Think of the slippery slope. The appellate court said, we see the logic of your argument. It goes up to the Michigan Supreme Court, and it settles.¹⁸ So, there is no law there, but these cases are showing up. Again, this has nothing to do with criminal responsibility. This has to do with the conceptual, mind-body dualism, but this is real law. These are real cases.

There are also a number of cases around substance use disorder and addiction. I will just flag one which came up two years ago in Massachusetts.¹⁹ The defendant involved was Julie Eldred. I think many of you know that requirement number one on almost every probation list or parole list is to stay drug free. Eldred had an opioid addiction. She was in prison, then she gets let out on parole. Again, rule number one, condition number one, stay drug free. Seven days later, she relapses. She argued that based on the Massachusetts State Constitution it was unconstitutional to require her to stay drug free because she did not have control over whether she stayed drug free or not. She analogized to telling someone “Don't get cancer.” How can I control that? That was her argument. The Massachusetts Supreme Judicial Court for a variety of reasons, both procedural and substantive, did not find for her, but the briefs were filled with neuroscience.²⁰ Neuroscience and law, not hypothetical cases, real cases.

Switching to another area of law, here in Minnesota, we have been leading a multi-year project around youth sports concussions.²¹ This does not

¹⁷ *Allen*, 760 N.W. 2d at 811.

¹⁸ *Id.*

¹⁹ Harv. L. Rev., *Commonwealth v. Eldred*, 132 HARV. L. REV. 2074 (May 2019) <https://harvardlawreview.org/2019/05/commonwealth-v-eldred/>; See also Deborah Becker, *Case Asks If It's Constitutional to Require Someone on Probation to Remain Drug-Free*, WBUR NEWS (Sept. 25, 2017) <https://www.wbur.org/news/2017/09/24/probation-drug-test-sjc>.

²⁰ *Commonwealth v. Eldred*, 101 N.E.3d 911 (Mass. 2018)

²¹ *Grand Challenges Research Grants Awarded – Phase 1*, UNIV. MINN.: DRIVING TOMORROW (2019), <https://strategic-planning.umn.edu/gc-research-grants-awarded>. See Sydney Diekmann, Christine Egan, Carly Rasmussen & Francis X. Shen, *The Failure of Youth Sports Concussion Laws and the Limits of Legislating Health Education*, 19 YALE J. HEALTH POL'Y L. & ETHICS 1 (2019); Carly Rasmussen, Sydney Diekmann, Christine Egan, Tyler Johnson & Francis X. Shen, *How Dangerous are Youth Sports for the Brain?: A Review of the Evidence*, 7 BERKELEY J. ENT. & SPORTS L. 67 (2018); Francis X. Shen, *Are Youth Sports Concussion Statutes Working?*, 56 DUQUESNE U. L. REV. 7 (2018).

have to do with free will. This has to do with how to keep kids safer. How do you balance risk and reward?

A lot of the cases I have shown you - and there are more of them than ever before, but they are still a small segment – do not involve any brain evidence. Which raises the question, is this a little tiny niche thing? I do not think so. I think one way to think about neuroscientific evidence is as instant replay.²² There are probably many sports fans in this audience, and you know that the vast majority of plays do not get any instant replay. So, for ninety to ninety-five percent, even in professional sports, there is no instant replay. But on certain plays we are familiar with referees using instant replay. Alright, when do we use instant replay? When the stakes are high. Was it a touchdown or not? When it is a close call. Like the foot is just on the line. Were they in-bounds or out-of-bounds? Where someone disagrees with the initial call on the field, and, crucially, where you actually have video evidence. There is hardly any instant replay in grade school or high school. It is not because you think the refs get it right all the time, it is because there just is not any video evidence. There was *no* instant replay up until the mid-twentieth century. Similarly, we did not have the opportunity to look at images or other types of brain data, and now we do.²³ I could imagine it being used again in a certain set of cases: high profile, high impact, borderline cases that are precedent.

It is not just brain data; it is biomarkers more generally. I will simply say that there is tremendous uncertainty about how the law is going to handle probabilistic data, probabilistic biomarkers of mental disease and disorder. Here is one example based on work that is being done at the University of Minnesota and internationally. What are the legal implications of early detection of elevated risk for autism spectrum disorder? Here is what my colleagues, Jed Elison and others, across campus do.²⁴ They take little six-month-old babies, and they scan their brains. They then can predict, with increasing accuracy, whether at age two those kids will be on the autism spectrum disorder. Why are they doing this? To identify opportunities for early and intensive intervention which the behavioral evidence has shown is

²² Francis X. Shen, *Neuroscientific Evidence as Instant Replay*, 3 J.L. & BIOSCIENCES 343 (2016).

²³ *See id.*

²⁴ *See The Elison Lab for Developmental Brain and Behavior Research*, INST. OF CHILD DEV., <https://innovation.umn.edu/elison-lab/> (last visited Feb. 27, 2021).

likely to have positive outcomes.²⁵ But it is raising legal implications. First of all, insurance coverage. Is insurance going to cover it? Is that a stigma then for later in life? Do you want insurance to know? Does the government have a responsibility to intervene earlier and earlier? Again, what about when it is just probabilistic? What does it mean to say my child has an eighty-two percent chance? That still does not mean that it is necessarily going to happen. Do you tell the parents? *What* do you tell the parents? These are questions that have never been confronted before because we have never been able to get this sort of data before. This is also part of law and neuroscience.

You might wonder if this brain evidence can persuade jurors. Those who know this field will know this case, but if you do not, let me mention it to you because it is quite instructive. The answer is yes, it can. We do not know how persuasive brain evidence can be, but at least in some cases it seems to make a difference. Grady Nelson is one.²⁶ He did a number of horrible things. He stabbed his wife over sixty times and killed her. He tried to kill his stepchildren – thankfully, they survived. He committed a litany of sex crimes and other violent crimes. It was clear he was guilty, and his defense attorney Terence Lenamon knew it. The only question at sentencing was whether he would receive the death penalty or life without the possibility of parole. This was a 2010 case out of South Florida. So, they showed this image, the image there in the lower right corner of the screen (Figure 2).

²⁵ News Release, Univ. Minn., U of M researchers assist in identifying autism biomarkers in infancy (Feb. 15, 2017), <https://twin-cities.umn.edu/news-events/u-m-researchers-assist-identifying-autism-biomarkers-infancy>.

²⁶ See Greg Miller, *Brain Exam May Have Swayed Jury in Sentencing Convicted Murderer*, SCIENCE (Dec. 14, 2020, 6:54 PM), <https://www.sciencemag.org/news/2010/12/brain-exam-may-have-swayed-jury-sentencing-convicted-murderer>.

Illustrative Case: Capital Sentencing

- Convicted of multiple crimes following his stabbing his wife 60 times, then slashing her throat; also sexually assaulting his step-children.
- Multiple prior convictions, including *raping a 7 year old girl*
- Prosecutors sought death penalty
- Wishes to introduce QEEG brain map data at sentencing
- His lawyer will argue that he has a “broken brain”

A “broken brain”?

Figure 2

Quantitative electroencephalography “brain mapping evidence.” I am on the record criticizing the use of this evidence in this particular case, but I want you to hear what the jurors said about this case.

The jury tied six to six, which means that Mr. Nelson did not go to death row. He went to life without the possibility of parole. Here, in their own words, is what jurors said.²⁷ Juror Dolores Cannon, a hospital secretary: “when [the brain evidence] came in, the facts about the QEEG, some of us changed our mind.” Juror John Howard, an airport fleet services worker: “[The QEEG evidence] turned my decision all the way around. The technology really swayed me . . . After seeing the brain scans, I was convinced this guy had some sort of brain problem.” Now, they did not all buy it. Juror Leon Benbow, a retired mailman: “All that [scientific] testimony, that was a waste of taxpayer money. That’s phony. There’s nothing wrong with that guy’s brain.”

I do not know if there is anything wrong with that guy’s brain. What I do know is that what was once theoretical is now practical lawyering. I know that the day after this decision came down, attorney Terry Lenamon put out a press release to his fellow attorneys announcing who his expert was and what results they had. Whether you like or dislike this use of neuroscience, it is showing up in courts.

²⁷ *Id.*

III. PULLING IT ALL TOGETHER

This is the main point: a lot in law hinges on how brains work.²⁸ So that is our context. Now, back to pulling this all together. Let me go back to the definition I offered at the beginning – neurolaw as the legal use and governance of neuroscientific tools, concepts, and data. You have now seen a variety – just a small snippet – of the legal use of neuroscience and governance for neuroscience tools, in concepts and in data. Here are, I think, three principles for moving forward.

First, I really like the idea of a broad definition. I would hope that our field includes everything that I just talked about and more. Second, I think we have to think about the role that neuroscience might play in law. So again, we have learned something from neuroscience, let us bring it to law. But also, law can shape neuroscience – the development of technologies, their use, and the nature and scope of research. Finally, I think we have to be patient – really patient – and expect a lot of variation along the way. When we talk about law and neuroscience it is a particular part of the scientific menu connected to a particular part of law and it is not going to develop evenly. So, we begin with the broad definition, which applies to so many areas of law. Work on elder law, work on pain, work on veterans' brains in the law, education law. There is a lot.

My second point is this, and I do want to say that this is a place where the law and neuroscience as a field is distinct from a lot of the other areas. It is the regulation of methods. This is a big deal. For instance, here in Minnesota we have a number of medical manufacturers, Medtronic, Boston Scientific, etc. When they hire attorneys, they are hiring them to work with the FDA, to work with government regulators to think about liability. Here is one that I work with colleagues on thinking about: the legal implications of portable brain scanners. We just had a big meeting this past week with this working group exploring the ethical, legal, and social implications of what happens when the scanner comes out of the lab and into your doctor's office or into the psychology building or into the corner of the school. These things are possible, and we need to think about them.

Finally, I think that we are heading in a really interesting and intriguing direction in this field of law and neuroscience. But at the same time, as bullish as I am about the future, I am reticent and hesitant about how

²⁸ Owen D. Jones & Francis X. Shen, *Law & Neuroscience: What, Why, and Where to Begin*, MACARTHUR FOUND. RES. NETWORK ON L. AND NEUROSCIENCE (2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2881613.

long it will take the law to really change. In part because we do not know how it should change. I will leave you with this thought. This comes from an essay called *The Path of the Law* by Oliver Wendell Holmes Jr. who, as some of you in bioethics would know, had some other questionable opinions. But on this point, in this book, I think he was right to point out that precedent is not good enough. We do not keep doing something just because we have been doing it a long time. "It is revolting to have no better reason for a rule of law than that so it was laid down in the time of Henry IV. It is still more revolting if the grounds upon which it was laid down have vanished long since . . ." ²⁹ That is really, I think, one of the ways in which neuroscience fundamentally will begin to reshape the way we think about law and the way we think about each other. Which assumptions in our daily life, in our social life, and in our legal life need to be examined? How might neuroscience and related fields help us to examine them? Then, slowly but surely, how might we harness this science to produce a more just and effective legal system? These are big questions, and I do not have the answers for any of them. But I think this field is heading that way and I think we ought to define it broadly so that we keep these many tendrils of conversation alive.

²⁹ Oliver Wendell Holmes, Jr., *The Path of the Law*, 10 HARV. L. REV. 457 (1897).