

# Keeping Up with Neurolaw: What to Know and Where to Look

Francis X. Shen

It is hard to know exactly what the future holds for law and neuroscience. But it is a fair bet that the future will look different, perhaps markedly so, than the neurolaw of today. How can one keep up with this change? In this brief essay, I provide a series of resources for those interested in expanding their knowledge of fundamental law and neuroscience issues, as well as keeping up to date on cutting-edge innovations.

A useful starting point for orienting to neurolaw is Bill Gates's observation on technological change, "People often overestimate what will happen in the next two years and underestimate what will happen in ten."<sup>1</sup> Gates suggests the importance of both a short-term and long-term view. In the short-term, it seems unlikely that legislators, advocates, or judges will produce a paradigm shift in law, or that any single neuroscience discovery will be game changing. In the long-term, however, the possibilities (as discussed by the many commentaries in this issue) are numerous and potent. The informed consumer and producer of neurolaw should be sensitive to both of these time horizons.

The practical reality of legal and judicial practice is that knowledge is typically and rightly driven by case-specific needs. The resources that follow provide general orientation, allowing navigation toward more specific information of great relevance for a specific case or query.

## PUBLISHED RESOURCES FOR THE REFERENCE SHELF

With a Law and Neuroscience Bibliography that now includes more than 1,000 entries, there is no lack of reading material in neurolaw. The bibliography is online, sortable, and searchable at [www.lawneuro.org/bibliography.php](http://www.lawneuro.org/bibliography.php). There are many specific topics covered in the bibliography, and general references include:

- OWEN D. JONES, JEFFREY D. SCHALL & FRANCIS X. SHEN, *LAW AND NEUROSCIENCE* (2014). This is the first coursebook in law and neuroscience, and it provides over 800 pages of hard copy in 21 chapters, with additional online materials and over 1,000 links. It is the single largest compendium of neurolaw materials. An overview, and sample chapter, are available online at <http://www.vanderbilt.edu/lawbrain>.
- Henry Greely & Anthony Wagner, Reference Guide on Neuroscience, in *FEDERAL JUDICIAL COLLEGE REFERENCE MANUAL ON SCIENTIFIC EVIDENCE* (3d ed. 2012).<sup>2</sup> This chapter by Greely and Wagner is an excellent, concise introduction to the field.
- A PRIMER ON CRIMINAL LAW AND NEUROSCIENCE (Stephen J. Morse & Adina L. Roskies eds., 2013). This edited volume

presents an all-star roster of scientists and legal thinkers on core issues in criminal law and cognitive neuroscience.

- Owen D. Jones, Joshua W. Buckholtz, Jeffrey D. Schall & René Marois, *Brain Imaging for Legal Thinkers: A Guide for the Perplexed*, 2009 *STAN. TECH. L. REV.* 5 (2009). This is a great introduction for the legal community to neuroimaging generally, and fMRI specifically.
- *OXFORD HANDBOOK OF NEUROETHICS* (Judy Illes & Barbara J. Sahakian eds., 2011). Neuroethics considers the ethical implications of neuroscience, including a number of issues germane to law and policy. This Handbook is a wonderful and comprehensive collection of contemporary neuroethics thought. You might also check out the journal *Neuroethics*, which often publishes work relevant to law.

**ONLINE RESOURCES.** The easiest way to keep up to date on neurolaw is to visit regularly or subscribe to updates from websites dedicated to law and neuroscience. These sites include the following:

- [www.lawneuro.org](http://www.lawneuro.org), hosted by *The MacArthur Foundation Research Network on Law and Neuroscience*, provides excellent introductory materials on neurolaw, links to conferences, a bibliography, and a blog with notable news from around the neurolaw universe. On the site you can subscribe to *Neurolaw News* at [lawneuro.org/listserv.php](http://lawneuro.org/listserv.php). *Neurolaw News* is a free service devoted to regularly circulating news of developments in scholarship, courts, and conferences in the field of neurolaw.
- [kolber.typepad.com](http://kolber.typepad.com) is the *Neuroethics & Law Blog*, maintained by law professor Adam Kolber. It features weekly dispatches from the Johns Hopkins Program in Ethics and Brain Sciences and guest bloggers on relevant neurolaw topics.
- [neuroethics.upenn.edu](http://neuroethics.upenn.edu), hosted by the University of Pennsylvania's Center for Neuroethics & Society, announces neurolaw events, highlights news of interest, and promotes awareness of neuroscience in society.
- [clbb.mgh.harvard.edu](http://clbb.mgh.harvard.edu), the home of the Massachusetts General Hospital Center for Law, Brain & Behavior, features news, events, and commentary on neuroscience and law.
- [www.ssrn.com/link/Law-Neuroscience.html](http://www.ssrn.com/link/Law-Neuroscience.html) links to the *Law and Neuroscience eJournal*, featuring recent neurolaw works uploaded to the Social Science Research Network (SSRN).
- [dana.org](http://dana.org) features the work of the Dana Foundation, which supports and disseminates research on the brain and the implications of brain research for society and law.

## Footnotes

1. BILL GATES, *THE ROAD AHEAD* 316 (1996).

2. Available online at [http://www.nap.edu/openbook.php?record\\_id=13163&page=747](http://www.nap.edu/openbook.php?record_id=13163&page=747).

**USER-FRIENDLY SCIENCE UPDATES.** Every week hundreds of research findings are published, posted, and circulated in neuroscience communities.<sup>3</sup> Most of these studies will not, and are not designed to, have direct bearing on law. But a few might. To keep an eye on what's happening, the following sites provide user-friendly summaries and critiques of notable studies:

- [www.sciencedaily.com/news/mind\\_brain/neuroscience/](http://www.sciencedaily.com/news/mind_brain/neuroscience/) ScienceDaily provides an excellent compendium of recent psychology and neuroscience research, each summarized in press-release-style posts.
- [blogs.discovermagazine.com/neuroskeptic/](http://blogs.discovermagazine.com/neuroskeptic/) Neuroskeptic is a useful resource for providing a critical eye on recent neuroscience research. The conversation in blog comments is often just as interesting as the posts themselves.
- [mindhacks.com/](http://mindhacks.com/) MindHacks describes itself as providing "Neuroscience and psychology tricks to find out what's going on inside your brain." It is consistently entertaining and often has legal relevance.

**LEARNING ABOUT THE BRAIN (IF LIFE IS BUSY).** A daunting task for wading into the neurolaw waters is the lack of scientific training that typically accompanies legal education. Where should the lawyer or jurist begin to catch up? The printed materials referenced earlier are all helpful, as the *Law and Neuroscience* coursebook includes a very user-friendly module on "The Fundamentals of Cognitive Neuroscience." It covers brain structures, brain function, and methods for studying (and imaging) the brain. In addition, the *Research Network on Law and Neuroscience* provides a variety of links to recommended neuroscience texts at <http://www.lawneuro.org/resources.php>.

Online, I suggest two additional resources. The first comes from the *Society for Neuroscience* (SfN, <http://www.sfn.org/>), which is the nation's hub for the neuroscience community. SfN produces the site [www.brainfacts.org](http://www.brainfacts.org), which is specifically designed for a general audience. On the *Brain Facts* site, you can catch up on brain basics, learn how to spot neuromyths, and read engaging stories about new research. Another fantastic resource is Neuroscientist Eric Chudler's *Neuroscience for Kids* site: <http://faculty.washington.edu/chudler/neurok.html>. Here's a tip: it's not just for kids. Dr. Chudler's award-winning site will answer many of those "I should really know the answer to this, but I don't . . ." questions. It is written in clear prose with useful illustrations.

**LEARNING ABOUT THE BRAIN (IF YOU HAVE MORE TIME).** While the above-mentioned websites may be more than enough for the time-constrained consumer of neurolaw, there are some additional options available if one has more

time to invest. Online, you can take advantage of the proliferation of free online courses and videos. For instance, through the Massachusetts Institute of Technology (MIT)'s OpenCourseWare project, you can take (via online lecture and accompanying reading materials) virtually all of the core offerings in their Brain and Cognitive Sciences catalog: <http://ocw.mit.edu/courses/brain-and-cognitive-sciences>.

If you prefer in-person instruction, be on the lookout for educational opportunities for the legal community. For instance, the Education and Outreach program (which I direct) of the MacArthur Foundation Research Network on Law and Neuroscience has developed a curriculum to introduce neuroscience in legally relevant ways to judges and lawyers. Videos and briefing materials from past programs are available in the Education and Outreach section of the Network's website ([www.lawneuro.org](http://www.lawneuro.org)), and you can be notified of future such programs by subscribing to the Network's email listserv (*Neurolaw News*, mentioned above). In addition to the Research Network, other sponsoring organizations have included the American Association for the Advancement of Science, the Gruter Institute for Law and Behavioral Research, the Federal Judicial Center, the National Judicial College, and the Advanced Science & Technology Adjudication Resource Center (ASTAR). Most of these programs run a day or two and provide an overview of key topics in neurolaw.

Finally, if you have ten days over the summer, you might consider applying to the University of Pennsylvania's Neuroscience Boot Camp. The Boot Camp is run by UPenn's Center for Neuroscience and Society and "is designed to give participants a basic foundation in cognitive and affective neuroscience and to equip them to be informed consumers of neuroscience research."<sup>4</sup> As a Boot Camp alumnus, I can report with firsthand knowledge that the program is exceptional.

**THE FUTURE OF NEUROLAW.** Writing about the history of artificial intelligence, Ray Kurzweil stated:

The technology "hype cycle" for a paradigm shift . . . typically starts with a period of unrealistic expectations based on a lack of understanding of all the enabling factors required. . . . While the widespread expectations for revolutionary change are accurate, they are incorrectly timed. When the prospects do not quickly pan out, a period of disillusionment sets in. Nevertheless exponential growth continues unabated and years later a more mature and realistic transformation does take place.

It may well be that law and neuroscience will enter a period, or perhaps we're already there, of disillusionment. For

3. Leading general scientific journals *Science* and *Nature* typically publish a couple of neuroscience papers each issue as well as frequent news and commentaries relevant to the law. Within the neuroscience community, journals of note that publish original research findings include *Journal of Neuroscience*, *Nature Neuroscience*, and *Neuron*. You can also gain more general knowledge

from highly qualified reviews published in the *Annual Review of Neuroscience*, *Current Opinion in Neurobiology*, *Nature Reviews Neuroscience*, *Trends in Cognitive Sciences*, and *Trends in Neuroscience*.

4. <http://neuroethics.upenn.edu/index.php/events/neuroscience-bootcamp>

instance, the *New York Times* ran an op-ed in 2012 called “Neuroscience: Under Attack”; a scholar recently wrote an article called “The Problem with Neurolaw”; and 2013 saw the publication of *Brainwashed: The Seductive Appeal of Mindless Neuroscience*. Critiques such as these can be helpful in that they remind us to be cautious. This is appropriate for the short term.

But we should be cautious with our caution. Today’s best medicine can’t tell us definitively if or when we’ll have cancer; today’s best meteorology can’t tell us when exactly we’ll have another hurricane; and today’s best paleontologists still can’t tell us exactly what *T. rex* was doing all day. But we don’t distrust the endeavors of these fields, and we are patient with their progress.

The same can be said for neuroscience generally, and for neuroscience and law in particular. Neuroscience can’t do a lot of things right now (for law or for medicine) that we’d like it to do. But there’s good reason to think that just as medical treatments for neurological and psychological disorders are improving, in the future neuroscience will excite, challenge, and frustrate the legal system in new ways.

If so, the legal system of tomorrow will rely on those visionary judges, lawyers, and citizens who have been keeping up with neurolaw.



*Francis X. Shen, J.D., Ph.D., is the Executive Director of Education and Outreach activities for the MacArthur Foundation Research Network on Law and Neuroscience, and a McKnight Land-Grant Professor and Associate Professor of Law at the University of Minnesota. Professor Shen conducts empirical and interdisciplinary research at the intersection of law and the brain sciences. He co-authored the first law coursebook on Law and Neuroscience (Aspen Publishers, 2014), and has explored the implications of cognitive neuroscience for criminal law, tort, and legislation in the United States. Professor Shen completed his B.A. at the University of Chicago in 2000, his J.D. at Harvard Law School in 2006, and his Ph.D. at Harvard University and the Kennedy School of Government in 2008. He thanks Owen Jones and Jeffrey Schall for helpful comments on this essay. Email: fxshen@umn.edu*