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SOME SPECULATION ABOUT MIRROR NEURONS AND COPYRIGHT

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ABSTRACT

Copyright plays a central role in regulating cultural transmission. Authors are given exclusive rights to copy, adapt, distribute, perform and display their works. These rights have limits, most notable fair use and the non-protection of ideas. In setting the bounds of those limits, courts implicitly follow some basic folk psychology. This paper would explore how neuroscience can be used to illuminate and challenge those background assumptions.

Copyright law implicitly assumes that literal copying is not necessary for cultural transmission. If there are many ways to express the same idea, then transmission of an idea will not be restricted by prohibiting copying of one way of expressing that idea. As the Supreme Court stated in Eldred v. Ashcroft, 537 US 186 (2003), fair use and freedom of expression provide less protection for the copying the work of others.

However, work with mirror neurons suggests that literal copying may be a necessary step in many kinds of cultural transmission. Rather than ideas being transmitted at an abstract level, much learning and communication may occur as basic imitation. It may be that, contrary to the assumptions of copyright law, abstract ideas are often not so easily separated from their concrete expression. That might have implications for copyright analysis. First, more latitude could be appropriate for some types of literal copying than fair use or the idea/expression dichotomy presently allow. Second, certain types of literal copying would qualify as "transformative" for purposes of fair use, although there is no actual change in the form of the relevant work.

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I. INTRODUCTION

The internet, a world-wide copy machine, caused some rethinking of copyright law. Cognitive science increasingly suggests that humans are smaller scale, more adaptable, copy machines. Copyright law may again change.[1]

II. MIRROR NEURONS

V.S. Ramachandran's *The Tell-Tale Brain*[2] explores the implications of the discovery of mirror neurons. It has long been known that when a monkey performs an action (pulls a lever, picks up the peanut, or pops the peanut in its mouth), specific circuits of sensory neurons in its brain fire.[3] In the 1990's, experiments showed that some of the same neurons fired when the monkey watched another monkey perform the action.[4] The neurons also fire when the monkey watches a human perform the action, but not when watching similar motion of an inanimate object, such as a stick moving.[5] That suggests that the neurons are responding to an intentional act by another. Such mirror neurons "enable the predictions of simple goal-directed actions of other monkeys."[6] By simulating what the other animal is doing, the monkey can predict what it is going to do. Detecting what the other monkeys are going to do would

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[1] OWEN D. JONES, JEFFREY D. SCHALL & FRANCIS X. SHEN, LAW AND NEUROSCIENCE (2014) (first law school casebook on the subject); The MacArthur Research Network on Law and Neuroscience, *Law and Neuroscience Bibliography*, VANDERBILT UNIVERSITY, http://www.lawneuro.org/bibliography.php (last visited Feb. 13, 2015); Adam J. Kolber, *Will There Be a Neurolaw Revolution?*, 89 IND. L.J. 807 (2014) (discussing implications of neuroscience for law). Because little is known yet of the link between abstract thinking and any particular brain region, the discipline is young. But possibilities exist, even in areas where there have hitherto been conspicuous inability to link legally relevant actions and neurobiological activity, such as lie-detection. *See* Joshua D. Greene & Joseph M. Paxton, *Patterns of Neural Activity Associated with Honest and Dishonest Moral Decisions*, 106 PROC. NAT'L ACAD. SCI. 12506-12511 (2009) *available at* http://www.wjh.harvard.edu/~jgreene/GreeneWJH/Greene-Paxton-Honesty-Dishonesty-PNAS09.pdf (paper showing possible correlation between brain scans and some dishonest moral decisions).

[2] V. S. RAMACHANDRAN, THE TELL-TALE BRAIN: A NEUROSCIENTIST'S QUEST FOR WHAT MAKES US HUMAN (2011) [hereinafter The Tell-Tale Brain] (the book explores a number of other topics in neuroscience, under the general question of how humans differ cognitively from other animals); *but cf.* Timothy P. O'Neill, *Mirror Neurons, the New Neuroscience, and the Law: Some Preliminary Observations*, 39 SW. L. REV. 499 (2010) (discussing role that mirror neurons could play in decision-making of judges and juries).

[3] Ramachandran, *supra* note 2, at 120-21.

[4] *Id*.

[5] *Id*. 121.

[6] *Id.*

be of great use to social animals like monkeys – and even more humans, the most social of animals.[7]

Ramachandran puts forth several indirect sorts of evidence for the existence of mirror neurons in humans. Individuals with paralysis due to a stroke sometimes deny, despite all evidence, that they lack the ability to move their arms.[8] Sometimes such individuals, on observing another paralyzed person, will likewise deny that that the other person is paralyzed. A simple explanation for this phenomenon is that the relevant mirror neurons have been damaged. Without the ability to mirror the other's actions in their own brain, the stroke victim is unable to conclude that the other person lacks the ability to move.[9]

An individual with an amputated limb provided another indirect evidence of mirror neurons in humans. [10] After a hand has been amputated, a person often experiences a "phantom limb." The hand is gone, but the neurons in the brain that sense and control the hand are still active. If the person's face is touched, the person may report feeling stimulation of the phantom hand. The sectors of the brain that control the hands and the face are next to each other.[11] Signals from the nerves in the face to the corresponding sector of the brain likely spill over to the neighboring neurons that correspond to the hand.[12] When such a person sees another person's face being touched, she may report feeling it in her phantom hand. That suggests that there are likewise mirror neurons that correspond to the hand.[13]

EEG readings have disclosed another type of evidence for mirror neurons. [14] Mu waves are suppressed when individuals perform manual tasks. The same waves are suppressed when someone watches another person performing a similar task. That likewise suggests that a network of neurons is mirroring the other person's actions.[15] Mirror neurons can be directly observed in monkey brains. Humans' brains are not opened for experiments and observation, but neurologists have taken advantage of the opportunities provided by surgery.[16] Sensory pain neurons in the brain have been observed to fire when the patient received a painful poke. The same neurons fired when the patient saw another patient receiving a similar poke.[17]

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[7] *Id.* For an example of skepticism about the mirror neuron hypothesis *see* Alison Gopnik, *Cells that Read Minds? What the Myth of Mirror Neurons Gets Wrong About the Human Brain*, Slate (Apr. 26, 2007, 6:19 PM), http://www.slate.com/id/2165123/. Present abilities to image the brain have far to go to be able to definitively answer such questions. *But cf.* Geoffrey K. Aguirre, *Functional Neuroimaging: Technical, Logical, and Social Perspectives,* 45 HASTINGS CTR. REP. S8, S8 (2014) ("I will consider in particular the preeminent method of functional neuroimaging: BOLD fMRI. While there are several practical limits on the biological information that current technologies can measure, these limits—as important as they are—are minor in comparison to the fundamental logical restraints on the conclusions that can be drawn from brain imaging studies.").

[8] Ramachandran, *supra* note 2, at 123. This condition, anosognosia, occurs in some patients with right-hemisphere stroke, very likely including President Woodrow Wilson. *Id.*

[9] *Id.*

[10] Ramachandran, *supra* note 2, at 125-27. .

[11] *Id.*

[12] *Id.*

[13] *Id.*

[14] *Id.* at 123-24.

[15] *Id.*

[16] Ramachandran, *supra* note 2, at 124.

[17] *Id.*

Such simple mirror neuron circuits permit assessment of the immediate intentions of others. Ramachandran suggests that more complex mirror neuron circuits lay under much of what differentiates humans from other animals.[18] Humans far surpass other animals in the ability to imitate. Mirror neurons "enable you to imitate the movements of others, thereby setting the stage for the cultural 'inheritance' of skills developed and honed by others."[19] Language, that most human of abilities, could likewise rest on the "ability to read someone's intentions and the ability to mimic their vocalizations."[20] By adding a layer of mirroring, mirror neurons could underlie consciousness. Mirror neurons allow us, in effect, to see things from another person's point of view ("He's reaching for the peanut."). Part of the other person's point of view is their observation of us ("He's watching me reach for the peanut."). Our awareness of ourselves may have sprung from the awareness of what others are up to. That same embedding through mirroring could account for the recursive nature of language. Humans, unlike any animal, use language with recursive nesting of clauses.[21]

III. COPYING AND COGNITION

Ramachandran suggests that the simple imitative nature of neurons could play a key role in complex cognition. Ramachandran sketches a hypothesis that deficiencies in the mirror neuron circuits could cause the symptoms of autism. He emphasizes the tentative nature of that hypothesis, given that the role that mirror neurons play is itself as yet hypothetical. Autism is characterized by "mental aloneness and a lack of contact with the world, particularly the social world, as well as a profound inability to engage in normal conversation."[22] As some have put it, autism is associated with a diminished "theory of mind.[23] Autism affect the capacities to "project intentions, perceptions, and beliefs into the mind of others."[24] Exactly the faculties that may depend on the imitative nature of mirror neurons "empathy, intention-reading, mimicry, pretend play, and language learning" are dysfunctional in autism.[25] The sensorimotor symptoms of autism are consistent with the idea that autism is associated with some deficiency in the mirror neuron circuits. Some empirical findings have yielded results consistent with this hypothesis. Mu waves in autistic subjects were suppressed when they performed voluntary actions, but - unlike nonautistic subjects - not when they observed others perform the same actions.[26] Likewise, autistic subjects (unlike other subjects) did not register an increase in their muscles when watching others perform tasks like squeezing a tennis ball.[27] Autistic children have

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[18] *Id.*

[19] *Id*, at 121.

[20] *Id.*

[21] *See e.g.* Steven Pinker, The Stuff of Thought: Language as a Window into Human Nature 106 (Penguin Books2007). The best definition of recursion: "Recursion: If you still don't get it, *see* 'Recursion'." *Id.*

[22] Ramachandran, *supra* note 2, at 137.

[23] *Id.*

[24] *Id.*

[25] *Id.*

[26] *Id*, at 143.

[27] Ramachandran, *supra* note 2, at 142.

"difficulty with miming and imitating other people's actions."[28] So the complex and varied symptoms of autism could possibly trace back to the mirror neuron mechanism, as the varied symptoms of diabetes trace back to the human body's use of insulin.[29]

Mirror neurons, then, might play a role in areas where humans are qualitatively different than other animals, such as in imitation, in discerning the intentions of others, and empathy. Far too little, however, is concretely known to rest on policy choices on them. Or, as Ramachandran puts it, we "must be careful not to attribute all puzzling aspects about the brain to mirror neurons. They don't do everything!"[30] But as we learn more about how the brain works (if little, as yet), it is worth testing the many assumptions about thinking that the law rests on. Some have already shown that the various mental states that criminal law supposes may not match well to what psychology has learned in the past few decades.[31] At the least, cognitive science can help reexamine the assumptions that law makes about human thinking.[32]

IV. IMPLICATIONS FOR COPYRIGHT LAW

So what hath all this to do with copyright? It's not news that people copy. But mirror neurons and their implications could require us to rethink how we think about copying. If cognition and culture depend so squarely on the bottom-up imitation by mirror neurons, perhaps some of the central tenets of copyright bear reexamining.

Copyright depends on distinguishing between copying at an abstract level (copying "ideas") and copying at a more literal level (copying "expression").[33] Ideas are not protected from copying – not because they are not worth protecting but because they are too important to be protected by copyright. In order to allow the free flow of ideas, copying ideas from a work is not copyright infringement. By contrast, copying expression is infringement, except for such exceptions as fair use. Mere expression of an idea is deemed to be less valuable, and so paradoxically gains legal protection. It is thought there are many ways to express an idea, so there is no harm in preventing others from copying one particular expression of that idea. This approach is exemplified by the "abstractions" test of Learned Hand.[34] But transmission of ideas may not be so handily separated from transmission of expression. Cognition increasingly appears to be "embodied," tied to the physical structures and processes of the brain, such as perception and memory.[35] If literal copying plays an important role in cultural transmission, then transmission of ideas may be much less effective if disembodied from their expression. So the "idea/expression dichotomy" may prove not to be a robust concept. Put another way, the merger doctrine, which states that

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[28] *Id*, at 137.
[29] *Id*, at 140.
[30] *Id*, at 145.
[31] *See* Francis X. Shen, et. Al., *Sorting Guilty Minds*, 86 N.Y.U. L. REV. 1306 (2011).
[32] *But cf.* Michael Pardo & Dennis Patterson, *Minds, Brains, and Norms*, NEUROETHICS 21-23 (2010), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1432476&download=yes.
[33] *See* generally 17 U.S.C. §102.
[34] Atari Games Corp. v. Nintendo of Am., Inc., 975 F.2d 832, 839 (Fed. Cir. 1992).
[35] Ramachandran, *supra* note 2, at 145.

expression is only protected if separable from ideas, could have considerably broader application.[36]

The central theory of copyright is to give authors exclusive rights in their works, as an incentive to create those works. The U.S. Constitution authorizes Congress "To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."[37] But copyright has grown in every dimension since the time of the first US copyright statute. Instead of just giving exclusive rights in books, maps, and charts for 14 years, copyright now gives the author of any creative work exclusive rights for the rest of her life, and her heirs for another seventy years. Copyright has long outgrown its incentive rationale. In addition, not all of the value of a work can be attributed to its author. Recent intellectual property scholarship has emphasized the value that users add to copyrighted works.[38]

Mirror neurons suggest another aspect of the value of works that springs from their use, not simply the creativity of the author. People, it seems, learn by copying and imitating. They need something to copy and imitate. The characteristics of the particular work are likely, in many cases, to be less important than whether the work is available, and, given humans' intense sociality, whether others are using the same work. In short, a copyrighted work may often play its most important role in simply being a focal point, something coordinates the learning and sociality of groups.[39]

If copying is so basic to cognition, copyright's values could require adjusting. Copyright serves authors by limiting copying. A trade-off has long been recognized, between granting rights to authors and limiting the ability of others to use works without permission. We take that trade-off seriously when it pits authors against authors. Authors must build on the work of previous authors. Some genres, such as parody, depend on quite specific copying and fair use gives them special protection.[40] Software developers may need to copy in order to reverse engineer the unprotected aspects of copyrighted software, and fair use recognizes that as well.

But where the balance involves authors against mere "users" of works – literal copiers – the thumb is often on the scale in assessing that trade-off. Rather than really trying to balance one against the other, copyright often implicitly assumes that in the case of doubt, it is better to err on the side of authors than mere consumers. Even the broadest outlines of copyright reflect the bias toward overprotection.[41] Copyright lasts decades longer than necessary to provide an incentive to create works or to protect other interests of authors. Copyright applies across the board to all creative works, irrespective of how. In fair use, a merely reproductive use is at the bottom of the scale.

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[36] Michael D. Murray, *Copyright, Originality, and the End of the Scènes à Faire and Merger Doctrines for Visual Works*, 58 BAYLOR L. REV. 779, 784 (2006).

[37] U.S. Const. art. I, § 8, cl. 8.

[38] Cf. Katherine Strandburg, *User Innovator Community Norms at the Boundary Between Academic and Industrial Research*, 77 FORDHAM L. REV. 2237, 2242 (2009).

[39] On the role of coordination, *see* Gillian Hadfield and Barry R. Weingast, *What is Law? A Coordination Model of the Characteristics of Legal Order*, Stanford Law and Economics Olin Working Paper No. 404 (November 1, 2010). *Cf.* Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CALIF. L. REV. 479 (1998).

[40] Harper & Row Publishers, Inc. v. Nation Enterprises, 471 U.S. 539, 549 (1985).

[41] Elizabeth Williams, *Copyright Law's over-Protection of Cyber Content: Digital Rights Management*, 12 INTELL. PROP. L. BULL. 199, 202 (2008).

The Supreme Court has even given a constitutional dimension to the low status of mere copiers. *Eldred v. Ashcroft*[42] considered whether there was any First Amendment issue raised, where Congress retroactively added twenty years to the term of copyright. The Court held that there was not, because mere copiers had little expressive interest at stake: "The First Amendment securely protects the freedom to make--or decline to make--one's own speech; it bears less heavily when speakers assert the right to make other people's speeches."[43] The Court held that copyright law provided sufficient protection for expressive interests through two doctrines: the idea/expression dichotomy and fair use.[44] Those doctrines provide protection for abstract copying. The idea/expression dichotomy allows for free copying only of abstract ideas in a work, but leaves its literal expression protected from copying.[45] Fair use likewise provides little protection for literal copying. Literal copying may be fair use if the copyright holder complains of a noncommercial use that has not been shown to have any effect on the market for the copyrighted work.[46] But if there is even the potential of harm – market harm or otherwise – shown to the copyright holder, then literal copying is likely not to be fair use.[47] But if literal copying, as mirror neuron theory tentatively suggests, is basic to cultural transmission, then copyright law will have to give more weight to what is now pejoratively called mere copying.

The existing policy is that ideas should be spread freely, but there is little harm in prohibiting copying of one particular expression of an idea. Other parties are free to copy the idea from the work, simply by expressing it in a different way – and any idea may be expressed in many ways. But this may rely on a false premise. If people learn and communicate in the bottom-up fashion suggested by mirror neurons, it may not be so easy to separate an idea from the expression of the idea. In a similar vein, taking a specific issue, the question whether sampling is fair use could look different if more weight were given to literal copying. Courts have held that sampling – using short, literal copies of song snippets in new recordings – is not fair use.[48] Use of such "verbatim copying" weighs heavily against fair use, as opposed to copying that transforms the first work by adding creative elements.[49] But such verbatim copying may be much more worthwhile, if mere copying has the importance that Ramachandran suggests. So, for example, there would be another argument for legal

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[42] Eldred v. Ashcroft, 537 U.S. 186 (2003).

[43] *Id.* at 221. Relying on *Eldred,* the Tenth Circuit has held that the interests of users had effectively no weight against the interests of authors (in deciding whether Congress could restore copyright to authors whose works had gone into the public domain). *See* Golan v. Holder, 609 F.3d 1076 (10th Cir. 2010) (holding that the restoration statute "advances an important or substantial governmental interest unrelated to the suppression of free expression"). The Supreme Court, however, has granted cert. in the case. *See* Golan v. Holder, No. 10-545, cert. granted (March 7, 2011). So perhaps the Court will give some weight to users' interests.

[44] *Id.* at 219.

[45] *Id.*

[46] Barton Beebe, *An Empirical Study of U.S. Copyright Fair Use Opinions*, 156 U. PA. L. 549, 599 (2008).

[47] *Id.*

[48] *See Bridgeport Music, Inc. v. UMG Recordings, Inc*., 585 F.3d 267, 277-79 (6th Cir. 2009).

[49] Bridgeport Music, 585 F.3d at 278.

protection for personal, noncommercial uses, as important as they may be for learning, cultural transmission, and self-expression.[50]

The foregoing all suggest caution in extending copyright protection. But considering the cognitive value of literal copying could also support increased copyright protection, in some respects. For a work to be copyrighted, it must reflect some creativity. Some courts have denied copyright protection where the added creative elements were deemed insufficient. Courts have also denied copyright protection to "slavish copying."[51] But the possible role of mirror neurons supports a view of creativity that often depends on close copying. Cultural transmission and adaptation may occur through copying works and then making very small tweaks to them. So very minor differences may constitute creativity – and even pure copying may be creative, where it involves changing the function of what is copied. So respect for low-level copying can cut both ways – permitting some-low level copying as fair use, but also allowing for some protection of new works that involve low-level copying.

V. CONCLUSION

The foregoing builds speculation on speculation. It remains to be seen whether mirror neurons underlie imitation, and whether that builds into language and cultural transmission. But copyright law may awaken from its dogmatic slumbers and to take more seriously the question of how our minds work. The law has been able to rely on various fictitious characters – the reasonable person, the person having ordinary skill in the art, in patent law, the premeditating criminal, not to mention characters like the rational maximizer borrowed from economics. Cognitive science – one hopes – is beginning to learn how people actually think and act – the very subject matter of law. Lawyers should activate their mirror neurons accordingly.

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[50] Jessica Litman**,** *Frontiers of Intellectual Property Lawful Personal Use*, 85 TEX. L. REV. 1871 (2007).

[51] Novelty Textile Mills, Inc. v. Joan Fabrics Corp., 558 F.2d 1090, 1093 (2d Cir. 1977).