# WILL BRAIN SCIENCE UNDERSTAND AND MODIFY MORALITY? A NEUROPRAGMATIC AND NEURO-ECOLOGICAL APPROACH TO NEUROETHICS

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ABSTRACT: We elaborate a pragmatic and contextualized outlook for comprehending the tasks and methods of the new interdisciplinary field of neuroethics. Within that outlook, we specifically highlight crucial features to the current understanding of brain processes responsible for moral cognition and moral judgment. Neuroethics will also foster speculations about the wider implications of revolutionary paradigms and novel technosciences able to affect and modify moral cognition. We recommend that neuroethics should stay pragmatically integrated so that better-informed approaches, utilizing all relevant interdisciplinary input, can consider what could possibly count as genuinely "moral" enhancements. Neuroethical deliberation should rise above local conventionality and a single social ethos, to instead survey the dynamic scope of human cognitive capacities, and the rich cultural diversity of human self-understandings. In its appreciation for the human as a bio-psychosocial organism, neuroethics engenders an interdisciplinary approach (conjoining anthropology, sociology, economics, and political science) to depict and address ethical issues within the contexts in which human activities are conducted. Neuroethics as a discipline – and in its methods, approaches, and practices – should embody and enable greater human self-understanding, and improve public deliberations over the many dimensions of life that we treasure.

The term "neuroethics" was first coined to point to ethical issues arising in clinical neurology and research in the brain sciences. Subsequently, the discipline and practices of neuroethics have developed a broader purview. According to neuroscientist and philosopher Adina Roskies, in its two foci, or so-called "traditions," the field addresses both the "neuroscience of ethics" and the "ethics of neuroscience."[1] The first focus points to expanding attempts to engage neuroscientific tools and techniques to explain how people can be ethical: how and why individuals process information relevant to morality and form their own moral judgments in response. The second focus points to urgent concerns about whether neuroscientific research and technoscience can be ethical: whether the research programs and applications of neuroscience can satisfy ethical values and principles.[2] In this article we advocate the position that views taken on the "neuroscience of ethics" must also look at matters through the lens of neuroethics' second focus, "the ethics of neuroscience," and in so doing, be scrutinized for the validity, viability and ultimate meaning and value of any and all approaches used. In light of this, we judge that the task of developing a "neuroscience of ethics" was originally given a simplistic description and unclear assignment.

We posit that neuroscientific inquiries into morality are better described as studies of those brain structures and functions that are involved in the ways that moral thoughts (including emotions) are processed and engaged in various actions in environmental circumstances. We would not deny or refute the importance of this approach; there is utility and appeal to a pragmatically neuroscientific understanding of moral cognition. But we go further in our assertion that because moral cognition itself plays only a coordinating and not a commanding role over human conduct, any attempt to study the coordination of conduct for managing social contexts calls for an ecological understanding of morality's proper role in human lives.

We regard this broader viewpoint upon neuroscience's investigations into morality both as an application of "neuro-pragmatism," and also as a paradigmatic example of "neuro-ecology." Although such terms throw more neologisms into the fray, we find that they accurately describe how neuroscientific inquiries should be conducted and what neuroscience is revealing about the nature of moral cognition and actions.[3] After

[1] Adina Roskies. "Neuroethics for the new millennium," *Neuron* 35 (2002): 21-23. Also consult N. B. Kohls and Roland Benedikter, "The origins of the modern concept of 'neuroscience'," in *Scientific and Philosophical Perspectives in Neuroethics*, ed. James Giordano and Bert Gordijn (Cambridge, UK: Cambridge University Press, 2010), pp. 37–65.

[2] See Judy Illes, and Stephanie Bird, "Neuroethics: A modern context for ethics in neuroscience," *Trends in Neuroscience* 29 (2006): 511–517.

[3] On pragmatic approaches, see the following works: James Giordano, "Neuroethics: Traditions, Tasks and Values," *The Human Prospect* 1.1 (2011): 2–8; John R.

setting out the current state of research in the neuroscience of moral cognition, we transition to a discussion of the realistic possibilities for manipulating the neurological processes putatively responsible for moral thought and behavior. Could the manipulation of neural mechanisms of moral judgment give rise to a new technoscience of and for morality? The standpoints of neuropragmatism and neuro-ecology afford severe reservations that deflate optimistic hopes for improving people's morality using novel technosciences. Neither the neuroscientific study of human morality nor the role of morality within society could support or encourage such hopes.

**(Attempts at) Mapping the "Moral Brain"**

Studies have employed a variety of neurotechnologically-based assessments in attempts to depict what brain structures and functions are involved in particular types of moral and ethical thoughts and behaviors.[4] Such neurotechnologies currently used include the following:

> Quantitative electroencephalography (qEEG) and/or magnetoencephalography (MEG) - to evaluate electrical and magneto-electrical activity in cortical layers and pathways.
>
> Functional magnetic resonance imaging (fMRI) - to obtain proxy depiction of active regions/sites in brain through determinations of blood oxygen level demand (BOLD) signals evoked by differential engagement of neural tissues.
>
> Diffusion tensor and kurtotic imaging (DTI/DKI) - to depict white matter tracts and directional network activity through magnetic detection of anisotropic signals of water molecules within the axonal processes of neurons.

Current evidence reveals that a number of brain structures can be involved in what are construed to be moral decisions.[5] These structures include:

> Hippocampus: Involved in memory functions, and in relating memory to understanding the emotions of others.
>
> Parts of the amygdala: Engaged in the regulation of emotional arousal.
>
> Ventromedial/ dorsolateral prefrontal cortex (vmPFC and DLPFC): Subserve discriminations of the emotional salience of various environmental stimuli and interpreting behaviors and emotional states of others.
>
> Posterior cingulate cortex (PCC) and precuneus: Involved in the interpretation of bodily sensations, what has been termed "self-referential cognition.
>
> Temporo-parietal junction (TPJ): Functions as a key network component of regulating social emotions and behaviors.

Shook and Tibor Solymosi, "Neuropragmatism: A Neurophilosophical Manifesto," *European Journal of Pragmatism and American Philosophy* 5 (2013): 212–233; and John R. Shook and Tibor Solymosi, eds., *Pragmatist Neurophilosophy: American Philosophy and the Brain* (London: Bloomsbury, 2014). Relating to neuro-ecology, consult: James Giordano and Roland Benedikter, "An Early - and Necessary - Flight of the Owl of Minerva: Neuroscience, Neurotechnology, Human Socio-cultural Boundaries, and the Importance of Neuroethics," *Journal of Evolution and Technology* 22.1 (2012): 14–25; and James Giordano, Roland Benedikter, and N. B. Kohls, "Neuroscience and the Importance of a Neurobioethics: A Reflection upon Fritz Jahr," in *Fritz Jahr and the Foundations of Integrative Bioethics*, ed. A. Muzur and H.-M. Sass (Münster and Berlin: LIT Verlag, 2012), pp. 267–280.

[4] Matt Carter and Jennifer C. Shieh, *Guide to Research Techniques in Neuroscience*, 2nd edition (New York: Academic Press, 2015).

[5] J. S. Borg, C. Hynes, J. Van Horn, S. Grafton, and W. Sinnott-Armstrong, "Consequences, action and interaction as factors in moral Judgments: An fMRI investigation," *Journal of Cognitive Neuroscience* 18 (2006): 803–817. Liane Young, Marc Hauser, et al., "Disruption of the right temporoparietal junction with transcranial magnetic stimulation reduces the role of beliefs in moral judgments," *Proceedings of the National Academy of Sciences* 107.15 (2010): 6753–6758. F. A. Cushman, L. Young, and J. Greene, "Multi-system moral psychology," in *The Oxford Handbook of Moral Psychology*, ed. J. Doris et al. (Oxford: Oxford University Press, 2010), pp. 46–69. G. Berns et al., "The price of your soul: neural evidence for non-utilitarian representation of sacred values," *Philosophical Transactions of the Royal Society–Biology* 367 (2012): 754–762.

However, what is becoming clear is that moral cognition, and decision-making about moral matters do not seem to be much different from any other kind of higher-level cognition, at least on a neurological level.[6] Like other forms of judgments and actions, moral decisions and behaviors involve memories, relating to others, reinforcements, anticipation of and response to reward and punishment, and emotions of pleasure, discomfort, and pain.

Indeed, the aforementioned neuroanatomical areas are only some prominent sites within the networked activity of the brain, which is engaged in many kinds of cognitive and behavioral processes in addition to those involved with morality. As far as cognitive neuroscience can reveal, the idea of a "moral center" somewhere in the brain is simply untrue. There is no "*nucleus moralis*," a dedicated "moral pathway," or even a specific "moral network" anywhere in the brain. So, at most, researchers can investigate and define diverse and diffuse arrays of neural systems, functioning in yoked and/or parallel ways, which contribute to moral performances. Current evidence demonstrates that those brain areas are not uniformly activated when engaging in morally-relevant thoughts, or deciding upon moral judgments and actions.[7]

Still, there are mechanisms and processes that are common to all. Every decision and action – whether considered to be moral or otherwise – involves a perception of the circumstances and actors involved, some orientation to a prior event that was similar or referential to the present situation, recall of actions (of one's self and others) – and their consequences, and recollection of the emotions that the actions and outcomes evoked. These functions are developed as a result of interactions and experiences throughout the life span.[8]

**Morality in Context**

While humans are not "born moral," we do appear to possess a degree of sensitivity and capability to respond to interpersonal cues, and to learn from others and the social environment. Infants and small children speedily establish a proto-moral psychological foundation, and acquire a sense of "good," "bad" "right," and "wrong" from an increasing circle of others (including family, friends, strangers, and the not-so-friendly). That proto-moral sense expands during childhood through more complex interactions with social environs; the communities in which we live, the formal and informal institutions encountered, and the local mores and norms that we learn to respect and emulate.

Functional patterns of brain activity involved in moral-type thoughts, and resulting decisions and behaviors, appear to differ based on a number of individual factors from one's age and gender to inter-personal perspective and social status.[9] Although

[6] K. Wunderlich, A. Rangel, and J. O'Doherty, "Neural computations underlying action-based decision making in the human brain," *Proceedings of the National Academy of Sciences* 106 (2009): 17199–17204. J. Verplaetse, V. DeSchrijver, and J. Braeckman, eds., *The Moral Brain: Essays on the Evolutionary and Neuroscientific Aspects of Morality* (New York: Springer; 2009). J. Greene, "The cognitive neuroscience of moral judgment and decision-making," in *The Moral Brain: A Multidisciplinary Perspective*, ed. J. Decety and T. Wheatley (Cambridge, MA: MIT Press, 2015), pp. 197–220.

[7] K. Wunderlich, A. Rangel, and J. O'Doherty, "Neural computations underlying action-based decision making in the human brain," *Proceedings of the National Academy of Sciences* 106 (2009): 17199–17204. J. Verplaetse, V. DeSchrijver, and J. Braeckman, eds., *The Moral Brain: Essays on the Evolutionary and Neuroscientific Aspects of Morality* (New York: Springer; 2009). J. Greene, "The cognitive neuroscience of moral judgment and decision-making," in *The Moral Brain: A Multidisciplinary Perspective*, ed. J. Decety and T. Wheatley (Cambridge, MA: MIT Press, 2015), pp. 197–220.

[8] V. Dubljević and E. Racine, "The ADC of moral judgment: Opening the black box of moral intuitions with heuristics about agents, deeds, and consequences," *AJOB Neuroscience* 5.4 (2014): 3–20. M. Avram and J. Giordano, "Neuroethics: Some things old, some things new, some things borrowed...and to do," *AJOB-Neuroscience* 5.4 (2014): 1–3.

[9] S. Blakemore, "The social brain in adolescence," *Nature Reviews Neuroscience* 9 (2008): 267–277. M. Fumagalli

"preferred" or learned cognitive patterns and beliefs are used in developing intuitions, rationalizations, and judgments, it appears that each of us actually employs a range of cognitive reasoning functions and abilities when faced with a problem or decision that we hold to be "moral" in its value and effect. In short, moral cognition involves reasoning and justification processes that are more of an admixture of ethical precepts.

To summarize thus far, current behavioral psychology and cognitive neuroscience have provided crucial insights into brain structures and functions that appear to be involved in moral decisions and actions. Each person's brain uses multiple ways to judge moral matters. Any brain capable of moral judgment is already able to make different, and sometimes contradictory, moral judgments, depending on other information that is available at the time.[10] In short, context matters, and any attempt at a neuro-cognitive science of ethics must therefore be concerned both with what is occurring within a brain and what is happening around a person. We can disagree among each other about morality because each brain can generate contradictory cognitions. That is why we all have experienced conflicting moral intuitions, hesitant moral judgments, and tough moral puzzles. Our brains do their best with the information available, and often such information won't be sufficient to dictate one obvious answer. Thus, any exploration into the possibilities for moral enhancement must be deeply grounded in the cognitive limitations inherent to all neurological processes.

This standpoint upon the discoveries of the "neuroscience of ethics" takes a philosophical stance labeled as "neuropragmatism." Among the core views of neuropragmatism, two theses state what serves as a basic approach to moral cognition:

> Complex cognitive processes engage and reflect neural mechanisms that function to effectively coordinate behaviors necessary for reliably achieving variable goals in changing environments.
>
> Human cognition is so deeply embedded in, affected by and oriented to many cultural features for facilitating cooperative aims that it should primarily be studied and evaluated largely in terms of its service for social goals.

A further thesis about sophisticated social cognition applies most directly to moral cognition:

> The most sophisticated modes of human cognition are developments and assemblages of lower-level cognitive processes. These complex modes of thought, seemingly far from mere matter or biology, remain embodied and functional for practical success. Higher self-conscious cognitive processes (reflection, inference, hypothesis testing) are socially invented and taught capacities to attentively focus on ways to generalize practical habits for flexible use. These higher social capacities serve to coordinate group cooperative practices where some creativity is needed to maintain efficiency in the face of unstable conditions.[11]

Hence, we opine that it is crucial to recognize how all specific types of moral cognition are varieties of broader categories of systemic cognitive processes that allow humans to be responsible and reliable members of societies. Morality, like everything human, did evolve, but the emerging hominid brain didn't simply grow new areas to accomplish moral thinking. Neural systems that evolved for other cognitive and behavioral tasks became linked and selectively recruited to work together for

et al., "Gender-related differences in moral judgments," *Cognitive Processes* 11.3 (2010): 219–226. E. C. Finger et al., "Caught in the act: The impact of audience on the neural response to morally and socially inappropriate behaviors," Neuroimage 33.1 (2006): 414–421. M. Avram, J. Giordano, et al., "Neural correlates of moral judgments in first- and third-person perspectives: implications for neuroethics and beyond," *BMC Neuroscience* 15 (2014): article 39.

[10] W. Sinnott-Armstrong and T. Wheatley, "Are moral judgments unified?" *Philosophical Psychology* 27 (2014): 451–474.

[11] John R. Shook and Tibor Solymosi, "Neuropragmatism and the Reconstruction of Scientific and Humanistic Worldviews," in *Neuroscience, Neurophilosophy, and Pragmatism: Understanding Brains at Work in the World*, ed. John R. Shook and Tibor Solymosi (London: Palgrave Macmillan, 2014), pp. 3–35, at 7 and 11.

responsibly acting in what human societies defined to be moral ways.

**Adjusting Morality in the Brain**

The heavily systemic nature to the ways that the brain processes moral thoughts and behaviors in those dynamic contexts poses a number of implications for any attempts to alter moral cognition and actions. While systemic, those processes are by no means structurally rigid. Flexibility is also a pervasive feature of the brain. There has been a growing theoretical view – coinciding with our own pragmatic approach – that neural functions operate as 'systems embodied and embedded within systems'. The isolation of neural systems from their dynamic interactions and effects only reduces their explanatory power when research seeks to account for behaviors.[12] Three crucial implications strike us as crucial here.

First, the systematicity involved with moral cognition relieves any need to keep seeking a precise site (or set of sites) at which to make adjustments. There's no need to go looking for the needle in the haystack – that singular neurological module that does the "moral thinking." Instead, powerful changes to one's moral cognition can be accomplished by altering kinds of cognitive functioning that wouldn't seem at first glance to be needed for morality. Neuroscientific studies have already described how ordinary moral cognition is affected by non-moral (neurological) modulators at any moment.[13] Moral judgments are sensitive to overall moods, ongoing emotional states, reactions to stress and anxiety, positive or negative responses to people around us, and many more contextual matters that keep the brain busy. On the one hand, this makes sense on a neurological level, since a "moral guidance system" is driven by whatever persons should be caring about and valuing from moment to moment. Unfortunately, this also means that no matter how well the neural networks responsible for moral sense are working, they can easily be diverted, distorted, or overridden by whatever some other regions of the brain become focused upon. Indeed, it is sometimes hard to be moral. However, modifications to rival neural systems that reduce ways that they detract from morally relevant cognition could improve moral sensitivity and moral judgment. We believe that research into the proper functioning of moral cognition will become ever more centered on those cognitive systems and processes that both support, and compete with moral cognition.

Second, the systemic nature of moral cognition is a corollary to moral judgment's abiding dependency upon cultural context. The neural systems that have been shown to be operative in capacities for morality are more generally involved in assessing interpersonal and social relationships. These types of assessments include monitoring how one's goals and values are being fulfilled, how potential consequences of various courses of action should be weighed, and how one's conformity to cultural expectations and social reputations can be managed. Moral cognition is heavily affective and emotional, moderated by the cognitive capacity for foresight, prediction, and course correction, and rapidly modulated for managing ongoing social situations.[14] Any neurological intervention aiming at modifying moral cognition and judgment must take these contextual factors of morality into account.

Third, how one handles moral matters can depend greatly on the surrounding situation one happens to be in. Notoriously, what a person regards as morally acceptable is not consistent across and within similar

[12] For an overview, see J. A. Scott Kelso, *Dynamic Patterns: The Self-organization of Brain and Behavior* (Cambridge, MA: MIT Press, 1995).

[13] M. Crockett and R. Rini, "Neuromodulators and the (in)stability of moral cognition," in *The Moral Brain: A Multidisciplinary Perspective*, ed. J. Decety (Cambridge, MA: MIT Press, 2015), pp. 221–236.

[14] Eric Racine, *Pragmatic Neuroethics: Improving Treatment and Understanding of the Mind-Brain* (Cambridge, MA: MIT Press, 2010).

situations, and a person will often display inconsistencies in moral judgements across variable situations. We take ourselves to be the same moral person through constantly changing scenarios, but we are not. We tell ourselves that we are only altering our moral stance because we pay attention to morally relevant details to each situation, but behavioral studies show we can't even do that consistently. What this implies is that even if a neurological alteration to moral cognition were accomplished, a person's conduct isn't automatically going to conform to some rigid pattern of predictable behavior. Results will vary, and vary widely, because many of the person's higher cognitive functions are creatively developing a response that is deemed to be appropriate to each encountered situation.[15]

To estimate the opportunities for adjusting anyone's morality, it must be continually kept in mind that there are numerous ecological factors that contribute to morality, from local social conditions to longstanding cultural traditions. If this science-based injunction is overlooked or ignored, one might easily presume that neuroscience can proceed in search of "the moral brain". That mistaken presumption, if promulgated by a devotion to finding some holy-grail-like "neuroscience of ethics" will only result in theoretical confusion and misguided recommendations. All the same, neuroethical inquiry may be tempted in that direction. That temptation is somewhat understandable and foreseeable. Neuroscience, like any scientific field, offers data, metrics, classifications, and objective descriptions. Why study just a few brains, when so many await? Is there truly a "normally functioning brain" to chart and consult, so we are not doomed to forever disagree about moral matters? Great hope, if not faith might be invested in scientific objectivity. Can enough research and the promise of big data offer the means and weight the averages so as to specify what constitutes "normal" functions of moral cognition and actions?

The brain sciences are making no such promises. Brain research surely should inform concepts and constructs of modifications to neurological structures and functions and the multiple implications that any such modifications may evoke. Brain research should also inform conceptions of values as being psychologically based and socially historical. Neither neurons nor norms exist and operate apart from wider contexts. Thoughtful entryways to neuroethics open up as such contexts receive closer consideration. Both values and facts have contexts, permitting them to be what they are. Value standards may seem as fixed as anything factual, but they have a cultural provenance and social significance. Modifications for improvement can seem as objective as anything measurable, yet any approach to neurological modification must acknowledge that brain structures and functions can and often do vary within and between individual subjects.

Attention to the ecological status and functioning of morality of individuals only further highlights the cultural stage upon which morality plays its role. It should not be presumed that every person, no matter their enculturation and/or the group socialization they embody, will classify a cognitive alteration in the same way. This crucial point is not simply a matter of stating what is already quite obvious: that different cultures have somewhat different moral codes. Our point goes deeper. Neuroscience won't be objectively categorizing moral judgment for "typical" human brains in any universalistic fashion, even if neuroscience and moral psychology can reveal precisely how human brains generically perform moral cognition. Knowing how all human brains perform moral cognition and produce moral judgments is not the same accomplishment as determining what sort of alteration to moral cognition will always produce a "more moral" person. What is classified as one sort of cognitive alteration may be differently classified in another culture, or possibly

[15] John R. Shook, "Neuroethics and the possible types of moral enhancement," *AJOB Neuroethics* 3.4 (2012): 3–14. Darcia Narvaez, *Neurobiology and the Development of Human Morality: Evolution, Culture, and Wisdom* (New York: W.W. Norton, 2014).

considered different by subgroups within the same culture.[16]

To reiterate, context matters. Prior to judging whether any alteration represents a "good" or a "moral" enhancement, its status as a specific cognitive alteration, and as a value-neutral alteration, must be considered, and not be taken for granted. This is no less true for any neuro-cognitive manipulation which is expected to result in some sort of "moral" enhancement.

**Neuroethics Divided?**

To this point, we have sketched our neuropragmatist and neuro-ecological perspective on the inquiries of neuroscience into moral cognition. We now return to the question of whether neuroethics as a whole is well-prepared to evaluate the potential of technosciences in yielding future opportunities to modify moral cognition in directions deemed to be more ethical.

The scientific foundations of neuroethics are advances in the brain and behavioral sciences, along with the development and use of novel technologies (whether surgical, pharmacological, genetic, nanotechnic, or cybernetic) that permit brain/mind modification. The philosophical foundations of neuroethics are also gradually becoming more organized. Neuroethics will be an essential part of speculations about the wider implications of revolutionary paradigms and novel technosciences. As originally defined, neuroethics embraces two questions of immense philosophical significance. First, how will increasing knowledge of brain function potentially impact wider understandings of self, society, and/or culture? Second, how will self-socio-cultural understandings impact potential modifications of brain function? These two questions are not independent. The first impacts the second, especially if self-understandings are called into question and compelled to change; and insights to the second must supervise the first, if brain science is to be held to any ethical standards.

Until the two questions – and the tasks they obtain and entail – are pragmatically integrated, a divided neuroethics will allow and even encourage stand-offs between opposing neuroethical positions to develop and harden. One camp conservatively rejects using some new neurotechnology by appeal to a selected aspect of stable social traditions, while another camp progressively recommends changing some selected aspect of social tradition by using some new brain technology. For any argument that favors the use of a neurotechnology by appeal to progressive ideals, there is a counter-argument that will reject such use of technology by appeal to conservative ideals. Only in some cases, where there is wide agreement on priorities among social norms, would we expect to see convergence on if and how to accept some novel neurotechnology.

Each society will use neurotechnologies most compliantly in those situations and ways that the society is already highly committed to some important goals, such as life extension or mitigation of violence. The justifications for using neurotechnologies to enhance desired conduct will take a "socially conventional" form, as a society appeals to what it considers to be universally valid and binding norms. Even in those "easier" cases of what may be called "social enhancers," opposition to neurotechnologies will still urge caution in light of potential longer-range problems and wider-range ethical principles. Societies tend to make short-run decisions on public policy concerns, so balance from longer-range wisdom is needed when making rules that relate to and influence far future consequences of technoscience. Societies tend to justify invasive practices by appeal to what are taken to be universally valid norms, so additional balance is needed to develop a more cosmopolitan, culturally sensitive and responsive

[16] John R. Shook, James Giordano, and Lucia Galvagni, "Cognitive enhancement kept within contexts: Neuroethics and informed public policy," *Frontiers in Systems Neuroscience* 8 (5 December 2014): article 228.

stance.[17] Doing so will require wider-ranging attention to what societies around the world regard as universally obligatory.

Past the "easy" but rare social convention justifications for the use of neurotechnologies, lurk many neuroethics stalemates on the rest of the controversies. However, there is a special feature of neuroethics that we believe enables it to transcend those stand-offs. By taking the brain and behavioral sciences most seriously, neuroethics has access to knowledge about how humans cognize the world and execute their actions. Neuroethical studies and deliberations can apply scientific knowledge about how humans engage and sustain social relationships to structure and manage the social world. In short, there is nothing about morality, moral habits, and ethical judgments that is theoretically off-limits or beyond the purview of neuroethics. As a discipline, neuroethics has informational and practical access to how humans actually do ethics that is not enjoyed to the same degree by any other field of practical ethics.[18] As an example, recall here the simple argumentative mode of holding one side of the formula steady and demanding what must be done (or not done) on the other to maintain coherence. In practice an approach to neuroethics can effectively control both the cognitive and the self-socio-cultural parts of the formula simultaneously: either by (1) eliminating the moral relevance of both parts at one stroke; (2) denying the moral relevance of one part to the other; or (3) discovering how to adjust both parts simultaneously for synergistic ethical effect.

The first scenario depicts the mutual elimination of the relevance of cognitive and the self-socio-cultural. Neuroethical perspectives could eliminate human morality and all ethics simultaneously. Ethics asks humans to behave in accord with justifiable moral principles. Neuroscience works to discover how the brain functions. What if neuroscience demonstrates that brains don't obey anything like moral rules, or that brains lack the sort of freedom required for moral responsibility? If so, then asking brains to be moral is unreasonable. Prominent interpretations of neuroscientific findings are already claiming that grounds for assigning any degree of moral responsibility to a person may be refuted as non-existent.[19] But we believe that it is unwise to prematurely credit this elimination scenario. Ethics deals with norms prevailing on social relationships, not just on single brains or brain regions. Granted, if brains aren't participating in morality, then individuals and societies aren't doing morality. Morality can't be done without brains participating. However, morality is a systemic matter, like language, with brains doing things in concert. Of course, there are things that societies do without all brains doing them too. For example, a society can become democratic without all the brains becoming individually "democratic." As neuropragmatism urges, crude reductionism, part-whole fallacies, and category mistakes must be avoided. A claim to the effect that there are no brain processes doing morality implies that no individual and/or society is doing morality; this viewpoint hides both a truth and an untruth. The tacit truth is that human brains must be involved in human morality. The tacit error is to seek moral agency only at the level of interacting neurological processes.

The first scenario needn't be taken too seriously. Still, it serves as a warning that neuroethics must maintain internal consistency. When neuroethical discourse speaks of brains doing morality and then offers judgments on what society *should* morally do, there had better be the same meaning of "morality" all along the way. For example, neuroethics cannot continue to

[17] E. Lanzilao, J. R. Shook, R. Benedikter, and J. Giordano, "Advancing neuroscience on the 21st century world stage: The need for – and proposed structure of – an internationally relevant neuroethics," *Ethics in Biology, Engineering and Medicine* 4.3 (2014): 211–229.

[18] James Giordano, "Neuroethics: two interacting traditions as a viable meta-ethics?" *AJOB-Neuroscience* 3.1 (2011): 23–25.

[19] Consult Stephen G. Morris, *Science and the End of Ethics* (New York: Palgrave Macmillan, 2015).

appeal to folk psychology notions of moral responsibility, because neuroscience demands modifications to those very notions. Still, we feel that the complete collapse of neuroethics into inconsistency won't happen anytime soon. All the same, a lesson has been learned. Arguments that start from how the brain does morality to how society should be, or the reverse, can only makes sense so long as "morality," "responsibility," and the like mean the same thing in both the antecedent and the consequent. But this consistency rule is violated all the time. For instance, too much amateurish philosophizing announces that criminal responsibility is unreal since no brains exhibit contra-causal free will. Really? Do legal systems first forensically confirm the presence of contra-causal free will in the accused before taking up the assignment of responsibility? However, many legal systems do consider the presence and efficacy of conscious volitional control when assigning degrees of responsibility, and fine-tuned neuroscience will likely play an increasing role in confirming those carefully defined matters.[20] Neuroethics must take great care that any links forged between what neuroscience has to say about morality and what society says about morality are links between the same refined and carefully defined subject matter. Failure to sustain that conversational clarity results in what some view as the proliferation of "neurotalk" in popular media that yields exciting headlines while causing widening gaps between science and culture.[21]

At this point, the second scenario looms as a real challenge for practical neuroethics. Even if it turns out that neuroethics can avoid the collapse of ethics altogether, and can further ensure that neuroethical arguments apply the same meaning of "morality" and other normative terms on both sides of the cognitive/self-socio-cultural formula, neuroethics might prove to be sterile. Could neuroethical arguments all turn out to be fallacious? What if there is no rational way to argumentatively reason that a modification to one side of the cognitive/self-socio-cultural formula requires a change to the other side? There should at least be a skeptical pause when considering a typical neuroethical argument. Why should some information about how the brain functions make any difference to how a society should function? Conversely, why should any information about how society functions make any difference to how a brain should function? The "Is-Ought" fallacy awaits any neuroethical prescribing about how brains should function better based on knowledge of how many brains currently do function.[22] In the absence of a bridge across that fallacious gap in reasoning, neuroethics could resort to a strict compartmentalization and deepen the divide between its essential tasks. Principles could – and arguably should - be applied by the ethics of neuroscience to provide guidelines and guardrails for the conduct of brain research and the application of brain-related technosciences. Those ethical principles are already available from the surrounding cultural traditions and philosophical theories that offer their wise counsel. Undeterred by any news from the frontiers of the neuroscience of ethics, applied neuroethics proceeds as any other area of applied ethics. Social convention and philosophical consultation can sustain neuroethics as a normative discipline, albeit one without its own normative foundations, at least in the short term.

Yet, a neuro-ecological approach dictates dissatisfaction with a divided and divisive neuroethics

[20] Consult Nicole A Vincent, ed., *Neuroscience and Legal Responsibility* (Oxford: Oxford University Press, 2013).

[21] See M. B. Crawford, "The limits of neuro-talk," in *Scientific and Philosophical Perspectives in Neuroethics*, ed. James Giordano and Bert Gordijn (Cambridge, UK: Cambridge University Press, 2010), pp. 355–369.

[22] Compare the article by S. Berker, "The normative insignificance of neuroscience," *Philosophy & Public Affairs* 37 (2009): 293–329, with the article by V. Kumar and R. Campbell, "On the normative significance of experimental moral psychology," *Philosophical Psychology* 25.3 (2012): 311–330. See also J. Greene, "Beyond point-and-shoot morality: Why cognitive (neuro)science matters for ethics," *Ethics* 124 (2014): 695–726.

unable to take advantage of its own insights into the psycho-social grounds of moral cognition. Thus, the third scenario remains open. In this light, we urge neuroethical utilization of both components at its disposal – the cognitive and the self-socio-cultural aspects – simultaneously. Insight into neurological processes of moral cognition can be of use to developing improved ways of teaching, reinforcing, and guiding moral, ethical, and legal thinking and conduct. Neuroethics needn't be a field looking at a given set of brain processes on one hand and a received set of ethical norms on the other. Of course, neuroethical discourse could suggest its preferred moral technosciences or its ethical values on an uncertain and unready society. But it doesn't have to, and it shouldn't do so. Moral conformity and ethical propriety needn't be enforced in any heavy-handed manner.

Herein lies the interaction with – and need for – the "second tradition" of neuroethics. While considering this ethics of neuroscience, it is crucial to address the ways that various techniques and tools are used in brain research, and how the results and products of brain science are used in larger contexts of medicine, public life, international relations, and national security and defense. It's important to remember that any ethical analysis begins with some appreciation for the factual situation. As neuro-ecology addresses the neuroscience of ethics, it demands a high level of ethical probity and prudence in the ways that the brain is studied, the ways that neuroscientific information is interpreted, and acknowledgement of what is not yet known about the brain and its functions. It especially demands attention to deliberations about the use, or misuse, of such information and neurotechnological capabilities to assess and affect thought, emotions, and behaviors.

**More Morality through Science?**

Can neuroscience and the ethics of neuroscience definitively inform what is "good" and how individuals and societies should live? No, not really; but neuroscience *can* define how brains function for developing and processing moral cognitions, emotions, judgments, and conduct. Neuroscience can provide insights to how various circumstances, actions, and effects influence the brain, and how and what brain functions are involved in various thoughts, emotions and behaviors. That's still important – and powerful – information.

In this light, the "second tradition" of neuroethics provides an especially valuable resource, as a discipline and set of practices. Its primary task can remain unified: to examine how the brain is studied with operational guidance over those investigations and the ways that neuroscientific information is put to work in the social sphere. Neuroethics can serve as both a lens to peer into the workings of the brain that are involved in cognitive processes of morality and ethics, and a mirror to reflect upon and foster a deeper understanding of human ecology, how humans think morally, and how neuroscience can be applied in ethically sound ways. A technoscientific approach to morality won't prove impossible, but it will prove to be far more about modifying society than about modifying brains. The risks and benefits of neural modifiers must be understood in order to guide their ethical use for improving neural function. We advocate that any alterations of neurological processes should represent genuine improvements, with minimized side effects, and we want those alterations to meet well-defined ethical standards.

What could more beneficial, and ethical, than "moral" enhancement? The approval is seemingly axiomatic to the name. Morality is regarded as good and beneficial for humanity, and moral improvement is widely viewed as something anyone should seek. One might think that moral enhancement couldn't be

unethical, since it must be consistent with morality, or else it wouldn't be called "moral" enhancement. Like "cognitive" enhancement, "moral" enhancement has a label that lends itself to approval, and to exaggerated expectations. However, even moral enhancement must be carefully studied to determine its effectiveness in real-world settings. The actual results may not be indicated by the label. To embark on experimentation with the ways that brains allow the capacity for moral behavior, it must never be forgotten that moral enhancement is only an experiment, not a foregone conclusion. Full responsibility must be taken for anything that brains will be able to think about morality. The brain sciences alone cannot shoulder that responsibility. Improvements to moral functioning should be consistent with autonomy, self-empowerment, and the development of personal responsibility. Trying to put some morality in a pill, pattern of magnetic pulse, or brain implant won't automatically achieve those social goals, and ethical concerns about risky procedures affecting moral cognition will be amply justified.

Surveying the literature about the neuroenhancement of morality brings into view disputes over 'morality', how 'morality' could be improved via neuroscientific means, and how it should be improved. The objectivity offered by the brain sciences cannot axiomatically lift discussions of moral enhancement to humanity-wide application. To be scientific, neuroscientists and neuroethicists must avoid narrow pre-definitions of morality that are ahead of the evidence. That is why many varieties or kinds of morality are now discerned. Separate sciences, and different theoretical stances within a science, can discriminate distinct human behaviors and apply the labels of "moral" or "non-moral" in divergent ways. Furthermore, what may be "moral" in a practical sense may not be moral in an ethical sense. It must never be unreflectively presumed that anything that seems to make a person more moral in some specific way is also generally conducive to the good life, or broadly ethical and wise. Even if it were to exist, a specific "moral enhancer" could detract from the autonomous pursuit of the good life, or it might prevent a person from even contemplating alternative forms of the good life. The good life may need to escape conformity to whatever society has already deemed to be strictly moral. Thus we nest the neuroscience – and neuroethics – of moral performance enhancement squarely within the socio-cultural realm. Societies will have a (if not the last) say on any implementation of what constitutes practical moral enhancement.

**Conclusion**

This discussion has been animated by a contextualized neuroethical outlook that allows for better-informed approaches, utilizing all relevant interdisciplinary input, for considering what could possibly be moral enhancements. It permits neuroethical deliberation to rise above local conventionality and a single social ethos, to instead survey the dynamic scope of human cognitive capacities, and the rich cultural diversity of human self-understandings. In its appreciation for the human as a bio-psychosocial organism, neuroethics engenders an interdisciplinary approach (conjoining anthropology, sociology, economics, and political science) to depict and address ethical issues within the contexts in which human activities are conducted. Thus, in the spirit of cognitive enhancement itself, neuroethics as a discipline – and in its methods, approaches, and practices – should embody and enable greater human self-understanding, and improve public deliberations over the many dimensions of life that we treasure.[23]

We predict that the brain sciences will discover and develop ways to alter how people conduct themselves in accordance with moral expectations. Moral

[23] John R. Shook and James Giordano, "A principled and cosmopolitan neuroethics: Considerations for international relevance," *Philosophy, Ethics, and Humanities in Medicine* 9.1 (2014): article 1.

performance, in short, can and will be adjusted, in directions which are already deemed to be moral. But make no mistake: prior judgments about what shall count as genuinely moral behavior are driving this experimental process. It is we together, and not any single "moral" brains on their own, who must take ultimate responsibility for deciding where moral enhancement may lead. The brain sciences by themselves won't find morality nestled among the neural networks. The only moral pathways to be discovered are the step-by-step journeys that we are already taking together as a society and as a species.