

## *If It Only Had a Brain*

### What “Neuro” Means for Science and Ethics

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The meaning of a word is what is explained by the explanation of the meaning.

Ludwig Wittgenstein, *Philosophical Investigations* <sup>1</sup>

What’s in a name? Is a rose of any color still a rose? Or going further, does such a rose have a “neurobiology”? A little more than a decade ago, the idea began to grow that plants had integrative functions that could enable some sort of “intelligence.”<sup>2</sup> This idea fertilized conferences, publications, and an international society devoted to plant *neurobiology*. But this became thorny. A number of plant scientists and neuroscientists sought to nip this in the bud in a 2007 article that refuted the essential premise of this idea.<sup>3</sup> They argued that absent a neural system, any claim of a “neurobiology” was an infelicity at best, a fallacious extrapolation of facts and reasoning at worst, and either way, served little good to the plant sciences or the brain sciences. The authors seeded a challenge urging advocates of plant neurobiology to “reevaluate critically the concept and...develop an intellectually rigorous foundation for it.”<sup>4</sup>

This was sound advice. Terminology matters. But let’s get into the weeds a bit. What does the prefix “neuro” mean? Certainly, it could be regarded as a reference to any structural and/or functional characteristics of nervous systems. Nervous systems are composed of neurons and glial cells, as well as ependymal cells and the like that are necessary for the systems’ integrity. If we were to homologously use the term “neuro,” it would dictate that anything to which the prefix is applied would be referential to “neural structures and functions.” But if we were to analogously apply the term, then “neuro” could refer to anything that does what neural systems do, but that need not be composed of specific neural structures. In this light, terms such as “neuro-like,” and/or “neural-like” may be needed to explicitly distinguish analogous from homologous reference and descriptions.

Thus, a computational “neural network” need not be composed of neurons to effect its functions, but it is considered “neural” all the same. Or is it? Philosopher Thomas Metzinger has posited that using “neural” terms—even if analogously—to discuss the functions of advanced computational systems (i.e., artificial intelligence [AI]) and the ethics that address issues and questions that blossom from them, is inaccurate.<sup>5</sup> What we’re really discussing is “cognitive” systems, and Metzinger has proposed that what is needed is an ethics of consciousness, or cogno-ethics, to more accurately reflect the moral, ethical, and legal concerns that arise if and when such a system were to obtain cognitive capabilities and consciousness. Would cogno-ethics take root where robo-, cyber- and neuroethics reach limits of applicability? Or would neuroethics branch out to encompass and address issues related to anything that does what “neuro” systems do?<sup>6</sup>

Before wandering too deep into the “neuro/cogno” woods, allow us to sprout another idea: what if we consider “neuro” to be synecdoche?<sup>7</sup> By definition, synecdoche is “a figure of speech by which a part is put for the whole, the whole for a part, or the name of the material for the thing made”<sup>8</sup> (such as “neuro” for the functions that arise from systems that do what neural-like systems do). Here mereological and hologic perspectives—and their relative interactions—come into play.<sup>9</sup> Does the brain “feel” pain, or love, or does the organism? Philosopher Ludwig Wittgenstein used pain as a prototypic example of the importance of words and language, and how constraints of what is known about the brain lend particular gravitas to the ways that terms used to describe mental states and functions are employed.<sup>10</sup>

And, if it remains unknown how “the great stuff” of consciousness and subjective experience occur in the “gray stuff” of the cells and the system of things “neuro,” then what does that imply for the ways in which we regard and treat things that have the gray stuff (i.e., those that have certain types of neurosystems)—and for things that can do the great stuff (like think or feel)?<sup>11</sup> Yet, as synecdoche, “neuro” could represent something more; it could refer to what is known about such systems and their functions, as well as what is not known, and reinforce how both science and ethics must simultaneously heed, explore, and deal with these realities in practice. This is axiomatically important for neuroscience and neuroethics.

In addressing neuroscience, neuroethical discourse must entail this recognition of what is currently known and unknown, and employ it as a balance on which to engage deliberation and decisions about how such science is used in its varied applications. But with advancements in brain science, such knowledge changes, and philosophy and ethics must acknowledge and respond to such change in order to remain of genuine value. How we talk about things “neuro” confers meaning, just as our knowledge of neurological processes affords insight into how language and meanings are developed and how they affect emotion and behavior.

Perhaps, as neuroscientist and neuroethicist Guillermo Palchik has suggested, brain science—and society—will need a new and more accurate lexicon as we learn more about neural systems and what they do.<sup>12</sup> Terms laden with neuroethical import such as “mind,” “consciousness,” “self,” “free will,” and “normality” may all require greater focus; and new terms and conceptualizations—and ethical views and values—may bloom as we probe and discover more about things “neuro.” And, if we may plant a seed of hope, perhaps we may more ably harvest the benefits of things “neuro” as we cultivate more finely grained ethics.

## Notes

1. Wittgenstein L (GEM Anscombe, transl.) *Philosophical Investigations*. New York: Macmillan; 1953, at 149
2. Brenner ED, Stahlberg R, Mancuso S, Vivanco J, Baluska F, Van Volkenburgh E. Plant neurobiology: An integrated view of plant signaling. *Trends in Plant Science* 2006;11:413–9.
3. Alpi A, Amrhein N, Bertl A, Blatt MR, Blumwald E, Cervone F, et al. Plant neurobiology: No brain, no gain? *Trends in Plant Science* 2007;12(4):135–6.
4. See note 3, Alpi et al. 2007, at 136.
5. Metzinger T. *The Ego Tunnel*. New York: Basic Books, 2010.
6. Giordano J. Conscious machines? Trajectories, possibilities and neuroethical considerations. In: Medsker L, ed. *The Nature of Humans and Machines: A Multi-disciplinary Discourse*. Palo Alto: CA: AAAI Press; 2015:13–7.

*From the Editors*

7. Giordano J. Neuroethics: Traditions, tasks and values. *Human Prospect* 2011;1(1):2–8.
8. *Merriam-Webster's Collegiate Dictionary*, 11th ed. Springfield MA: Merriam-Webster; 2004, at 1268.
9. Bennett MR, Hacker PMS. *Philosophical Foundations of Neuroscience*. Oxford: Wiley-Blackwell; 2003.
10. See note 1, Wittgenstein 1953.
11. Loveless S, Giordano J. Neuroethics, painience and neurocentric criteria for the moral treatment of animals. *Cambridge Quarterly of Healthcare Ethics* 2014;23(2):163–72.
12. Palchik G, Giordano J. A new lexicon for neuroscience and neuroethics. Paper presented at the Meeting of the International Neuroethics Society, Washington, DC, November 10, 2011.



Tzara, Tristan, Self-Portrait, (1928). Drawing, Coll. Arturo Schwarz, Photo Credit: Scala/Art Resource, NY. Reproduced by permission.