

De-ontologizing the Brain
from the fictional self to the social brain
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~Charles T. Wolfe~

The brain thinks, not man. Man is just a cerebral
crystallization.

-- Gilles Deleuze & Felix Guattari [1]

I don't pretend to account for the Functions of the Brain. I
never heard of a System or a Philosophy that could do it.

-- Bernard Mandeville [2]

What can a philosopher say about phantom limb syndrome? More specifically, what can a materialist philosopher say about phantom limb syndrome? At first glance, a phenomenon by which our 'corporeal imagination' -- what La Mettrie in the eighteenth century called the "magic lantern" working within the brain, projecting images created by our memory and intellect [3] -- induces us to feel pains in a missing limb might seem like profound evidence that naive, scientific views of consciousness are false or at least useless. How could science with its measurements ever grasp the irreducibly subjective construction which my body is? Notice that in any case, regardless of our answer to such a question, a somato-psychic phenomenon like phantom limb syndrome raises significant issues regarding good old-fashioned notions such as the self, and slightly less old-fashioned notions such as the tandem 'self and brain'.

Namely, if the self has already been deflated -- since Hume and Nietzsche in their respective traditions, and in recent times since Dennett -- what about the brain?

Our suspicions regarding nefarious neurophilosophers and other ~heraunts~ of scientism should be allayed, or at least mollified, by the realization that present-day neuroscience and philosophy of neuroscience is fully aware that brains can be sources of illusion, tricks on the mind, self-deception, as much as they are reliable ontological substrates of something like the self.[4] An intangible phenomenon like feeling the presence of a phantom limb used to be viewed, in a kind of crude reductionism, as "wishful thinking" or "mourning" on the part of the patient (following Ramachandran's

expression) but this is no longer so.[5] Consider for instance the fact of volitional control of a phantom limb, as described in Ramachandran's famous mirror box experiment (which he also describes as the "virtual reality box") and its implications for an integrated vision of body, mind and brain.

The box is made by placing a vertical mirror inside a cardboard box with the roof of the box removed. The front of the box has two holes in it, through which the patient inserts his good arm

and his phantom arm. The patient is then asked to view the reflection of his normal hand in the mirror, thus creating the illusion of two hands, when in fact [he] is only seeing the mirror reflection of the intact hand. If he now sends motor commands to both arms to make mirror-symmetric movements, he will have the illusion of seeing his phantom hand resurrected and obeying his commands, i.e. he receives positive visual feedback informing his brain that his phantom arm is moving correctly.[6]

Now, in what follows my aim is less to stake out a position on phantom limbs (real? imagined? material? neuronal? phenomenal?) than to show that philosophical reflection on brains, even when it seeks to rebut the dogmatic anti-naturalism found in most corners of phenomenology, does not have to be naively, crudely reductionistic or scientistic -- in other words, to show that one can be a materialist without having to feel like "a cop at Woodstock" (in Dennett's colourful expression, referring in his case to being a reductionist materialist philosopher at a meeting on quantum physics and consciousness; but he added that he wanted to be like a "good cop").[7]

My argument runs as follows:

1. What do phantom limbs seem to imply? The first-person perspective.
2. But a materialist response to this first-person challenge is possible. Further, it has to be an embodied materialist response.
3. However, in order to not reinvest the brain with the mysterious character that the self has lost, this must also be an embedded vision of the brain, not just in the body but in the network of symbolic relations. One can describe this as the 'social brain', and emphasize the coeval, co-originary relation between organ and prosthesis, so that the difference between an original substrate and an artifact disappears or becomes purely instrumental. This is what I mean by "de-ontologizing the brain."

1.

Phantom limbs and anosognosias -- cases of abnormal impressions of the presence or absence of parts of our body[8] -- seem like handy illustrations of an irreducible, first-person dimension of experience,[9] of the sort that will delight the phenomenologist, who will say: aha! there is an empirical case of self-reference which externalist, third-person explanations of the type favoured by deflationary materialists, cannot explain away, cannot do away with.

As Merleau-Ponty would say, and Varela after him, there is something about my body which makes it irreducibly my own (le corps propre).

Whether illusory or not, such images (phantoms) have something about them such that we perceive them as our own, not someone else's (well, some agnosias are different: thinking our paralyzed limb is precisely someone else's, often a relative's). One might then want to insist that phantom limbs testify to the transcendence of mental life!

Indeed, in one of the more celebrated historical cases of phantom limb syndrome, Lord Horatio Nelson, having lost his right arm in a sea battle off of Tenerife, suffered from pains in his phantom hand.

Most importantly, he apparently declared that this phantom experience was a "direct proof of the existence of the soul"[10] -- the clearest possible statement of the kind of view I wish to oppose here.

Although the materialist might agree with the (reformed) phenomenologist to reject dualism and accept that we are not in our bodies like a sailor in a ship, she might not want to go and declare, as Merleau-Ponty does, that "the mind does not use the body, but fulfills itself through it while at the same time transferring the body outside of physical space." [11] This way of talking goes back to the Husserlian distinction between *Körper*, 'body' in the sense of one body among others in a vast mechanistic universe of bodies, and *Leib*, 'flesh' in the sense of a subjectivity which is the locus of experience.

Now, granted, in cognitivist terms one would want to say that a representation is always my representation, it is not 'transferable'

like a neutral piece of information, since the way an object appears to me is always a function of my needs and interests. What my senses tell me at any given time relies on my interests as an agent and is determined by them, as described by Andy Clark, who appeals to the combined research traditions of the psychology of perception, new robotics, and Artificial Life. But the phenomenologist will take off from there and build a full-blown defense of intentionality, now recast as 'motor intentionality' (as currently discussed by neuroscientists such as Alain Berthoz and Marc Jeannerod and philosophers such as Sean Kelly), a notion which goes back to Husserl's claim in *Ideas II* that the way the body relates to the external world is crucially through "kinestheses": all external motions which we perceive are first of all related to kinesthetic sensations, out of which we constitute a sense of space. On this view, our body thus already displays 'originary intentionality' in how it relates to the world.

This is part of what I mean by the appeal to the first-person dimension. In contrast, for someone like Dennett, phantom limbs and agnosias are, at least as much as they are instances of self-reference, instances of self-deception: we don't have a transparent relation to ourselves. "You are not authoritative about what is happening in you, but only about what seems to be happening in you," [12] or, as Andy Clark puts it, "the conscious self is but the tip of the 'I' berg." [13] Phantom limb phenomena merely bring to light a much wider sense in which we live in 'intended' rather than 'actual' worlds [14], i.e., we presuppose an enormous amount of what is there in order to act. Put in an extreme way, "your own body is a phantom, one that your brain has temporarily constructed purely for convenience." [15] Given this, it's not a good idea -- at least ontologically; the ethical story is different, as Locke saw (and his response was to emphasize that 'person' was a "forensick term") -- to trace everything back to a central, unifying and grounding self(hood):

For your entire life, you've been walking around assuming that your 'self' is anchored to a single body that remains stable and permanent at least until death... yet these results suggest the exact opposite -- that your body image... is an entirely

transitory construct that can be profoundly altered with just a few simple tricks.[16]

Our self -- and its neural correlates -- is a construct, at most a "narrative center,"[17] and by that token, it's a fiction (as first seen by Hume, and also Montaigne). I am a character in a story my brain is making up, "consciousness is a property I have by virtue of my brain's attributing it to me. My story doesn't have to cohere completely to be useful." [18] Katherine Hayles calls this new intuition "posthuman": "Consciousness for the posthuman ceases to be seen as the seat of identity and becomes instead an epiphenomenon, a late evolutionary add-on whose principal function is to narrate just-so stories that often have little to do with what is actually happening." [19] I will keep referring to it for now in more plain terms as the fictional self. One also hears echoes of the fictional self in Michael Gazzaniga's accounts of his split-brain studies (severing the corpus callosum in the case of certain seizures): in commissurotomy subjects, it is not the 'whole person' who does the reintegrating of their world, but one hemisphere of their brain; "the person is utterly unaware of the tricky communicative ploys the brain comes to exploit." [20] This was arguably already Kurt Goldstein's point -- namely, that it is simply a 'fact', a 'property' of our brains that they construct unity or totality, as a normal state but also in response to abnormal situations [21] -- but he ontologized it into a property of the brain and by extension of 'the organism' that somehow removed it from the world of causality and mechanistic natural science. I won't go along with the ontologization, but before I get to this, I'd like to put some more nails in the coffin of the (admittedly 'undead') first-person perspective.

As I said initially, phantom limbs and related phenomena seem like ideal cases for the phenomenologist (whether slightly favourable to a naturalistic viewpoint or not), of a bodily state in which the viewpoint of the subject is an irreducible part of the state, such that if it were factored out, that 'state' would no longer make any sense, indeed would no longer exist.

2.

The 'trivially true' materialist response here would be to say: these are cases of 'remapping' the inner 'model' of the body we have, known as the cortical map [22] or the Penfield map (after the Canadian neurologist, Wilder Penfield), caused by mismatches between visual and proprioceptive feedback. In other words, these apparently uniquely 'mindful' phenomena are nonetheless mechanistically specifiable and explainable. (Ironically, this is not so far removed from Descartes' position on phantom limbs: we shouldn't trust the senses but rather our reason. He viewed phantom limbs as illusions, which tells us that the problem of phantom limbs is the mind-body problem, since it demands that we define the relation between a sensation and 'that of which it is a sensation'.) The variant of the materialist response that I shall offer here can include such deflationary elements, but I would add that (a) insofar as such accounts refer back to the uniqueness of our subjective experience, they run into the aporia of opposing the first-person perspective to the third-person perspective and (b) insofar as the present version of materialism allows for embodiment [23] (and is thereby

not just a physicalism), it can accommodate such experiences without having to explain them in first-person terms.

(a)

To lay out the third-person, externalist perspective, it's always helpful to remember that there is no homunculus:

The cardinal background principle [for the neurophilosopher] is that there are no homunculi. There is no little person in the brain who 'sees' an inner television screen, 'hears' an inner voice, 'reads' the topographic maps, weighs reasons, decides actions, and so forth. There are just neurons and their connections. When a person sees, it is because neurons, individually blind and individually stupid neurons, are collectively orchestrated in the appropriate manner.[24]

And there are no qualia either. As Dennett has memorably written, believers in qualia are tied to a picture of the mind as a 'Cartesian theatre', in which mental entities are on display before the mind's eye. To move from, e.g., the reality of colors as properties of physical objects to the reality of color qualia as the properties of internal states is an unjustified inference.[25] One can add that the notion of 'phenomenal information' is doubtful -- perhaps interesting, and heuristically useful, but in no way more real than the 'rational part of the soul.' The Husserlian claim that experience itself, qualities and all, contains the 'essences' we need to inquire into, is more convincing!

Thomas Nagel's famous appeal to subjective experience in "What is it like to be a bat?"[26] is an elegant revival or recycling of the phenomenological vulgate from the Continent, a 'minimal credo' one could find in Bergson, Merleau-Ponty or even Husserl, but it is not an argument to assert that 'the mental is subjective and science is objective, therefore science cannot explain the realm of the mental (and materialism is false)'. This is logically true in the same way that 'All Martians are adulterous, and all adulterous people are meat eaters, so all Martians are meat eaters' is true, but it says nothing more. In fact,

Human and other subjects can have functionally or computationally different states that nonetheless home on the same objective state of affairs, either external or internal. But there are no intrinsically subjective or perspectival facts that are either the special objects of self-regarding attitudes or facts of 'what it is like'. There are only states of subjects that both function in a particularly intimate way within those subjects and have the subjects themselves and their other states as inevitable referents. And that is all there is to 'subjectivity'.[27]

(b)

More interestingly, and moving towards 'embodiment', Paul Churchland has pointed out that we can claim to have a first-person, privileged

relation to all sorts of physical things, including our muscles, skin, stomach and bowels (!), what Patricia Churchland has elegantly called "awareness of visceral circumstance." [28] Curiously -- and doubtless without the Churchlands' knowing it -- Leibniz entertains this possibility in the New Essays Concerning Human Understanding (1704), asserting that "something occurs in the soul in reponse [to] the internal motions of the viscera," [29] perhaps in response to Descartes' remarks in the Sixth Meditation on how my experience of bodily processes includes "twitching in the stomach." [30] But Leibniz, heading off objections to animism, says the soul is actually unaware of such movements. In any case, the point here is that purely internal, 'private' events which only I can feel, are in no way separate from the natural, causal world which science studies. Of course, while muscular or visceral motions can be studied from a third-person perspective, in terms compatible with the scientific representation of the world, we can also claim to feel things about them which this representation cannot include.

Specifically,

The existence of a proprietary, first-person epistemological access to some phenomenon does not mean that the accessed phenomenon is nonphysical in nature. It means only that someone possesses an information-carrying causal connection to that phenomenon, a connection that others lack. [31]

The materialist can accept that we have "a route of epistemological access" to our own body, which others lack (this is not Merleau-Ponty but the Australian identity theorist David Armstrong!), and thereby also to our mind. [32] But it must be explained: "there remains a genuine obligation on the materialist's part to give some account of the subjectivity or perspectivalness or point-of-view-ness of the mental"; "the materialist owes the world an explanation of what it is about a mental/neural state that makes its proprietor think of it as subjective." [33] In other words, instead of denying the existence of introspection, the materialist should try and locate it within the physical world, within the overall framework of explanation (as Spinoza did). One place to start, where philosophy still has to catch up on neuroscience, despite brief and passing remarks by the 'identity theorists', [34] is proprioception, precisely inasmuch as it is my 'internal' sense of my body and yet is light-years removed from any aprioristic vision of an "inner sense" or "sense of senses" as found in St. Augustine, Kant or the phenomenologist Erwin Straus. The American poet Charles Olson was perhaps alone in recognizing the import of this concept, speaking of "the 'body' itself... by movement of its own tissues, giving the data of, depth," "spontaneously [producing] experience of, 'Depth', viz. SENSIBILITY WITHIN THE ORGANISM BY MOVEMENT OF ITS OWN TISSUES," and he described the body as an "interior empty place filled with 'organs'? for 'functions'?", which (sounding suddenly very Germanic) "removes the false opposition of 'consciousness'." [35]

What proprioception -- among other biological phenomena -- tells us is that even if we were restricting ourselves to 'biological talk', we would end up with some account of our subjective relation to the world, of our sense of 'self' in the midst of our experience of the world. Further, it would equally be within the province of biological discourse to describe how we construct partial versions of the world for ourselves (as described at the level of perception by the eminent

neurophysiologist Walter Freeman).[36] One way of explaining this is to view our perceptual processes as filters, which "take in and retain only a tiny and tendentiously selected fraction of the information that is available in an object under scrutiny." [37] Hence no two subjects perceive the same object in the same way, including for evolutionary reasons.

Indeed, since the embodied materialist standpoint is not merely a physicalism but can appeal to biological information, it offers plenty of ways to understand individuality, selfhood or agency, from reflections on the developmental process to immunology and the neuroscience of action. There is no need, then, to oppose a private (and foundational) self to the body or the brain. Instead of declaring rather dualistically that "It is man who thinks, not the brain," as Erwin Straus does[38] -- that is, that brain events do exist but have nothing to do with the world of our experience -- the reverse formulation, Deleuze and Guattari's, seems more wise: "The brain thinks, not man. Man is just a cerebral crystallization." [39]

3.

The trick is to not go all the way with embodiment, so as not to end up in what Deleuze, speaking of Merleau-Ponty, called the "mysticism of the flesh." [40] After all, is there anything metaphysically unique about flesh, skin or the brain which makes them do what they do? My last point, then, is to not get too comfortable with embodiment either, since the brain is necessarily located within the social and symbolic world: this is what I mean by 'de-ontologizing the brain.'

Namely, if we demystify or deflate some concepts of self and subjectivity by relating such concepts to the reality of the brain -- the processes of which are dynamic, distributed, non-centred, dissipative, and include 'remapping' -- we shouldn't then turn the brain itself into a mysterious substance which explains everything, some sort of 'Wonder Tissue'; a corrective is needed. If mind and body belong together, as do body and brain, so do brain and world.

Call this the "co-evolutionary" perspective (with Terrence Deacon) and emphasize 'Baldwinian evolution', i.e., the cluster of linguistic and cultural layers in evolution which do not fall under Darwinian evolution; call it the "social brain," in the Spinozist tradition (including Damasio but also Lev Vygotsky and Antonio Negri[41]). The idea is that 'not everything is in the head', or 'the skin is not a real barrier' (think of how much we care about extended limbs, how upset we get if they are severed, including even remote-controlled limbs). This is what Andy Clark calls "scaffolding": we are inseparable from the "looping interactions" between our brains, our bodies, and "complex cultural and technological environments." [42] In other words, our brains have the talent for making use of the environment, "piggy-backing on reliable environmental properties," [43] which is in fact a far more economical and swift action procedure than processing representations of objects.

"Scaffolding" is one of the vehicles humans employ, so that language, culture and institutions empower cognitions. [44] On this view, the brain is not a central planner but rather possesses a "scaffolding" which is inseparable from the external world.

Think of it in terms of plasticity: the possibility, as described in Ramachandran's mirror box experiment, of reviving volitional control and somatic sensations in a phantom arm by simply using a mirror, even when no sensation had been experienced by the subject for the previous ten years, "implies a surprising degree of plasticity in the adult brain." [45] And this plasticity implies in turn a surprising degree of opportunistic openness towards the non-organic, the artificial, the technological: the biological functioning of our brains themselves "has always involved [using] nonbiological props and scaffolds," [46] with direct consequences for brain architecture

itself: "a youngster growing up in a medieval village in twelfth-century France would literally have different neural connections than a twenty-first-century American adolescent who has spent serious time with computer games." [47] In Deleuze's terms, "Creating new circuits in art means creating them in the brain." [48]

In any case, my point is not to take a position in the current debates on the status and importance of neural plasticity, [49] but rather to emphasize the 'scaffolding' dimension, which implies -- at the risk of sounding a bit like a practitioner of 'Theory' -- that the 'paradigm' of the phantom limb might not be not so far removed from that of the prosthesis.

Given the degree of openness of the central nervous system, and on the 'personal' level, our ability to identify with non-biological extensions of our body, the 'artificialist' perspective, in which body and prosthesis, indeed, body and tool, merge, is not so far off.

Just as the 'fictional self' is the outcome of the deflation of the ontological unity of self, the social, evolving, 'cultured' [50] brain deflates the ontological uniqueness and isolation of the brain.

Instead of opposing subjectivity to the natural world, or the body to the tool, we have arrived at a vision of the "productive potential"

of the agent as inseparable from a "set of prostheses," [51] in a process of what Felix Guattari would have called the "production of subjectivity." In Negri's terms,

The tool... has entirely changed. We no longer need tools in order to transform nature... or to establish a relation with the historical world..., we only need language. Language is the tool. Better yet, the brain is the tool, inasmuch as it is common. [52]

The brain is "common" inasmuch as it is constituted by and inseparable from the network of relations to which we belong. If phantom limb syndrome was the point of entry here by which the brain opens onto the world of fiction, revealing our sense of self, including its 'embodied' dimension, to be a "transitory internal construct," in Ramachandran's terms, then the prosthesis (akin in this respect to certain appropriations of the figure of the cyborg) is the point at which the brain escapes any solipsism, whether of the post-Cartesian, brain-in-a-vat sort, or the more omnipotent, brain-as-self sort. If one thinks of the recent examples of the performers Stelarc and Orlan (regardless of their different vocabularies and cultural contexts), one can see this sense in which biological limits are being transcended, by being 'plugged into'

technological networks (this mainly in the case of Stelarc).[53] This is the kind of commonality we have been discussing -- in which self and brain are constituted through interactions with various extended entities, so that what it is to be 'me' is nothing other than a productive potential, a "set of prostheses," of fictions.

* * *

The common brain or social brain generates the fictional self, but really, the fellow-traveler of such a self should be termed the de-ontologized brain. Now, one can ask in response if a de-ontologized brain can "think ontologically,"[54] and the initial response seems to be No: if an ontology amounts to a definition or catalogue of what there is, as opposed to what there isn't (tables, chairs, bodies and maybe mathematical entities, but not centaurs or smiles of Cheshire cats), then brains as entities 'plugged in' to the network of artificialist, technological production shouldn't think ontologically at all. However, if one understands ontology in a sense closer to the "production of subjectivity," namely, as "constitutive ontology," in Negri's terms, then there is no tension between a plastic, social, cultured brain-in-a-network and the constant production and reproduction of being, through the desires and actions of concrete agents.[55] If what there is, is constituted, the brain's positing and desiring are no more real than the fictional, "forensick" masks of the self, but they are also no less real than the social, ethical and political forms into which they crystallize.

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Notes:

[1] Gilles Deleuze & Felix Guattari, *Qu'est-ce que la philosophie?*, Paris: Minuit, 1991, pp. 197-198.

[2] Bernard Mandeville, *A Treatise of the hypochondriack and hysteric diseases*, 2nd corrected edition, London: Tonson, 1730; reprint, Delmar, N.Y., Scholars' Reprints, 1976, p. 137.

[3] Julien Offray de La Mettrie, *L'Homme-Machine* (1748), in Aram Vartanian, *La Mettrie's "L'Homme-Machine." A Study in the Origins of An Idea*, Princeton: Princeton University Press, 1960, p. 165. La Mettrie adds that the soul as a whole can be reduced to the workings of the imagination.

[4] See Todd E. Feinberg & David M. Roane, "Anosognosia, completion and confabulation: the neutral-personal dichotomy," *Neurocase* 3

(1997) and William Hirstein, *Brain Fiction. Self-Deception and the riddle of confabulation*, Cambridge, Mass.: MIT Press, 2005 (an important work which addresses several of the concerns in the present essay).

[5] V.S. Ramachandran & L. Levi et al., "Illusions of body image," in Rodolfo Llinás & Patricia S. Churchland, eds., *The Mind-Brain continuum: sensory processes*, Cambridge, Mass.: MIT Press, 1996; V.S. Ramachandran & William Hirstein, "The Perception of phantom limbs" (D.O. Hebb lecture), *Brain* 121_ (1998).

[6] Ramachandran & Hirstein, "The Perception of phantom limbs," p. 1620.

[7] Daniel Dennett, "The Myth of double transduction," *Toward a science of consciousness II, The Second Tucson discussions and debates*, eds. S. Hameroff, A.W. Kaszniak & A.C. Scott, Cambridge, Mass.: MIT Press, 1998, p. 97.

[8] See Antonio Damasio, *Descartes' Error. Emotion and reason in the human brain*, New York: Putnam, 1994, pp. 62-66.

[9] Feinberg & Roane, "Anosognosia, completion and confabulation: the neutral-personal dichotomy."

[10] As quoted in Ramachandran & Hirstein, "The Perception of phantom limbs," p. 1604.

[11] Maurice Merleau-Ponty, *The Structure of behavior*, trans. A.L. Fisher, Boston: Beacon Press, 1963, pp. 208-209 (trans. modified).

[12] Daniel Dennett, *Consciousness Explained*, Harmondsworth: Penguin, 1990, p. 96.

[13] Andy Clark, *Natural-Born Cyborgs. Minds, technologies and the future of human intelligence*, Oxford: Oxford University Press, 2002, p. 100.

[14] Borrowing this formulation from Chris Frith (discussion, London, 2005).

[15] V.S. Ramachandran & Sandra Blakeslee, *Phantoms in the brain*, New York: W. Morrow, 1998, p. 62.

[16] Ibid.; the body image is a "transitory internal construct" (Ramachandran & Hirstein, "The Perception of phantom limbs," p. 1623).

[17] Dennett, *Consciousness Explained*, ch. 13, esp. pp. 426-427; "The Self as center of narrative gravity," in F.J. Kessel, P. Cole & D.L. Johnson, eds., *Self and consciousness: multiple perspectives*, Hillsdale, NJ: L. Erlbaum, 1992; Antonio Damasio, *The Feeling of what happens*, New York: Harcourt, Brace, 1999, ch. 7.

[18] Drew McDermott, "Little 'me'" (commentary on Daniel Dennett & Marcel Kinsbourne, "Time and the observer"), *Brain and Behavioral Sciences* 15:2 (1992), p. 217.

[19] N. Katherine Hayles, "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," *_Configurations_* 10 (2002), p. 319.

[20] Daniel Dennett, *_Elbow Room. The varieties of free will worth wanting_*, Cambridge, Mass.: MIT Press, 1984, p. 40, n. 23, referring to Michael S. Gazzaniga & Joseph E. Ledoux, *_The Integrated Mind_*, New York: Plenum, 1978. See also, inter alia, Gazzaniga, "The Neuronal Platonist" (interview by Shaun Gallagher), *_Journal of Consciousness Studies_* 5:5-6 (1998), online at http://www.imprint.co.uk/gazza_iv.htm

[21] See Kurt Goldstein, *The Organism: a holistic approach to biology derived from pathological data in man_*, New York: Zone Books / MIT Press, 1995 (originally published 1934). In modern neuroscience Goldstein's role as a predecessor of more recent split-brain studies has been seen by Norman Geschwind, "Disconnexion syndromes in animals and man," *_Brain_* 88 (1965).

[22] See Nicholas Humphrey, *_A History of the mind_*, New York: Simon & Schuster, 1992, pp. 171-176, here, p. 172.

[23] For more on the 'embodiment' paradigm in cognitive science, see Francisco Varela, Evan Thompson & Eleanor Rosch, *_The Embodied Mind_*, Cambridge, Mass.: MIT Press, 1991.

[24] Patricia S. Churchland, *_Neurophilosophy: towards a unified science of the mind/brain_*, Cambridge, Mass.: MIT Press, 1986, p. 406.

[25] Daniel Dennett, "Quining Qualia," in A.J. Marcel & E. Bisiach, eds., *_Consciousness and contemporary science_*, Oxford: Oxford University Press, 1988.

[26] Thomas Nagel, "What is it like to be a bat?," *_Philosophical Review_* 83:4 (1974).

[27] William G. Lycan, "What is the 'subjectivity' of the mental?," in James Tomberlin, ed., *_Philosophical Perspectives vol. 4: Action theory and the philosophy of mind_*, Atascadero: Ridgeview Publishing, 1990, p. 126.

[28] Patricia S. Churchland, "Reduction and the neurobiological basis of consciousness," in Marcel & Bisiach, eds., *_Consciousness and contemporary science_*, p. 282.

[29] Gottfried Wilhelm Leibniz, *_New Essays on Human Understanding_*, P. Remnant & J. Bennett, ed. & trans. Cambridge: Cambridge University Press, 1982, book II, chapter I, sect. 15.

[30] Rene Descartes, *Oeuvres*, C. Adam & P. Tannery, eds. 11 vols., reprint, Paris: Vrin, 1964-1974, vol. IX, p. 60.

[31] Paul M. Churchland, *_The Engine of reason, the seat of the soul_*, Cambridge, Mass.: MIT Press, 1995, p. 198.

[32] David Armstrong, in his exchange with Norman Malcolm, *_Consciousness and causality. A debate on the nature of mind_*,

Oxford: Blackwell, 1984, p. 112. See Armstrong's *A Materialist theory of the mind*, London: Routledge & Kegan Paul, 1968 (2nd ed., 1993), pp. 100-115, for the materialist's reconstruction of introspection.

[33] Lycan, "What is the 'subjectivity' of the mental?", pp. 110, 116.

[34] See e.g. J.J.C. Smart, "The Identity theory of mind," *Stanford Encyclopedia of Philosophy* (<http://plato.stanford.edu>) (2000) and Armstrong, in Armstrong & Malcolm, *Consciousness and causality*, pp. 110-112. Admittedly, most of the cognitive science discussions of proprioception seem to miss its philosophical implications, too. In his broad and influential work *Being There. Putting brain, body and world back together again*, Cambridge, Mass.: MIT Press, 1997, Andy Clark simply says that proprioception is "the inner sense that tells you how your body is located in space" (p. 22) and leaves it at that.

[35] Charles Olson, "Proprioception" [1961-1962], in *Collected Prose*, ed. Donald Allen & Benjamin Friedlander, Berkeley: University of California Press, 1997, pp. 181, 182. Thanks to Homa Shojaie for helping me locate this text.

[36] See Walter J. Freeman, "The Physiology of Perception," *Scientific American* 264 (February 1991) and *How Brains Make Up Their Minds*, London: Weidenfeld & Nicholson, 1999.

[37] Lycan, "What is the 'subjectivity' of the mental?", p. 117.

[38] Erwin Straus, *Du sens des sens*, Grenoble: J. Millon, 1989, p. 183.

[39] Deleuze & Guattari, *Qu'est-ce que la philosophie?*, pp. 197-198.

[40] For Merleau-Ponty's overtly mystical statements about 'Flesh' see e.g. *Phenomenology of perception*, trans. Colin Smith, London: Routledge Kegan Paul, 1962, p. 212: "Just as the sacrament not only symbolizes... an operation of Grace, but is also the real presence of God... in the same way the sensible has not only a motor and vital significance but is a way of being in the world... sensation is literally a form of communion."

[41] On the social brain, see Paolo Virno, "Multitude et principe d'individuation," *Multitudes* 7 (December 2001), <http://multitudes.samizdat.net/Multitude-et-principe-d.html> and Charles T. Wolfe, "Il cervello sociale," *Forme di vita* vol. 4 (Rome, 2005). Some of the recent interest in Gilbert Simondon touches upon this topic, including the recent special issue of *Multitudes* 17 (2004).

[42] Andy Clark, *Natural-Born Cyborgs*, pp. 11, 43. Clark intersects here with a good deal of recent cultural theory, media theory, and literary theory (when it concerns itself with the relation between fiction, embodiment and technological forms) -- see in particular Donna Haraway's "cyborgs" (in "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women: The Reinvention of Nature*, New York: Routledge, 1991, online at

<http://www.stanford.edu/dept/HPS/Haraway/CyborgManifesto.html>) and Katherine Hayles' "posthuman" subjects (in "The Life Cycle of Cyborgs: Writing the Posthuman," in *A Question of Identity: Women, Science and Literature*, ed. M. Benjamin, New Brunswick: Rutgers University Press, 1993; *How We became posthuman: Virtual bodies in cybernetics, literature, and informatics*, Chicago: University of Chicago Press, 1999 and "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," op. cit.). But Clark is unique in that he speaks from within cognitive science -- which also entails that there is no utopian dimension to his theory.

[43] Clark, *Being There*, p. 45.

[44] Ibid., pp. 21, 87.

[45] V.S. Ramachandran & L. Levi et al., "Illusions of body image," p. 34.

[46] Clark, *Natural-Born Cyborgs*, p. 86.

[47] Hayles, "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," p. 300.

[48] Gilles Deleuze, *Negotiations 1972-1990*, trans. M. Joughin, New York: Columbia University Press, 1995, p. 26.

[49] Contrast Steven Quartz & Terry Sejnowski's "neural constructivism" (essentially a kind of 'hyper-plasticity') with Gazzaniga's insistence that we actually have less plasticity than is currently thought. Further, consider the 'new innatist' point that phantom limbs imply the existence of internal representations of our body which we are born with (e.g., the fetus which knows how to put its thumb in its mouth without 'putting out its eye', an example suggested by a participant in the 'Phantom Limb' conference).

Another, more cautionary response to invocations of plasticity is to point out that cortical remapping is not always a good thing! (Bodies are not just what Los Angeles media executives make out of them, in Eagleton's celebrated image -- he was attacking the postmodern obsession with the body coupled with its disregard for the real-life "piece of matter that sickens and dies," and concluded that "the creature who emerges from postmodern thought is centreless, hedonistic, self-inventing, ceaselessly adaptive. He [is] more like a Los Angeles media executive than an Indonesian fisherman"

[T. Eagleton, *After Theory*, London: Allen Lane, 2003, p. 186].)

[50] On the theme of the "cultured brain" see Warren Neidich, *Blow-Up. Photography, cinema and the brain*, New York: Distributed Art Publishers, 2003. A 'Deleuzian approach' to the brain is a significant component of Neidich's analysis; for a helpful discussion of Deleuze on the brain see John Rajchman, *The Deleuze Connections*, Cambridge, Mass.: MIT Press, 2000, pp. 133f., 136-138, and my review at <http://mentalhelp.net/books/books.php?type=de&id=476>

[51] Antonio Negri, "Alma Venus. Prolegomena to the common," trans. Patricia Dailey & Constantino Costantini, in Charles T. Wolfe, ed., *The Renewal of Materialism* (Graduate Faculty Philosophy Journal 22:1,

New York, New School for Social Research, 2000), 16b. Online at <http://www.generation-online.org/t/almavenus.htm>

[52] Ibid.

[53] See <http://www.stelarc.va.com.au> and <http://www.orlan.net>

[54] As suggested by an anonymous reviewer for CTheory.net

[55] Michael Hardt & Antonio Negri, *Empire*, Cambridge, Mass.: Harvard University Press, 2000, p. 362. For more on Negri's notion of "constitutive ontology," see my discussion, "Materialism and temporality. On Antonio Negri's 'constitutive' ontology," in Timothy S. Murphy & Abdul-Karim Mustapha, eds., *The Philosophy of Antonio Negri 2: Revolution in Theory*, London: Pluto Press, forthcoming 2007.

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