Bodily Self, Affect, Consciousness, and the Cortex

Commentary by Vittorio Gallese (Parma)

Mark Solms's hypothesis holds that two main body representations are housed in the brain: the sensorimotor body and the autonomic body. These two body representations would be associated with two different types of consciousness: cognitive consciousness and affective consciousness, respectively. According to Solms, cognitive consciousness is secondary and depends on the primary, brainstem-located, affective consciousness. The consequence of this is that Freud's id would be conscious, while the ego would be unconscious. In my commentary, while praising Solms for his emphasis on the inseparable relation between affect and consciousness, I challenge his rigidly dichotomous account of consciousness. In so doing, I vindicate the role played by the cortex and, in particular, the cortical motor system in generating the varieties of phenomenal self-awareness we entertain.

Keywords: affect; bodily self; cortical motor system; embodied simulation; feelings; neocortex

With "The Conscious Id," Mark Solms puts forward a thought-provoking, daring hypothesis. Solms builds upon the "affective revolution" (of which he is himself a protagonist—see Solms & Panksepp, 2012) brought forward by Jaak Panksepp's affective neuroscience (Panksepp, 1998a, 1998b) and by Antonio Damasio's enlightening studies and theorization on the neural basis of human feelings (Damasio, 1999, 2010; Damasio & Carvalho, 2013). Solms's hypothesis relies on empirical evidence and has the merit of attempting to weave together the body, the nature of consciousness, its affective connotations, the role of archaic subcortical brain structures, and the bearing of all this on psychoanalytic theory and clinical practice.

The gist of Solms' proposal is the following: (1) We can distinguish two main body representations in the brain: the sensorimotor body and the autonomic body. (2) These two body representations are associated with two different types of consciousness: cognitive consciousness and affective consciousness, respectively. (3) The first type of consciousness—cognitive consciousness—is secondary and depends on the primary,

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brainstem-located, affective consciousness. (4) From this, radical consequences ensue for psychoanalytic metapsychology: Freud's id would be conscious, while the ego would be unconscious.

In this commentary, for the sake of space, I focus only on the first three points of Solms's proposal. In particular, I discuss his—in my opinion problematic—rigidly dichotomous account of consciousness, maintaining that affective consciousness is entirely subcortical, while the cortically located sensorimotor body maps would generate at best a secondary and derivative cognitive consciousness.

First of all, I would like to state that Solms's proposal undoubtedly offers a fresh view of brainstem nuclei, long conceived of as mere "switches" of neocortical activity. Brainstem nuclei and, more generally, subcortical limbic structures not only modulate cortical activity, but also contribute to the affective quality of what is being processed at the cortical level. As aptly put by Solms, "Conscious states are inherently *affective*."

Furthermore, I very much agree with Solms when he points out that emotions are "peremptory forms of motor discharge." Solms correctly emphasizes that the distinctive feature of affective consciousness consists of the pleasure–unpleasure series, motorically expressed as approaching/withdrawal behaviors.

Indeed, a few years ago Thomas Metzinger and I argued in a similar vein that the prehistory of representational goal-states is likely to be found in the reward system, just because reward is the payoff of the self-organizing principles functionally governing and internally modeling the organization of the living body (Gallese & Metzinger, 2003; Metzinger & Gallese, 2003). Living organisms are endowed with drives pushing them toward homeostasis. Reward systems are necessary to tell the organism that it is doing right, that it is achieving a good level of integration. Thus, reward systems can be conceived of as generating a representational content of a nonsymbolic kind: the internal value assigned to a certain state. In one of those papers we wrote: "A conscious representation of value, as, for instance, expressed in a subjectively experienced emotional state, has the additional functional advantage of making survival value-related information globally available for the selective and flexible control of action, attention, and cognition within a virtual window of presence. It makes this information accessible to many different processing systems at the same time" (Gallese & Metzinger, 2003, p. 370).

The relation between goal-state representations and reward also plays a crucial role in cognitive development. Very early on, infants learn to rely on external causes for activating the reward system. Positive reactions (or their lack) to infants' behavior induced in adult caregivers provide very useful cues about how to act in a given context. Around 6 months of age, infants visually "check back" to the mother's emotional reaction in order to disambiguate how to react to certain events. Such a phenomenon is commonly designated as social referencing. The evaluation of the emotional signs of adults' reactions brings about the consolidation (or the inhibition) of a given goal-state representation.

The evolutionarily most ancient affect-related systems Solms describes in his Target Article not only provide emotional color to our behavior, but also likely provide basic and adaptive descriptions of objects[1] such as "edible," "not edible," "dangerous," "pleasurable," etc. (see Gallese, 2000). The implications for psychoanalysis could not be more obvious.

What I would like to challenge here is Solms's idea that phenomenal selfhood is the *exclusive* outcome of the upper-brainstem nuclei and of the limbic system. This view, on the one hand, while correctly criticizing the dominant corticocentric view of affective consciousness, downplays too much the role played by the neocortex in a variety of aspects of conscious life. I think that being a self whose experience of encounters with the world is constantly guided by the feelings such encounters evoke is inconceivable without the crucial role played by the neocortex. On the other hand, Solms's proposal betrays the neglect of the major role the cortical motor system plays in several aspects of consciousness, such as phenomenal body ownership and phenomenal agency (for a thorough discussion of these aspects, see Gallese, 2007; Gallese & Sinigaglia, 2010, 2011a). Briefly, it has been proposed that there is a sense of body that is enactive in nature, enabling the capture of the most primitive sense of self as bodily self. According to our perspective, the body is primarily given to us as a "source" or "power" for action—that is, as the variety of motor potentialities defining our interaction with the world we inhabit. Such primitive sense of self as bodily self is conceived of as being antecedent to the distinction between consciousness of agency and consciousness of ownership. Empirical evidence shows that the cortical motor system plays an important role in generating such a sense of bodily self (see Ferri, Frassinetti, Ardizzi, Costantini, & Gallese, 2012).

We recently addressed with an fMRI study the issue of how affect and action bind within the neocortex of healthy young participants (Ferri et al., 2013). This study shows how the emotion dynamically expressed by the face of an observed agent (happiness, anger, or neutral) modulates cortical circuits activated during the perception of her or his grasping action. As control

stimuli, participants observed either the same agent's face expressing an emotion, or the agent's body performing the same grasping actions with no visible face.

The trick was that the observed grasping actions were identical in all stimuli. What changed was the absence/combination of concurrent facial expressions of positive and negative emotions of the agent. Our results show that the observation of an action embedded in the emotional context constituted by the observed agent's facial expression, when compared with the observation of the same action embedded in a neutral context, elicits higher neural responses at the level of motor frontal cortices, and of temporal and occipital cortices, bilaterally.

In particular, observing actions embedded in the context of anger, but not happiness, compared with a neutral context, elicits stronger activity in motor-related cortical areas, such as the precentral gyrus and the inferior frontal gyrus, and the presupplementary motor area (pre-SMA)—all regions playing a central role in motor control. Results suggest that the observed dynamic facial expression of anger appears to modulate the embodied simulation of the observed action. The angry context is combined with the motor representation of the observed action at the level of the cortical motor system. This triggers an immediate, context-modulated embodied simulation from the observer.

The pre-SMA plays a central role in the control of motor behavior. Its higher activation for "angry" than for "neutral action" (Ferri et al., 2013; see also Oliveri et al., 2003) can be interpreted in the light of the role the pre-SMA plays in the shaping of self-initiated actions. One could speculate that the negative emotional context connotes the perceived action as potentially threatening and, hence, evokes in the observer the embodied simulation of her or his potential motor reaction. This integration process, taking place at the level of the neocortex, probably contributes to the building of the immediate ascription of the emotional intention associated with the observed action (see Ferri et al., 2013; Gallese & Sinigaglia, 2011b).

In view of such evidence, I think we should be very careful before assuming a rigid dividing line between cognitive and affective consciousness. As recently emphasized by Damasio (Damasio & Carvalho, 2013), "feelings are likely to arise from maps of body states"; thus, "it is sensible to focus the search for neural substrates of feelings on the regions exhibiting topographically organized somatic maps" (p. 146). They conclude that ". . . the most prominent system level candidates for neural substrates of feelings can be found on two distinct phylogenetic levels: the more primitive level of the brainstem (specifically, the parabrachial nucleus, the nucleus tractus solitarius, the periaqueductal grey and the deep layers of the superior colliculus) and the more recently evolved cerebral cortex (specifically, the insula, SI and SII [somatosensory I and II])" (p. 146). I would certainly add cortical motor areas to this list.

Three levels of selfhood have been identified from a phenomenological point of view (see Parnas, 2000, 2003). The first one consists of the implicit awareness that this is "my" experience. Such pre-reflective level of selfhood is sometimes referred to as the "basic" or "minimal" self, or as "ipseity." The second level consists of the more explicit awareness of self as an invariant subject of experience and action. Such a reflective level of self-awareness presupposes the "minimal" self. Finally, there is the social or narrative self, which refers to personality, habits, style, and other characteristics of an individual.

I agree with Solms when he says that our conscious thinking is "*constantly accompanied by affect*." However, on the basis of the currently available neuroscientific evidence, I am not convinced that a phenomenal first-person perspective can be exclusively explained by affect and its subcortical underpinnings. For the very same reasons, I am even less convinced that the "cortex is nothing but random-access memory" and that Freud's "bodily ego" can *only* become conscious "when cathected by the id." Luckily enough, all of these issues can be empirically investigated by cognitive neuroscience.

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