

Consciousness is more than wakefulness

Commentary on "Consciousness without a cerebral cortex:
A challenge for neuroscience and medicine" by Merker
Brain & Behavioral Sciences, in press

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Merker's definition of consciousness excludes self-reflective thought, making his proposal for decorticate consciousness not particularly groundbreaking. He suggests that brainstem sites are neglected in current theories of consciousness. This is so because broader definitions of consciousness are used. Split-brain data show that the cortex is important for full-blown consciousness; also, behaviors exhibited by hydranencephaly patients and decorticated rats do not seem to require reflective consciousness.

In the target paper Merker wisely starts by explaining what his view of consciousness is. He defines consciousness as "... a state of wakefulness ... which typically involves seeing, hearing, feeling, or other kinds of experience...", but excludes reflective awareness (i.e., being "aware that one is seeing, hearing, and so forth..."). As such, consciousness is equated with wakefulness and responsiveness to one's environment, and the reader is indeed tempted to concur with the author that consciousness results from activity of subcortical and brainstem mechanisms. In other words, the proposal that consciousness, as defined above, is possible without a cortex does not seem particularly groundbreaking and has been supported by neurophysiological evidence for quite some time now (as Merker extensively documents in the target paper).

Merker states that "Few cognitivists or neuroscientists would today object to the assertion that 'cortex is the organ of consciousness.'" "With some notable exceptions..., brainstem mechanisms have not figured prominently in the upsurge of interest in the nature and organization of consciousness that was ushered in with cognitivism in psychology and neuroscience..." This is not surprising, since what most researchers today are interested in is not "consciousness in its most basic and general sense, that is, as the state or condition presupposed by any experience whatsoever", but in full-blown introspective consciousness—which does depend on cortical activity. More than forty-five years of split-brain research has convincingly shown that surgically isolating the cerebral hemispheres alters consciousness (Gazzaniga, 2005). At least six main interpretations of commisurotomy have been put forward (Morin, 2001)—of which only one suggests that consciousness is unaltered by the surgical procedure; the other five views (pre- and post-operation dual consciousness, equal and unequal division of consciousness, and dual personhood in the intact brain) all ascribe a key role to the cerebral hemispheres (and thus to the cortex) in consciousness. The fact that Merker does not mention this large body of work in the target article is rather disconcerting.

Hydranencephaly is used by the author to support his view of decorticate consciousness. He reports his first-hand experience with children afflicted by this condition and proposes that "These children are not only awake and often alert, but show responsiveness to their surroundings in the form of emotional or orienting reactions to environmental events..." This is followed by a description of behaviors that these children can engage in, including expressing pleasure and aversion, differentially responding to the voice of familiars, showing preferences for situations, and taking behavioral initiatives. It is further observed that decorticated rats can "... stand, rear, climb, hang from bars, and sleep with normal postures..." They can also swim, eat, mate, and defend themselves. The question, of course, is: How should one interpret such behaviors in relation to consciousness? Does expressing emotions or swimming entail "consciousness" as defined by Merker? Certainly. Do these behaviors necessitate self-awareness? Most probably not. This represents a challenge reminiscent of the one

primatologists face when trying to determine if apes possess Theory-of-Mind, auto-noetic, or metacognitive abilities (see Terrace & Metcalfe, 2005). For instance, one can ask animals to recall food locations or past personal events to test auto-noetic consciousness. Monkeys can indeed exhibit such behaviors (Menzel 2005; Schwartz, 2005), but again, the point is that such behaviors most likely imply wakefulness and responsiveness but not reflective consciousness.

Merker cites Baars (1988), Mandler (1975), and Miller (1986) as examples of theorists who do not focus on subcortical brain areas in their attempts to explain consciousness. The reason for this is simple: their definition of consciousness is much broader than the one proposed in the target article. To illustrate, Baars' definition of consciousness (1988) includes one's private experience of reading a word, remembering what one had for breakfast yesterday, and the feeling of a toothache—i.e., instances of visual and auditory images, inner speech, bodily feelings, etc. Consciousness also contains "peripheral" information at the fringe of conscious experience—e.g., the vague awareness one has of surrounding noises. Consciousness also encompasses one's access to current beliefs, intentions, meanings, knowledge, and expectations, as well as voluntary control. Baars' more operational definition of consciousness requires that (1) the organism can testify that it was conscious of something following the conscious experience, and (2) an independent effort at verifying the accuracy of the experience reported by the organism be made. Interestingly, Baars rightly notes that in reporting its experience the organism engages in a metacognitive act. Clearly, such a view of consciousness goes far beyond wakefulness and incorporates auto-noetic consciousness (access to one's autobiography and mental time travel), self-description, verbal report, metacognition, and self-agency. These various facets of consciousness are reflective in essence.

If one defines consciousness simply as a state of wakefulness and responsiveness, then of course only brainstem sites are necessary, and Merker's careful analysis is very useful in that respect; however, if one embraces the more common view of consciousness which includes self-reflection (e.g., Dennett, 1991; Schooler, 2002; Zelazo, 1999), then obviously cortical areas are involved (e.g., Craik *et al.*, 1999; Goldberg *et al.*, 2006; Johnson *et al.*, 2002; Kjaer *et al.*, 2002), and Merker's thesis does not apply.

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