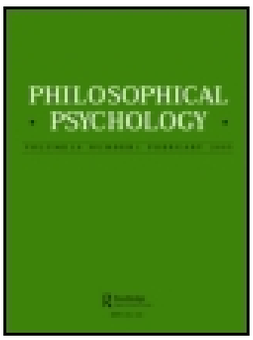

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The centered mind: What the science of working memory shows us about the nature of human thought

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BOOK REVIEW

The centered mind: What the science of working memory shows us about the nature of human thought, by Peter Carruthers, New York, NY: Oxford University Press, 2015, 256 pp., $50.00 (hardback), ISBN 9780198738824

Accounts of reflective reasoning, the ability to bring myriad thoughts and experiences together to bear on one another, have featured centrally in the history of philosophy. Peter Carruthers, in *The Centered Mind*, presents a sustained challenge to the intuitive view that commonplace reflection allows for the free association and interaction of both sensory and non-sensory, or amodal, thoughts. Rather, Carruthers argues that our stream of consciousness, in which reflection occurs, admits of only sensory-laden thoughts, leaving our amodal thoughts, including intentions and goals, to operate unconsciously, directing the stream of consciousness and reflection from behind the scenes. In motivating this view, Carruthers reviews large swaths of literature from human and non-human cognitive science, building both a compelling case for his revisionary philosophical claim and an accessible introduction to recent empirical investigations into the nature of working memory and attention. Simultaneously, this work presents the first philosophically oriented introduction to the foundational construct of *working memory*. If the overall project suffers from any major faults, it is in the daunting task of adequately condensing the substantial and convoluted empirical findings and fruitfully bringing those results to bear on a host of disparate philosophical discussions, from action theory to functionalism of mind, that Carruthers employs to move his central claim forward.

The Centered Mind is divided, roughly, into four parts that correspond nicely to the argumentative steps necessary for Carruthers' radical account of reflection. To defend his account that only sensory-laden thoughts can participate in consciousness and, a fortiori, reflection, while amodal attitudes operate unconsciously in the background, Carruthers must carry out three moves. First, he must show that there *are* genuine amodal attitudes. Second, Carruthers must demonstrate that our cognitive capacities underlying consciousness and reflection are sensory-based, and hence cannot admit amodal attitudes. Consequently, he must argue against the existence of an "amodal workspace," or an additional, necessarily unconscious, reflective capacity that trades solely in amodal attitudes, in part by showing that the previous sensory-based and conscious reflective capacity can exhaust the requirements of reflection. Lastly, completing these moves allows him to present the upshot, and possibly the most exciting part, of the project, which both traces an evolutionary continuum that our reflective capacities share with other animals and challenges prototypical claims of human uniqueness, including paradigmatic accounts of rationality and agency. Each of these moves will likely interest a different set of scholars, as Carruthers draws from many literatures that are rarely brought into contact with one another. However, in what follows I will focus on the first and second moves, sketching the mental architecture that Carruthers appeals to and diagnosing potential pitfalls along the way.

The book begins by taxonomizing a range of amodal propositional attitudes, from the classic dyad of belief and desire, continuing through goals, judgments, intentions, and

decisions, borrowing heavily from work on action theory, particularly Bratman's theory of intentions (1987). Beliefs form a broad class of information-bearing first-order states that operate unconsciously and guide decision processes (pp. 21, 196). Desires are a set of unconscious first-order evaluative and motivational states that help guide decisions (p. 23). Decisions are the unconscious products of a process of deliberation and issue in intentions, which themselves are abstract motor-plans for action that can be executed, stored in memory for future use, or when coupled with sensory content—for example in imagining future action—reflected upon (p. 24). Goals are often abstract desire-like states that, "control and direct the attentional processes" that, for instance, keep one focused on a task (p. 24). At risk of spoiling what's to come, let me give an example to illustrate the kind of mental architecture that Carruthers appeals to. Suppose I'm sorting through avocados at the store, trying to find a ripe one. I would have a set of goals, such as, "I am making guacamole tonight," that interact with beliefs, such as, "avocados are necessary for guacamole," to direct my attention to the avocados that I sort. While my attention is directed, my perception of the avocados is rendered globally accessible to many consumer systems that can send evaluative signals and compete for attentional resources, such as, "this avocado is too hard: hence not *good*." These signals can interact with my goals to issue in motor plans (i.e., intentions) to, for instance, place the avocado back and pick up another one. Crucially, none of the propositional attitudes are themselves globally accessible (i.e., conscious), only the sensory perceptions are; however, some of these amodal attitudes can be rendered conscious when they are correctly embedded or coupled with sensory content (consider a sentence in inner speech, "Hmm, not ripe," prompted by holding a green avocado) (p. 72). Now it should be evident just how Carruthers' project is dependent on the global broadcast account of consciousness.[1]

Global broadcast theories of consciousness hold that a mental state is conscious when it is made "globally" or broadly available to a wide set of brain systems for consumption and processing (p. 52; see also Baars & Franklin, 2003). The mechanism by which a state is broadcast is a kind of attentional "spotlight," resulting in some form of attention being necessary for consciousness, or at least for report (i.e., access-consciousness) (pp. 62–63). Some scholars (Prinz, 2012) push the claim to suggest that attention is *sufficient* for consciousness; however, Carruthers takes a weaker, albeit vague, line wherein attention is sufficient for consciousness when directed at a stimulus that is "*sufficiently intense and long-lasting*" (p. 58). In reviewing the empirical literature on attention, Carruthers finds that "attention itself has an exclusively sensory focus," primarily targeting "midlevel sensory areas" pp. (91–92). This picture of attention and its role in consciousness serves to restrict current conscious thoughts to a sensory domain, with amodal attitudes only participating indirectly either by directing attention or when properly embedded in sensory contents. However, in isolating attention as an active, necessary, and sensorily focused lynchpin of consciousness, Carruthers is forced to equate attention with the narrow notion of covert, top-down attention—suggesting without argument that it forms a "natural kind" at the core of attention—at the expense of the diverse range of attentional processes often discussed in cognitive science, including overt and bottom-up forms (p. 63). This ostensive circumscription of foundational psychological constructs—such as attention and working memory—from their convoluted and contentious statuses in the literature, though likely necessary for expediency, is simultaneously my largest gripe with Carruthers' method and project.

With a sensorily dependent model of conscious perception on the table, it's an easy extension to reflection. All that is needed is a system that can token and sustain similar states in the absence of current perceptual stimuli. Carruthers finds just such a system in working memory, the famed psychological capacity enabling us to maintain and

manipulate information no longer present in our environment (Baddeley, 2003). To preclude amodal attitudes from entering the contents of working memory without their proper sensory contents, Carruthers must—as with attention—restrict working memory to sensory-laden states. He does this in two ways, first by siding with theorists such as Postle (2006) who argue that working memory is a process that emerges and constitutively depends on sensory systems, pace earlier accounts of working memory as an abstract, frontally loaded process (Goldman-Rakic, 1995, p. 76). Second, Carruthers holds that the attentional systems that guide the maintenance and manipulation of states in working memory are the same narrowly circumscribed systems that operate in the case of conscious perception (p. 89). Consequently, all contents of working memory, given their direction by attention and Carruthers' previous commitments to global broadcasting, must be conscious and sensorily laden (p. 107).

Of course, these conclusions run afoul of recent dialectical shifts in the working memory literature that indicate that the construct is far from stable, particularly the search for unconscious working memory and "activity silent," or unattended, working memory representations that participate in the maintenance of information (Lewis-Peacock, Drysdale, Oberauer, & Postle, 2012; Soto, Mäntylä, & Silvanto, 2011; Stokes, 2015). Carruthers simply denies that these results are genuine instances of working memory, for instance terming the "unattended" representations found by Lewis-Peacock and colleagues to be *long-term working memory* and not "working memory properly so-called," as their underlying mechanisms are distinct (p. 91). This move is troubling for at least two reasons. First, many theorists, including Baddeley, consider "long-term working memory" to be a constitutive part of working memory (2010, p. R140). Second, if working memory involves the maintenance and manipulation of information in the service of goals, it is likely that we will find many mechanisms that service these broad functions. Consider how even non-cognitive structures such as the retina can engage in the maintenance and manipulation of information when these functions are broadly described: Activation can persist in the retina after the withdrawal of the stimulus (for example, when seeing an after-image), and cells in the retina can inhibit their neighbors, thus enhancing edge contrast and producing the undulating Mach band illusion. D'Esposito and Postle suggest as much, stating, "it is likely that there are numerous neural mechanisms that can support the short-term retention of information in working memory and many likely operate in parallel" (2015, p. 6). It may be argued that Carruthers is concerned with more narrow functions than maintenance and manipulation; however, he cites working memory as the source of many broad ranging cognitive phenomena, including episodic remembering, reasoning, prospection, creativity, and so on that certainly instantiate broad cognitive functions and recruit diverse mechanisms (pp. 118, 158, 166). Adding to the confusion, some theorists identify working memory exclusively with the mechanisms that manipulate representations, not those that sustain them (Postle, 2015). Clearly what is needed is a more thorough philosophical account of these constitutive functions and their roles.

In any case, if Carruthers' view of working memory holds, then he has established a space for conscious, active, and sensorily dependent reflection that excludes purely amodal concepts and attitudes from entrance. Despite my worries regarding the circumscription of attention and working memory, I am broadly sympathetic to this conclusion and am especially impressed by the compelling evolutionary narrative and evidence Carruthers proffers in chapter eight to anchor this account (the work described on avian remembering and prospection (pp. 212–213) alone merits its own manuscript). I find it remarkable that this serious, and much needed, philosophical treatment of the dense and convoluted constructs of attention and working memory leads us to a similar, sensorily dependent, account of the mind as Aristotle holds in the *De Anima*. Recall that in the *De Anima*,

Aristotle introduces the capacity of *phantasia* which, like working memory, enables us to entertain a perceptual image in the absence of any stimulus; more crucially, *phantasia* is deemed necessary for all thought, as "the soul never thinks without an image" (431a16). Scholars have attempted to diffuse the anti-propositional content of this claim for millennia; however, if Carruthers is right, they may not have to.

Note

1. For those keeping track, Carruthers' embrace of a first-order, global workspace account of consciousness is a substantial revision of his previous commitment to higher-order thought theories of consciousness (2000).

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