Toward a Resolution of the Debate on the Cognitive Penetrability of Perception

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What determines the contents of our perception? A century and a half of psychophysics research has focused on the process by which objectively measurable stimuli are represented by the brain. This paradigm has focused on discovering lawful relationships by which we form veridical representations of the external world and has classically viewed perception as a one-way mapping from the world to the mind. At the same time, perception researchers have long understood that perceptual systems have been honed by evolution to transform energy (electromagnetic waves, mechanical vibrations, aromatic molecules) into forms useful for guiding our actions (Marr, 1982). To be maximally useful, the same input should be represented differently depending on current task demands. This idea conflicts with the traditional emphasis on veridicality (e.g., Hoffman, Singh, & Prakash, 2015; cf. Lupyan, 2015b). If true, then rather than focusing on the world as a determinant of what we perceive, the best approach for understanding the contents of our perception may be to emphasize the needs, goals, and expectations of the organism as they *relate* to the world (a line of thinking diversely represented in e.g., Clark, 1997; Gibson, 1979; Noe, 2004).

It is this tension that underlies the debate on the *Cognitive Penetrability of Perception* (Fodor, 1984; Churchland, 1988; Pylyshyn, 1999). Are the contents of our perception determined strictly by physical inputs (no cognitive penetrability of perception), or are they jointly determined by physical inputs and our cognitive states (perception is cognitively penetrable).

Many may have thought that this debate has been settled by modern cognitive (neuro)science. As it turned out, the debate just took a hiatus and is now rekindled and going strong (e.g., Deroy, 2013; Firestone & Scholl, 2014, 2016; Goldstone, de Leeuw, & Landy, 2015; Lupyan, 2015a, 2017a; Lyons, 2011; Ogilvie & Carruthers, 2015; Raftopoulos, 2005; Teufel & Nanay, 2016).

I will argue that despite the continuing terminological and methodological disagreements, we have sufficient empirical evidence to resolve the debate in favor of cognitive penetrability.

The first half of the talk will outline a theoretical argument that what we know about the function of perception and its neural implementation *necessitates* perception to be cognitively penetrable (at least in organisms with mammalian behavioral repertoires). The second half will provide examples of demonstrable effects of cognitive states affecting what we perceive. For example, verbal cues can make otherwise invisible percepts, visible (Lupyan & Spivey, 2010a; Lupyan & Ward, 2013), and participants' knowledge that pumpkins are orange but that cars come in a variety of colors causes people to experience more vivid color afterimages of pumpkins than of pumpkin-colored cars (Lupyan, 2015c).

I will end by issuing several challenges to remaining skeptics of the idea that what we know routinely influences what we perceive.

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