

## Insects: Still looking like zombies

Commentary on [Klein & Barron](#) on *Insect Experience*

**Christopher S. Hill**

Department of Philosophy, Brown University

**Abstract:** In arguing that insect brains are capable of sentience, Klein & Barron rely heavily on Bjorn Merker's claim that activity in the human mid-brain is sufficient for conscious experience. I criticize Merker's claim by pointing out that the behaviors supported by midbrain activity are much more primitive than the ones that appear to depend on consciousness. I raise a similar objection to Klein & Barron's contention that insect behaviors are similar to behaviors that manifest consciousness in human beings. The similarity is weak. I also respond to the related view that integrative activity in mid-brain structures is sufficient to explain the sensory integration that characterizes human perceptual experience. There is good reason to think that the cortex makes additional contributions to experiential integration.

**Keywords:** consciousness, perception, midbrain, insect, sensory integration

[Chris Hill](#) works on problems in epistemology, philosophy of language, and philosophy of mind.  
<http://bit.ly/ChristopherHillphilo>



Klein & Barron (K & B) (2016) claim that insects are capable of perceptual consciousness. Their main argument for this view runs as follows:

*First premise:* Certain types of midbrain activity are sufficient for subjective experiences in human beings and other vertebrates (Barron & Klein 2016, p. 2).

*Second premise:* Insect brains are functionally isomorphic to vertebrate midbrains in all the respects that are relevant to conscious experience (K & B, p. 5).

*Conclusion:* Insects probably have subjective experiences.

As K & B point out, this argument leads immediately to the claim that insects have a form of consciousness, because there is a "very basic sense of 'conscious' that refers to the basic capacity to have subjective experience" (K & B, p. 2).

What exactly do the authors mean by subjective experience? I don't think there's a clear answer in K & B, but we can see what they have in mind by considering the following passages from Barron & Klein (2016):

*"In vertebrates the capacity for subjective experience is supported by integrated structures in the midbrain that create a neural simulation of the state of the mobile animal in space. This integrated and egocentric representation of the world from the animal's perspective is sufficient for subjective experience."* (Abstract)

“[T]he human midbrain subserves the basic capacity for subjective experience. It does so in virtue of producing an integrated simulation of the state of the animal’s own mobile body within the environment.” (p. 2)

Expanding on these passages, in the light of various supplementary comments K & B make, we can say that in their view, a subjective experience is a spatiotemporal model of the environment that integrates information from the various senses and represents egocentric spatial relations between perceived objects and the subject. They also hold that every subjective experience has a proprietary phenomenology (K & B, p. 1). Thus, they mean to be discussing what is known to philosophers as “phenomenal consciousness.”

K & B are to be congratulated and thanked for questioning the widely received view that consciousness is a cortical phenomenon. Without such challenges, science and philosophy fall into dogmatic slumbers. Inevitably, however, there are reasons for concern. The most important of these is that K & B say very little in defense of what appears to be their central claim – that certain representations in the human midbrain are sufficient for conscious experiences. Instead of giving detailed arguments for this sufficiency thesis, they refer their readers to the work of Merker (2007). I think this is a mistake because, as far as I can tell, Merker’s reasoning leaves a lot to be desired.

Merker offers several arguments that purport to establish an intimate relation between midbrain activity and consciousness, but most of them could at best establish a necessity thesis. Thus, for example, he points out that consciousness can be significantly impaired and even suspended by interventions in the midbrain. This argues for necessity but is irrelevant to sufficiency. To make a case for sufficiency, Merker has to provide evidence for consciousness in subjects who either lack a cortex altogether or possess it only in highly attenuated form. He tries to meet this obligation by appealing to children who are afflicted with hydrocephalus. He maintains that these patients are capable of a range of behaviors that accompany consciousness in normal subjects. For the most part, however, his examples are not convincing, because the behaviors tend to be much more primitive than the ones that plausibly require consciousness. His examples include orienting to objects and visually tracking them as they move. These behaviors are no evidence of consciousness. Blindsight patients can orient to objects that are presented in their blind fields, and they are also capable of tracking such objects (Weiskrantz 2009). Merker also cites the expressions of emotion shown by hydrocephalic children, pointing out that they can occur even when the cortex is virtually annihilated. But again, the behaviors he cites are too primitive to count as good evidence for consciousness. Like the similar displays of infants, they can be explained as behavioral manifestations of unconscious needs, designed to trigger nurturing responses in solicitous parents.<sup>1</sup>

In addition to the official argument that I cited in my first paragraph, it is possible to extract two others from the target article. I am not sure whether they were intended as stand-alone arguments, but they have a certain *prima facie* appeal and it seems best to take note of them. One is just that perceptual integration takes place in the midbrain, particularly in the superior colliculus. Information from all of the spatial senses is represented there, and the structural relationships among the representations are strongly indicative of integration. Since, as we saw, K & B emphasize perceptual integration in their account of subjective experience, it might seem appropriate for them to conclude that the midbrain is the seat of subjective experience. The

trouble is that the brain contains multiple sites, including cortical sites, where perceptual representations are integrated. Consider awareness of speech, which binds together visual and auditory information. It is plausible that such awareness has a cortical ground, given its complexity and availability to higher cognitive faculties, such as those that are responsible for forming and testing beliefs. There is also experimental evidence for cortical integration of perceptual information. Thus, for example, it appears that when transcranial magnetic stimulation is applied to the posterior parietal cortex, it can interfere with the processes that bind visual and tactual information. This demonstrates a causal connection between cortical activity and multisensory integration (Pasalar et al. 2010).

I turn now to a third argument for insect consciousness. Unlike the first two, which depend crucially on the claim that certain types of midbrain activity are sufficient for human perceptual consciousness, this third one sets aside questions about midbrain activity and focuses instead on a direct analogy between human experiences and states of insect brains. Let us use “I-states” as a term for the states of insect brains that K & B believe to be conscious. The idea is that I-states play causal roles in the lives of insects that are very similar to the causal roles that conscious experiences play in us. Developing this idea, K & B claim that I-states (i) support assessments of the significance of various external objects for the organism, given its current needs; (ii) support processes integrating current information about the environment with information that is stored in memory; (iii) support planning of courses of action, including courses of action that are directed on goals that are not currently perceived; and (iv) support decision making. These are all properties of conscious experiences in human beings, so there are grounds for thinking that the insect states in question are conscious experiences.

Or so it might seem. In fact, however, reflection shows that this line of thought is vulnerable to an objection like the one to Merker’s claims about victims of hydrocephalus. It is no doubt true that bees and flies engage in activities that bear *some* degree of resemblance to such human activities as evaluating objects, planning, decision making, and forming and testing beliefs, but there is plenty of room for doubt that they are capable of the complex forms of the latter activities that are supported by conscious experiences.

## Notes

1. As is widely recognized, there is good reason to think that we are endowed with quick but very dirty heuristics for attributing complex mental states to other beings. Arguably this is what is at work when we respond to the primitive behavioral displays of children with virtually no cortex by attributing emotions to them. (The existence of such heuristics is illustrated by a famous video by Heider and Simmel (1944). In the video, simple two-dimensional shapes (two triangles and a circle) move in ways that are characteristic of biological creatures, and as a result, viewers find it almost irresistible to ascribe complex emotions to them — even though, on reflection, they recognize that ascribing emotions to two-dimensional shapes is absurd. The difference between the shapes in the video and severely afflicted children is that it’s more difficult to second guess the results of the heuristics in the latter case, because the beings have an outwardly human form. But of course, having a human form provides no additional *evidence* of conscious emotional experience.)

2. I thank Casey O’Callaghan for very helpful advice.

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