



Appraising evidence for valence

## Assessing evidence for valence

Commentary on [Segundo-Ortin & Calvo](#) on *Plant Sentience*

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**Abstract:** I make some remarks about whether evidence of valenced responses constitutes evidence of valenced states, and therefore of sentience, in organisms.

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Segundo-Ortin & Calvo (2023) (S&C) present compelling evidence that plants are capable of complex cognitive capacities and argue that this increases the probability that plants are also capable of sentience. In this commentary, I will focus on a point briefly touched on by S&C, but closely related to their main argument: What constitutes evidence for valenced states in an organism?

In a concluding passage, S&C claim that the list of cognitive abilities that increase the probability that plants are sentient includes not only decision-making, learning and memory, but also “valence” (p. 19). In this context, valence is understood as the “organism’s capacity to assign a value (advantage/good, harm/bad) to a particular stimulus or the summary of information about its surroundings relative to its own current state.” (Lyon et al., 2021, quoted by S&C).

To understand the relevance of valence in the argument, we should keep in mind that researchers standardly distinguish a “broad” notion of sentience, understood as the capacity to experience mental states (also referred to as “phenomenal consciousness”), from a “restricted” notion, understood as the capacity to feel valenced states such as suffering or joy (also referred to as “affect”). The association between valenced states and phenomenal consciousness remains an area of unresolved debate, but evidence of valenced states in an organism is still widely considered to raise the likelihood of phenomenal consciousness (Dawkins 2017), as S&C’s concluding remarks attest.

As S&C point out, there is little doubt that plants’ cognitive repertoire includes the capacity to value perceived stimuli and select the course of action that appears to maximize positive outcomes or minimize negative ones (e.g., during root foraging). Particularly relevant is the finding that decision-making processes in some plants can involve trade-offs between competing parameters, such as richness of soil vs. degree of certainty, rather than mere automatic responses (Dener et al 2016). However, the question arises: does the capacity to evaluate constitute empirical evidence of the capacity to experience valenced states?

To understand those cases where it does, let us note that, apart from decision-making, there are plenty of aspects of an organism's responses that may be considered "valenced": Behavioural, physiological, or expressive responses can be categorized as "positive" or "negative" because they are triggered by stimuli that increase/decrease the organism fitness, for example. Lacking direct evidence for affect, researchers single out those responses that reliably occur as a consequence of affective states in the presence (or absence) of species-relevant environmental stimuli.

At this stage, however, it would be a mistake to count such a hypothesis as evidence of valenced states in an organism. To achieve that, the causal link between valenced states and valenced measurable responses needs to be embedded in a theoretic framework in which it fulfills an explanatory role.

Let's look at two representative examples of such an embedding:

1. Researchers may proceed by comparing physiological responses in humans reporting the experience of affective states with the physiological responses of non-human mammals undergoing similar experimental conditions, grounded on the idea that similar effects in phylogenetically close species arise from similar causes (Panksepp 1998).
2. In the case of species more distant from us, such as invertebrates, researchers may instead proceed by measuring the influence of affective states on their judgment, grounded on extensive evidence that individuals in negative states manifest more "pessimistic" judgments relative to their counterparts in more positive states (Mendl et al. 2010)

In both examples, the prediction — namely, that a particular physiological or behavioural response is triggered by valenced states — is confirmed or not (or, if necessary, refined) according to an independently motivated set of assumptions. These may relate to the physiological substrate behind the realization of affective states in phylogenetically close species, the function of affective states as proximate mechanism guiding organisms' behaviour, etc.

Hence, there is no need to hypothesize valenced states on the basis of just the observation of valenced-like behavioural, physiological, or expressive responses; an explanatory framework is required. When physicists hypothesize theoretical entities, they do not do so merely on the basis of observations or effects, but on the basis of an explanatory model (e.g., the Higgs boson, which was hypothesized to explain the origin of particle masses within the Standard Model of particle physics) or a theory (e.g., the neutrino, which hypothesized to explain certain aspects of the  $\beta$ -decay within the theory of the weak interaction). It would be difficult to argue for weakening such a requirement in the case of non-animal entities.

In conclusion, the observation of complex cognitive abilities in plants, including the capacity to evaluate environmental stimuli as positive or negative, does not constitute evidence of the capacity to experience valenced states – and therefore, following a widespread assumption, of the capacity of phenomenal consciousness. Observed aspects of an organism's responses that may be construed as valenced may, at most, raise the subjective probability of affective sentience, but not the objective one.

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