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Editorial

All Is Perception

Robert Friedman †

Department of Biological Sciences, University of South Carolina, Columbia, SC 29208, USA; bob.network.science@gmail.com
† Retired.

Abstract: This editorial addresses the universality and importance of the science of perception. In particular, recently published studies in this journal illustrate the natural variations in perception. These articles are a reminder of perception as a natural process with inherent variations and that any two individuals are not guaranteed to form the same representation of an object, regardless of whether it originates from the senses or not. Since perception is a foundation for higher cognition, it also has an immense influence on studies of humanity and interpretations of natural processes.

Keywords: perception; internal reconstructions; physical processes; mental processes; neural network; awareness; cognition

1. Overview on Sensory Perception

Our knowledge is constructed from the outside world in the form of internal representations, including those of sensory and abstract objects [1,2]. These constructions are formed by a complex process in the neural network of the brain, a network that varies among individuals. Therefore, an individual is not expected to form knowledge in the same way as others [3–7]. The reasons for this variation include differences in the physical structure of the brain, sensory experiences, internal representations, and interactions among these phenomena. Originating from a probabilistic process, the internal representations are formed from observation. Likewise, the outside world represents information in different forms by the pathways of probabilistic processes that are not bound by a principle of locality, where this principle refers to the assumption of a spatial component in the physical world [8].

The above limits on the formation of knowledge are based on mathematics, logic, and individual experience [9,10]. Sensory perception in humans is equally subject to variations through different mechanisms, such as genetics, animal development, and learning. An individual may have a deficit in the perception of a visual object, or recognition of a speech pattern, while another individual may compensate for this deficit by learning or another process of resilience [11,12]. This phenomena of perception can otherwise be described as a complex pathway including mechanisms that compensate for error [13].

The phenomena of speech perception has been theorized since the time of Plato's *The Sophist*, and is complemented by a more recent book, Lippmann's *Public Opinion* [14]. Therefore, speech perception is a complex pathway that is limited by its physical causes. However, it is perhaps simpler to conceive of visual perception since a person tends to judge the world based on what they can see. As stated in Aristotle's *Metaphysics*, "we prefer sight, generally speaking, to all the other senses", although these concepts mask that speech perception and language processing are crucial for forming higher knowledge [15].

These perceptions are not merely abstract ideas for scientific analysis. They are also inherent in our navigation and interpretation of the world. This exemplifies the importance of perception as a science and its full incorporation into other areas of knowledge, such as the social sciences, and contrasts to a deterministic view based on a theory of the mind that relies on non-material interpretation. These interpretations often arise from faith in

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Citation: Friedman, R. All Is Perception. *Symmetry* **2022**, *14*, 1713. https://doi.org/10.3390/sym14081713

Received: 10 August 2022
Accepted: 12 August 2022
Published: 17 August 2022

common sense, most often a naive and oversimplified construction of reality. However, metaphysical assumptions, whether they stem from formal hypotheses, or instead from naive certainty, must allow for perceptual experience and its variability. The science of perception places a limit on our ability to acquire knowledge and the construction of belief.

As stated earlier, vision is arguably more reliable as sensory information than hearing. However, it may be conjectured that speech perception is the main mechanism of sociality in humans, whereas in other species, such as in hymenopterans, other mechanisms, such as chemical signaling, may be used to enforce strict and genetic social organization.

2. Perception as a Social Science

Perception is a process that includes information retrieval and representation construction. It is also a mechanistic foundation for conspecific and predator–prey interactions in animals. The hymenopterans are particularly illustrative of sociality since members of their taxonomic order have complex societies analogous to those of humans. As the naturalist David Attenborough noted, this system is an opportunity for conspecifics and predators to test the constraints of a social order [16]. Natural selection is a putative mechanism for the formation of complex societies, although this process is not inevitable in an evolutionary context, but instead better described as a sequence of novelties where each step is expected to lead to a stable social order. While these societies are maintained by conformity among members of the population, one mechanism for instability in the system is deception. Given no compensatory mechanism, deception as a term is a personification of the instability of such a system. Instead, it is better to consider society as a population-level phenomenon that has an origin, and is then maintained over evolutionary time as a response to the natural environment. In other words, societies in nature are tractable to the mathematics of population biology. The ability of individuals to perceive and respond to deception is largely dependent on sensory perception. Social insects, such as leafcutter ants, maintain their social order by chemical signaling, including the control of reproduction by its members [17,18]. This is commonly referred to as innate behaviors, presumably to contrast them with intentional behaviors.

It follows that the concepts of innateness and intentionality are juxtaposed in describing the responses of individuals in societies. However, this proposition is not well-supported by evolutionary processes in an animal society, one that has a low tolerance for intentional deception and the resulting instability of this system. In the case of a capacity for true intent for deception, individuals are not bound by societal constraints, and the social system would likely go unobserved since the time scale of evolution would extinguish all or nearly all evidence of the existence of a social organization. Instead, deception would very likely persist as a mere innate trait in this population.

As with the term "deception", the formal concept of awareness is often associated with a state of mind, a characteristic of the brain as a whole. However, awareness is better categorized as perception caused by physical processes in the neural network of the brain. Therefore, there are time delays in this experience of perception, similar to motor actions, since information in the neural network is not instantaneously processed. Physical processes in biology are not expected to have instantaneous dynamics (although our observation of the subatomic world is not always bound by this expectation). In the cognitive sciences, there are theories of awareness, and this term may be used in different contexts, where experts divide awareness into many kinds [19,20]. Other common definitions of terms of cognition are equally anchored in traditional ideas of the mind and its mental states. This is the reason for clarifying the use of these terms, and even substitute terms: for the accurate communication of scientific concepts without an advocation for pedantic science and its perils. Unfortunately, scientific communication does not necessarily translate to a form of common knowledge. More specifically, scientific beliefs are not a requirement for public discourse or the formation of common sense. These problems have been well-recognized in philosophy, and well-described in Plato's literary works, *The Sophist* and *Parmenides* [21].

The processes of cognition are further tractable to quantification as shown by studies on social insects [22] and abstract models [23]. Therefore, there is scientific progress in deconstructing the remnants of ideas about natural kinds as described in the literature and art of Medieval Europe. Instead of strictly categorizing natural kinds by a hierarchical order that models natural kinds by their inherent perfection and status, it is better to construct ideas that are reliant on natural processes. The alternative is often a descent into naive descriptions of reality based on mere opinions, whereas a formal scientific belief requires convincing and reproducible evidence by observation [24]; however, the formation of true belief ultimately originates as a population process. Over time the natural sciences may tend toward better models of reality, and this includes concepts of perception and the mind. To summarize, the science of perception is essential for understanding the nature of humanity, along with the role of observation by individuals in forming common sense and knowledge about the world around us.

Funding: This research received no external funding.

Conflicts of Interest: The author declares no conflict of interest.

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