

Gestalt isomorphism and the primacy of subjective conscious experience: A Gestalt Bubble model

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Open Peer Commentary

Empirical constraints for perceptual modeling

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Abstract: This new heuristic model of perceptual analysis raises interesting issues but in the end falls short. Its arguments are more in the Cartesian than Gestalt tradition. Much of the argument is based on setting up theoretical straw men and ignores well known perceptual and brain science. Arguments are reviewed in light of known physiology and traditional Gestalt theory.

Steven Lehar's article purports to present a new model of perception based on Gestalt principles. Lehar raises some interesting issues but in the end falls short of his claims. His heuristic model is more Cartesian than Gestalt and much of his argument is based on setting up straw men. He ignores much of what is known in perceptual and brain science. I will confine myself to these issues, although there are others.

Lehar maintains the Cartesian mind-body distinction and assumes internal representation as a requirement. He also ignores the distinction between conscious perception as active construction and the perception/action continuums implied by physiology and direct perception data. Lehar recycles the Cartesian machinelike body now inhabited by the "ghosts" of mental representations and computations. This dualism is at odds with traditional Gestalt theory (Köhler 1969).

The target article ignores the contemporary distinction between (1) perceptual mechanisms that subserve action; and (2) the cognitive mechanism of recall and analysis; instead, it suggests the latter as the sole perceptual mechanism. This emphasis stems from Lehar's belief that "introspection is as valid a method of investigation as is neurophysiology" (sect. 2.3, last para.). This is not the position of traditional Gestalt theory, which states that "a satisfactory functional interpretation of perception can be given only in terms of biological theory" and warns that "The value of biological theories in psychology is not generally recognized." Gestalt psychology adopted the program of building bridges between psychological rules and the activities of the central nervous system (Köhler 1940; 1947; 1961). Köhler recognized this task as "beyond present technical possibilities." These purely technical limits are being overcome today, yet the target article ignores a large body of empirical physiological evidence, some of which is presented below (see also Milner & Goodale 1995 and Gallese *et. al.* 1999 for summary of some areas). Although we should not limit our theories to physiology, theory must

account for known physiology. The target model does not. To take a specific example, the model ignores the important role of eye movements even though they were of concern to the early Gestalt theorists (Koffka 1935) and are a critical part of contemporary perceptual theory (Ebenholtz 2001). More generally, there is ubiquitous evidence, collected over many decades, for the important role of physiological systems in perception. Simply consider the differential perceptions resulting from anatomical and physiological states of sensory end organs. Visual perception in the myopic, dark-adapted, or maculardegenerated eye is more influenced by anatomy and physiology than by computations on a mental image.

Lehar emphasizes computational neuroscience at the expense of known physiology despite his assertion that “most fundamental principles of neural computation and representation remain to be discovered” (sect. 2.4, para. 3). This leads to oversimplification to the point of error. For example, he dismisses direct perception because “No plausible mechanism has ever been identified neuro-physiologically which exhibits this incredible property” (sect. 2.2, para. 3) and “all that computational wetware” (sect. 2.1, para. 2) must serve some “purpose” (i.e., “produce an internal image of the world”; sect. 2.1). Yet there is growing physiological evidence to the contrary. As I have discussed elsewhere (Fox 1999), area MST in monkeys (similar to area V5 in humans) shows cells that are responsive to three-dimensional motion information that is characteristic of the type of flow field emphasized by direct perception theory (Duffy & Wurtz 1995; 1997a; 1997b). More recently, direct perception theorists have examined the relation of neural information systems to Tau, a property of environmental optics (Grealy 2002; Lee et al. 2002). Hence, contemporary physiology supports an emerging model suggestive of an environmentally adapted physiology rather than the metaphor of representational/computational “wetware.”

Lehar further misrepresents direct perception theory as describing perception “as if perceptual processing occurs somehow out in the world itself rather than as a computation in the brain” (sect. 2.1, para. 1). Using the term “perceptual processing” or “computation” is a serious misrepresentation of direct perception (Gibson 1966; 1979), regardless of where one attributes it. Gibson contends that the perceptual system is sensitive to “affordances” that are naturally occurring and require no processing but rather are directly perceived. The exact characteristics of affordances are disputed, but a recent paper (Chemero 2003) provides a critical analysis and comprehensive definition of the concept of affordances and makes it very clear that affordances are perceived relations that are dynamic but neither computed nor components of computations. This is consistent with the physiology described above.

Gestalt psychology is also misrepresented as a representational/ computational approach. I content that a key – perhaps the key – insight of Gestalt theory is that adequate knowledge of wholes, such as objects, comes from observing wholes. Such understanding does not come from a “humpty-dumpty” approach that tries to put the object “back together again” through computation. The target model is reductionist/empiricist and, as such, is contrary to Gestalt theory (Koffka 1935; Köhler 1947). The relevant properties of things are not computational properties superimposed on the object system, but rather, the intrinsic relational properties within the object and between the object and the perceiver/actor (Köhler 1947). For example, Köhler certainly did not suggest that perception is a mental computation when he wrote: “While climbing once in the Alps I beheld ... a big dark cloud ... nothing could be more sinister and more threatening. ... the menace was certainly in the cloud.” The menace stems not from computations on mental images but from physiological sensitivity to relations among environmental physical energies, and between these relations and the state system of the observer/actor. I suggest a dynamic, person-environmental mechanism rather than internal representation and computations. This is consistent with the Gestalt statement: “rules in which we formulate (functional, psychological) relationships imply occurrences of certain functions in a realm that is surely not the phenomenal realm” (Köhler 1940).

A final, critical point concerns isomorphism: Isomorphic relations are ubiquitous, so one needs to be specific. Gestalt “Psychophysical Isomorphism” is a hypothesis that rejects Cartesian dualism and is informed by physiology (Köhler 1969). Lehar, using a digital computer metaphor, suggests a point-to-point isomorphism between the internal image and external objects/space. However, this is not supported by physiology. Cells in the supplementary eye field of the monkey show firing patterns (Olson & Gettner 1995) that do not encode visual space in any one-to-one manner. Rather, they

incorporate higher dimensions of information such as attention or purpose (Fox 1999). Hence, even if we accept isomorphic, internal representations, there is neurophysiologic evidence that such representations are more complex than suggested in Lehar's model.

The target model does not accomplish its ambitious goals of presenting a modern Gestalt perceptual model. A more fruitful heuristic for understanding perception is a physiology that has evolved a sensitivity to meaningful environmental relational information, or, as suggested by Clark (1998), one that represents action-oriented systems.

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