Commentary on **Steven Lehar, Gestalt Isomorphism and the Primacy of Subjective Conscious Experience: A Gestalt Bubble Model. Brain and Behavioral Sciences.**

Just bubbles?

Włodzisław Duch
School of Computer Engineering, Nanyang Technological University, Singapore, and Department of Informatics, Nicholaus Copernicus University, Torun, Poland
http://www.is.umk.pl/~duch

Abstract: Lehar misrepresented neuron doctrine and indirect realism. His conclusions on consciousness are unjustified. The Bubble Gestalt perceptual modeling disconnected from neuroscience has no explanatory power.

1. Perception has not evolved for our enjoyment, it serves action, exploration of the world (O'Regan, Nöe 2001) Although the richness of visual perception may partially be an illusion, sensory data should elicit brain states that reflect important features of perceptual organization. Such functional representation would be very useful, facilitating information retrieval from visual and auditory cortex, stored in attractor neural networks after termination of direct sensory inputs (Amit 1994). Persistent brain activity may be responsible for visual imagery, filling in, illusory contours and other such phenomena. This internal representation, being a physical state of the brain, is focused and interpreted by other brain areas, gating it to the working memory and facilitating conscious perception. It is constructed from sparse information obtained from eye fixations between saccades (as is evident in the change blindness experiments, O'Regan, Nöe 2001), and thus may not be so faithful and rich as it seems. Since for many people endowed with visual imagination (individual variance seems to be quite large in this respect) visual experiences are rich and vivid, filling in of missing information must be strong.

2. Construction of the inner perspective is a difficult task. Lehar does not even attempt to enumerate the dimensions required for perceptual modeling that could replace (or at least complement) neural modeling. I have argued myself (Duch 1997) that an intermediate level of cognitive modeling should be useful. It should represent mental events in a way that is closer to our inner perspective, acceptable to psychologist, but also should facilitate reduction, at least in principle, to the neural level. Complex neural systems reveal emergent processes (responsible, as Lehar has noticed, for Gestalt phenomena), requiring a higher level of description characterized by new laws and phenomena. The usual approximation to neural activity misses the perceptual level by going from states of recurrent networks (such as Grossberg's adaptive resonant states, Grossberg 1995), to states of finite automata (cf. Parks et al. 1998 for neural models in psychiatry). A shortcut from neuroscience via neural networks to behavior is satisfactory only to behaviorists. Mind states and mental events may emerge as "a shadow of neurodynamics" in psychological or perceptual spaces (Duch 1997). This is in accord with ideas of Shepard (1987, 1994), who believed that universal laws of psychology may be found in appropriate spaces. Psychological spaces are spanned by subjective dimensions (such as color, shape, and motion), and one may use them to explain subjective perception and to talk about mental events implemented at the neurodynamical level. Therefore I sympathize with Lehar's goal, although details of his proposal are not satisfactory.

3. Trivializing the "neuron doctrine" Lehar writes about neural networks as the "quasi-independent processors", and "an assembly of independent processors". The whole essence of

neural networks is in the interaction of their elements, cooperative computational abilities that facilitate their holistic emergent properties. Recurrent neural networks are certainly not “the atomistic feed-forward model of neurocomputation” (Parks et al. 1998). The Neuron Doctrine paradigm has been completely misinterpreted in the target article.

4. The arguments evoked against indirect realism are strange to say the least. Lehar mixes mental and physical levels freely, writing statements like “the world that appears to be external to our head is actually inside our head”, and “beyond those perceived surfaces is the inner surface of your true physical skull encompassing all that you perceive”. How can physical scull encompass non-physical, inner world? “The world inside the head” is a metaphor, and it does not make much sense to invert it, unless one believes that there is some kind of physical world squeezed inside the scull.

Indirect realism claims that we perceive and comment upon states of our own brain. These states reflect properties of the environment, but interpretation of the spatial structure of the states of visual system has nothing to do with their physical location. There is nothing strange about it, as there is nothing strange in transmission of the voice and images via wires and radio waves. The spatial world inside the head is there in the same sense as panoramic image in the integrated circuit of a computer graphic chip. Subjective reversal of a multistable percept follows the change of neural dynamics. It has to be experienced vividly as an inversion of a perceptual data structure, since visual experiences are a reflection of neural dynamics – how else could changes of visual cortex states be experienced?

5. It is certainly not clear “that the most fundamental principles of neural computation and representation remain to be discovered”. Churchland (1984) argued against it already 20 years ago, and since that time computational neuroscience has made a lot of progress. It may very well be that Hebbian learning is the only fundamental principle that is needed and that sufficiently complex models of the brain will be able to simulate its emergent functions.

6. It is quite probable that “our own conscious qualia evolved from those of our animal ancestors”. But certainly the “conclusion is that all matter and energy have some kind of primal proto-consciousness” is not inescapable. In fact I am regularly loosing my consciousness in sleep, while anesthetics and damages to the reticular formation lead to coma, obliterating consciousness. Complex organization of matter is not sufficient for consciousness. Instead of looking for conditions necessary for manifestation of consciousness - a fruitful way is to use here a contrastive approach between perception and reception (Taylor 1999) - Lehar goes down the beaten track of thinking about consciousness as some kind of a substance that is present in all matter, although sometimes in watered down form. Conclusion of this line of reasoning is absurd: proto-consciousness of soap bubbles.

Of course since the concept of consciousness is not defined one may try to extend it to all matter, but taking about stomachs being “conscious” leaves no semantic overlap with the word “conscious” applied to a baby, or to a cat. If consciousness is a function, and plays functional role, as Lehar seems to believe (“It seems that conscious experience has a direct functional role”), the inescapable conclusion is rather that not all brains are equal. Language is unique to humans, and even though one can extend the concept of language to some more primitive forms of communication, interaction between internal organs of the body, or message passing between components of a computer system, is not the same “language” as natural languages. The difference between a “field” in agriculture and “field” in physics is comparable to the difference between animal “consciousness”, and “consciousness” of a soap

bubble due to the physical forces that determine its shape. We should not be deceived by words.

7. It remains to be seen if the main contribution of the target article, the Gestalt Bubble model, will be useful for understanding, or even for a description of perception. The goal of science is not modeling *per se*, but rather explaining and understanding phenomena. Modeling perception should not become an exercise in computer graphics, creating volumetric representations of space and objects. Bubbles of neural activity, as presented by Taylor (1999), have real explanatory power and are amenable to empirical tests. Perceptual modeling proposed by Lehar promises a new language to describe high-level visual perception. Any language that is useful in design and analysis of experiments must reflect more basic neural processes. Nothing of that sort has been demonstrated so far and it is doubtful that Gestalt Bubble model may explain observations that have not been hidden in its premises.

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