Failures to bind spatially coincident features

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In his arguments against the existence of a visual binding problem, Di Lollo [1] fails to address some of the strongest psychophysical evidence for the existence of the problem. Several studies have documented profound failures to bind spatially coincident colour, form, and motion.

One such failure can be experienced by viewing a simple online animation (http://www.psych.usyd.edu.au/staff/alexh/research/TiCS09/movies/TiCS09_Movie2_Binding3speeds40fps.mov) that appeared in this journal [2]. In the display, a field of dots alternates between leftward and rightward motion. The dots are black when moving to the left and white when moving to the right. At slow alternation rates, it’s easy to perceive the pairing of the color and motion. However, when the alternation rate exceeds about 6 per second, people can no longer perceive whether, when the dots move to the left, they are black or white [3]. Yet the constituent colors (black and white) and motions (leftward and rightward) remain easy to perceive. A similar animation using red and green rather than black and white is available as a supplemental video and also can be viewed here: http://www.psych.usyd.edu.au/staff/alexh/research/colorMotionSimple/.

A binding failure for colour and global form in alternating Glass patterns has been reported by Clifford, Holcombe & Pearson [4]. Moreover, for brief presentations subjects easily detect the presence of a Glass pattern but perform near chance when judging whether it is carried by white signal dots in black noise or vice versa [5,6]. As with classical illusory conjunctions, these are cases where feature perception is dissociable from perception of the features’ pairings.

Further evidence for dissociations between colour and global form mechanisms have been provided by other studies. Di Lollo describes work by Mandelli and Kiper [7] on the perception of Glass patterns as documenting “a splendid example of joint selectivity” for color and form. But other studies report no chromatic tuning of global form-selective mechanisms [8,9]. Moreover, Rentzeperis and Kiper [9] provide an alternative explanation for the results of Mandelli and Kiper [7] in terms of chromatic tuning only at the level of local orientation detection and not global form processing. Similarly, Figure 1 of Di Lollo’s paper illustrates selectivity for contrast polarity at the level of local orientation detection [10] but says nothing about the mechanisms of global form detection.
After experiencing profound failures to perceive feature pairings such as that in the online animation, it is hard to avoid the conclusion that one’s brain has a binding problem. Di Lollo invokes inappropriate observer expectation to explain illusory conjunctions, but it does not seem possible for observer expectations to explain the sustained failure of binding with the arbitrary feature pairings we mention above. Di Lollo also suggests that incorrect high-level perceptual hypotheses can somehow “gain the highest correlation”. But this does not illuminate why feature pairings in particular, as opposed to features themselves, fail to be perceived.

References


