Kingdom's reply to Todorovic's comments on Kingdom's chapter

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In his response to my chapter, Dejan Todorovic offers a number of demonstrations to counter my case for an illumination-interpretation stage in brightness/lightness perception. This putative stage is a lightness constancy mechanism that discounts spatially-varying illumination, such as shadows, shading, highlights and transparency. The evidence for such a stage is that equiluminant regions perceived to lie under different illumination often appear very different in brightness, and in ways that appear to defy explanation in terms of contrast.

Dejan's Figure 1 shows some novel variations of Figure 12 in my chapter that depicted a checkerboard lit by a near-sinusoidal variation in illumination. Both my own and Dejan's figures contain equiluminant test diamonds (**a** and **b**) that look very different in brightness. Dejan'sFigure 1b is similar to his Figure 1a except that it depicts multiple abrupt transitions, rather than a single smooth gradient in illumination. Dejan's Figure 1c depicts a checkerboard with a single abrupt transition in illumination, and his Figure 1d is identical to Figure 1c, except that the impression of having two sides differently lit is neatly eliminated via a minor change to the configuration in the centre of the display. Dejan argues that the **a**-b difference in brightness is no less in Figure 1d than in 1c, in spite of the absence of any impression of differential illumination in Figure 1d. He argues that this is not what one would expect from an illumination-interpretation account of Figure 1c, and by extension that such an account is also unlikely to be true both for hisFigure 1a and my Figure 12.

I asked a number of colleagues as well as non-vision persons to rate the brightness difference between the diamonds **a** and **b** in all four of Dejan's figures. Most agreed with Dejan that the \mathbf{a} - \mathbf{b} difference in Figures 1c and 1d was very similar. However, and for me this is the telling observation, nearly all reported that the **a**-**b** difference in both figures was either very small or negligible, especially compared to the much bigger **a-b** difference in Figures 1a and 1b. For some reason, the abrupt transition in illumination depicted in Figure 1c fails to produce the same magnitude of illusion as the smooth transition in Figure 1a. A similar difference in illusion strength depending on whether the depicted illumination gradients are abrupt or smooth can be seen in two versions of Adelson's tile pattern published recently by Logvinenko (1999) (see also my commentary on these patterns in Kingdom, 1999). The seemingly weak illusion in Figure 1c makes me suspect that little room remains for a further reduction in the strength of illusion with a change in configuration. So for me Dejan's argument falls at the first hurdle because his critical test stimulus fails to reveal the signature of the putative

illumination-interpretation stage that he wishes to dispute.

Turning now to Dejan's corrugated Mondrian stimuli in his Figure 2, these also fail to convince, but for different reasons. Dejan argues that the illusory **a-b** difference in Figure 2a is of the same magnitude as inFigures 2c and 2d, yet only in Figure 2a is the smooth gradient in luminance consistent with an illumination interpretation, given the figure's surface geometry. I agree that the **a-b** difference in all three figures is similar. But is consistency with surface geometry what is crucial here for brightness/lightness vision? I get equally strong*impressions* of illumination gradients from all three figures, and I suspect that it is these *impressions* that elicit the illuminationinterpretation mechanisms that augment the **a-b** brightness differences. Smooth changes in the average luminance of highly articulated patterns may be sufficient for eliciting impressions of illumination gradients, irrespective of any inconsistency with surface geometry.

Finally, although I have argued that Dejan's demonstrations fail to dispute the existence of an illumination-interpretation stage, they do not constitute evidence *for* such a stage either, as they are not accompanied by stimuli that control for the effects of contrast (see my chapter for a more detailed discussion of this issue).