# Dynamic Colour Constancy

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The relation between colour and motion processing in the cortex is a cornerstone for the understanding of the functional organisation of the visual pathways in the cortex. Previous findings of apparently colour blind motion processing[1,2] gave support to a strict segregation of the colour and motion processing in the ventral and dorsal stream, but recently a significant input of chromatic information to motion processing has been established[3-6]. On the other hand, little is known about the influence of motion on colour processing since colour vision is generally investigated using static stimuli. However, under real viewing conditions colour is often seen in combination with motion of the retinal image (by movement of objects relative to the observer or movement of the observer relative to an object).

Here I am investigating the implementation of an important aspect of colour computation, namely colour constancy during image motion. The test pattern (see Figure 1 insert) was produced on a calibrated colour monitor and consisted of a $2^{\circ} \times 2^{\circ}$ test-patch (u'= 0.197; v'= 0.468; $l_{test}$ = 19.3 cd/m$^2$) in front of a heterochromatic checkerboard ($20^{\circ} \times 20^{\circ}$; $l_{mean}$=19.3 cd/m$^2$). Colour constancy was measured for simulated illumination changes along the cardinal axes in an equiluminant plane in colour space. Colour constancy was quantified by a hue cancellation technique, whereby the subject had to adjust the chromaticity of the test patch (before and after the illumination change) so that it appeared achromatic. The illumination change was presented for 5 seconds, after which the subject had to make his/her judgement within a 600 ms time-interval, before the stimulus was presented for 15 seconds under standard (D65) illumination. This cycle was repeated until the subject was satisfied with the achromatic setting, which was recorded. Different motion conditions were tested: global motion (test and background moving), motion parallax (background moves, test field is static), and object motion (test field moves across static background). The horizontal motion was constant throughout each experiment and different velocities were tested (0.5 – 16 deg/s). Four subjects participated in the experiments. It was found that colour constancy was significantly enhanced in the object motion condition (Figure 1), but no enhancement by motion was found for any of the other motion conditions. Preliminary results for the different velocities show an increase of colour constancy with increasing velocity. However at velocities higher than 4 deg/s the function levels off.

I conclude from these results that colour processing is influenced in a specific way by object motion, and that the interaction is located at a higher stage of motion processing, possibly with the involvement of a "feature tracking system"[7]. The results are discussed with respect to their implications for the co-processing of colour and motion in cortical pathways and their importance for colour constancy in real scenes.

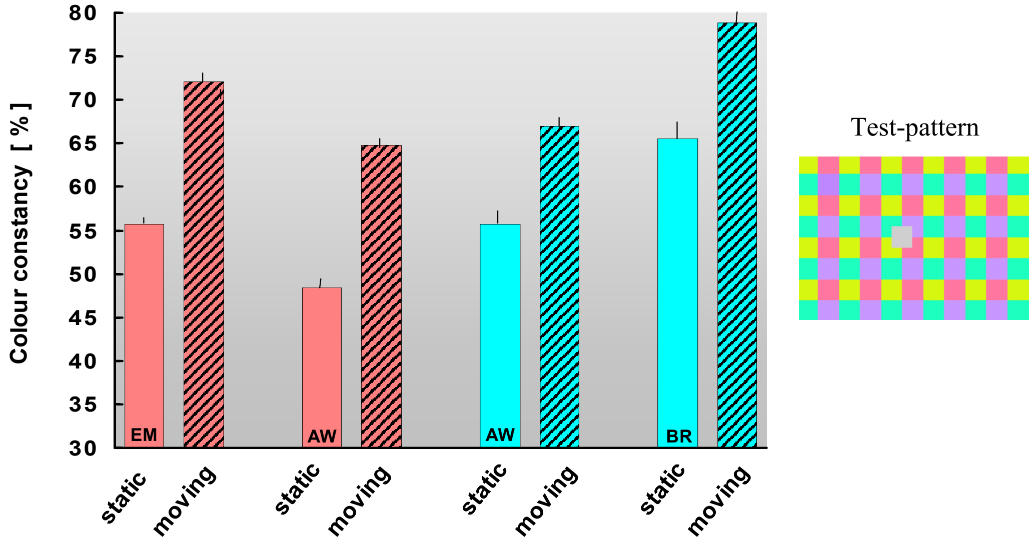


**Figure 1** The effect of object motion on colour constancy (test-field moves horizontally across the heterochromatic background (see inserted figure); velocity was 4 deg/s). 'Colour constancy [%]' indicates the amount of colour constancy relative to a complete compensation of the respective illumination change. The first two double bars indicate results for illumination changes towards red, while the second two double bars represent illumination changes towards green. In all cases, colour constancy is significantly increased in the motion condition (second column of each double bar) as compared to the static condition (first column of each double bar). Results are shown for three subjects.

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