

# Opponent channel responses to changes in the illuminant of natural scenes for primates and birds

P G Lovell, D J Tolhurst, C A Párraga, R J Baddeley, U Leonards, J Trościanko, T Trościanko

Evidence suggests that the red - green opponent system is optimised for the task of detecting fruit against a dappled background of leaves. One reason the red - green opponent (RG) system aids the detection of fruit is its relative insensitivity to shadows and other variations in the illuminant. This is because the peak sensitivities of the L and M cones are close together; where the light becomes redder or bluer, the response of the RG system tends to vary only a little in comparison with the blue - yellow opponent (BY) channel. Using time-lapse recording with an LMS calibrated camera and a spectrometer, we examined the opponent responses to a scene containing foliage and fruit from dawn until dusk. Opponent responses were computed for primates (human) and birds (starling) using the Macleod - Boynton RG and BY equations. The contrast between the fruit and the surrounding region was assessed with  $d'$ . As expected, responses of RG opponent channels were more stable than those of BY channels under varying illuminants, and  $d'$  scores were higher. Furthermore, primate RG responses were more reliable than bird responses; this was due to the fact that bird cones are not only more widely spaced but also because the action spectra of the L and M cones have a narrower bandwidth.