

Recalibration of Retinal Coordinates by Change of Direction of Gaze

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With the head pointing forward, a stimulus such as a dot appears directly in front with gaze by right eye (the left eye closed) directed towards the front. The visual acuity is maximal.

When the direction of gaze is shifted to the right by about 10 degrees, two phenomena occur. First the dot shifts to the left of front, the direction of foveal gaze being towards front and second there is a decrease in the visual acuity at the region of the dot. This shows that there is a recalibration of retinal coordinates, the direction of foveal gaze 10 degrees to the right being taken as front and the region of the dot earlier in the front, now 10 degrees to the left taken as periphery.

When the direction of foveal gaze is changed by a large visual angle greater than 10 degrees such recalibration does not occur viz the foveal gaze appears to be directed to the periphery and the dot appears to be in the front.

The direction of foveal gaze per se and not eye movement that brings about these effects. There are direction of gaze coding neurons in the frontal eye fields, area 8. It is possible that these neurons in conjunction with the position of the stimulus recalibrates the retinal coordinates. Why such recalibration should occur remains to be explained. The shift of the dot for small displacement of the gaze in the front could be a consequence of a simultaneous contrast involving position of visual field viz two contiguous points being repelled. Alternatively the recalibration for small shift is part of a mechanism coordinating eye head movement. Recalibration of proprioception by vision has been shown to occur. It is possible that recalibration of retinal coordinates along with recalibration of proprioception brings about visual perception of position of eye head and limbs and body during coordination of eye head body movements. This is possibly the significance of recalibration of retinal coordinates by change of direction of gaze.

References

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