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GUEST EDITORIAL

Eye Movements: Spatial and Temporal Aspects

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This special issue includes six papers on various aspects of visual perception that relate to eye movements or that rely on measuring eye movements as a tool to study spatial perception. This special issue is as a direct outcome of the *Applied Vision Association* (AVA) annual meeting 2010, held on 29 March on the campus of Liverpool Hope University, UK. There were two invited speakers: Bruce Bridgeman (University of California, Santa Cruz) and Nicholas Wade (University of Dundee), and a total of 23 presentations (mainly oral) on a variety of topics, including eye movements. The abstracts of all presentations are available in *Perception* 2010 **39** 1147-1155.

The AVA aims to advance the study and knowledge of vision science. Its first meeting was held 1996 in Reading, UK. Since then there have been regular annual meetings, sometimes on special topics. Although it is based in the UK, AVA membership is open to international scientists, and some meetings take place outside the UK.

The aim of any special issue following a scientific meeting is to turn excellent oral presentations into excellent papers. In addition, it is worth mentioning that the birth of *i-Perception* as an electronic journal was a contributing factor that made this special issue possible. Unlike other new journals, *i-Perception* can build on the tradition and reputation of its print parent, *Perception*. Because of its electronic format, it is able to accommodate special issues that originate from small meetings (with fewer than ten papers, like ours) and very large meetings (something that traditional paper-based journals may struggle to do). Therefore, we hope that this special issue will set a precedent for further initiatives.

It has been a great pleasure to serve as guest editors of the special issue *Eye Movements: Spatial and Temporal Aspects*. We are in debt to all authors for their time and effort in writing and revising their papers for this special issue. Finally, if you want to know more about the AVA or become a member, you are invited to visit the website: www.theava.net.

The title for this special issue relates to aspects of eye movement research that reflect both historical and contemporary concerns. The articles will speak for themselves and so there is little that needs to be said here about their specific content. Rather, their relations with one another will be mentioned. Modern methods readily record where the eyes are directed and the paths they pursue in reaching those positions: the spatial and temporal features of oculomotor behaviour are grist to the modern eye-movement mill. It was not always thus. Wade ("Pioneers of eye movement research") points out that the spatial dimension assumed priority in the past: determining where the eyes were pointing could be assessed either by direct observation of the eyes of others or by comparing the apparent locations of afterimages and real images. The use of photographic recording methods, at the beginning

of the 20th century, transformed understanding of both the dynamics of eye movements and the functions they serve. As Bridgeman ("How the brain makes the world appear stable") observes, the eyes "flit from one fixation to another" about three times every second, yet our perceptual world appears stationary. For the last two centuries a particular interpretation of this remarkable phenomenon has been advanced and generally accepted – some signal of eye movement intention compensated for the image displacement over the retina. The formalisation of this interpretation in the 1950s exposed its shortcomings, and Bridgeman provides a modern resolution. As is the case for many features of perceptual stability, rather than relying on one source of information, the visual system utilises several.

Details of the dynamics of eye movements are now being dissected (with the aid of eye trackers), and the following articles deliver some of the results that have derived thereafter. The fractionation of time, to examine ever briefer intervals between stimulus presentations and their response consequences, has yielded many insights into their elaborate relationship. Many factors determine where the eye will next move. For instance, the target selection is the outcome of a competition between potential targets. McSorley and Cruickshank ("Evidence that indirect inhibition of saccade initiation improves saccade accuracy") present new evidence on the effects of local and remote stimuli that act as distractors. The increased latency associated with a remote distractor improves target localisation because of later disengagement from fixation. Another way of examining target selection is to manipulate the displays at the moment a saccade is to be initiated. This technique was adopted by Hermens and Walker ("The influence of onsets and offsets on saccade programming") in order to determine the effects of stimulus offsets at remote locations on saccade latency. They found that saccade latencies increased with peripheral onsets but were not influenced by offsets.

When photographic techniques were introduced in the early 20th century, one of the problems addressed was whether spatial illusions can be related to the extents of eye movements. Knox ("The reduction of the effect of the Müller–Lyer illusion on saccade amplitude by classic adaptation") returns to this issue, but in an agnostic manner. The magnitude of the Müller–Lyer illusion declines with repeated trials, as does the extent of eye movements. Knox's interest is not in the spatial distortion itself but in the saccade sizes with the configurations and their dependence on stimulus presentation time: saccade amplitude declined with repeated presentations of 1 s but not of 200 ms. The application of eye-tracking techniques to examine well-established perceptual effects is embraced by Wade and Tatler ("Recognition and eye movements with partially hidden pictures of faces and cars in different orientations"). Pictures of frontal faces or cars were embedded in patterns of concentric circles so that it took some seconds to recognise them. The authors found differences in eye movement patterns which were disrupted more by inversion for faces than for cars.

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