SOME CURIOUS PHENOMENA WHEN OBSERVING STROBE-LIGHTS

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Summary

Visual perception is suppressed during saccadic eye movements. Intense light flashes may still be observed but are difficult to localize. Two possible causes are suggested on the basis of observations made with police patrol-car strobe lights.

At present, police patrol cars in the Netherlands are equipped with blue flash lights consisting of two sets of three halogene-incandescent lamps each, with separate reflectors. The sets are mounted at both ends of a cross-bar on the top of the vehicle roof. The reflectors rotate around the lamps with the same frequency but with a distinct phase offset; the result is a very specific impression that might be described as a kind of "waving". These light arrangements are quite satisfactory in practice, both from the point of view of the police and of the general public. For a number of reasons, however, it was decided to replace these incandescent lamps by two Xenon strobe-lights. These strobe-lights are also mounted, each at one end of a roof mounted cross-bar. They flash alternatively with a similar flash frequency as is used with the incandescent lamps. The pros and cons of the two systems were compared, and during this comparison a number of curious and unexpected phenomena were observed.

Alerted by complaints from the general public regarding the difficulties to locate the lights precisely, a number of full-scale observations were made on an unlit motorway section not yet in use. The complaints could be substantiated to a certain extent. When observing the patrol car equipped with the strobe-lights, it seemed as if the lights were not attached to the car but drifted around the car in a random way. In part, this phenomenon may be explained as follows. It is well known from physiological optics that during the saccadic movements (the movements of the eye-ball in the socket that occur between consecutive fixation pauses) the light absorption in the retina, the transformation of the light quanta into neuro-electrical pulses, and the transfer of these pulses in the "lower" part of the nervous system continue to take place. It is also known,

however, that the visual information contained in these pulses is suppressed (filtered out) somewhere in the "higher" processing of the visual signals. This can be observed immediately and directly: even when one moves his eyes, there is no apparent blurring, although at certain moments the visual scene sweeps the retina. Now, the suppression of the neural signals seems to take place at a "higher" stage of the process. It is not a physical obstruction like an opaque screen; this means that, in principle at least, the obstruction can be forced. And precisely this seems to take place when observing strobe-lights. When the light flashes during a saccadic eye movement, the "normal" visual information regarding the surroundings is suppressed. The flash, however, is so intense that it passes through the obstruction. Now, the retinal location of the image of the flash does not coincide with the retinal image of the car before the saccadic movement began or with the location of the car after the saccade. The location of the flash then does not correspond in any normal way to the position of the car: precisely the phenomenon observed.

But there is more. A second aspect of this curious phenomenon is the illusion that the flashing light drifts around the car. To understand this, one should consider the fact that not only the visual information is suppressed during the saccade but that also the time interval of the saccade itself somehow disappears from consciousness. A normal saccade takes a couple of hundreds of milliseconds - a time interval long enough to be easily observed. It is of the same order of magnitude as a wink. And we all know that winks are easy to observe! The time required for a saccade is, however, not observed. This can be very easily observed by looking into a mirror, and shifting one's gaze from the one eye to the other. This shift takes subjectively no time, and furthermore one cannot see the eyes move. One's experience, as if the shift of the gaze from the one eye to the other takes no time at all, is really instantaneous. The consciousness somehow fills up the missing time interval. If during this missing time interval a flash is presented, a flash intense enough to break through the barrier of the suppressing mechanism, the flash not only does not seem to be where it actually was but also seems to interrupt the natural - if subjective - flow of time.
Under critical circumstances this "psychedelic" effect can be quite unnerving. Probably this effect is applied precisely for this reason in discos and in brain-washing sessions!