A FLASHED STIMULUS PERCEPTUALLY LAGS A MOVING ONE DUE TO REWRITING OF THE PAST, NOT EXTRAPOLATION INTO THE FUTURE.

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To explain the flash-lag effect, wherein coinciding flashed and moving objects appear to be displaced, it has been proposed that the visual system accounts for neural delays by extrapolating the trajectory of moving stimuli. We here present evidence that motion extrapolation cannot be the explanation underlying the flash-lag effect. Subjects observed a ring moving in a circular trajectory on a computer screen (Fig 1), and indicated whether a flashed disc appeared to be directly in the middle of that ring. We assayed the perceived displacement between the flashed and moving objects by varying their physical displacement. The initial trajectory of the ring was identical in all cases; however, immediately after the flash, the ring either continued, stopped, or reversed. If motion extrapolation were occurring, the extrapolated trajectory should be the same in all cases, since the initial trajectory was identical. Contrary to that hypothesis, for subjects to report spatial coincidence, the flash needed to be differentially displaced depending on the trajectory succeeding the flash (see figure). We found identical perceptual results when the ring did not begin to move until after the flash appeared, further demonstrating that the flash-lag effect is independent of initial trajectory. Moreover, only -50 msec of movement after the flash is sufficient to determine the direction of flash-lag. Our results are not consistent with motion extrapolation. Instead, the perception attributed to an event at time $t=t_o$ seems to depend on what happens in $t_o < t < t_o+50$ msec. Supported by NSF and Sloan Foundation.