tion chosen for the sequential stimuli. Similar performance was obtained with the use of fiber optics to produce the dots in a black surround.

In dichoptic viewing of the two dots, illusions similar to the monocular illusions can occasionally be obtained. On the other hand, by careful positioning of the two sequential flashes near the mutual boundary of the two hemiretinae of one eye (the two stimuli were presented several degrees below the fixation point), which may amount to "dichogeniculate" presentation, all three subjects tested found a small range of positions in which the illusion was abolished.

Involuntary eye movement appears not to be a factor in these experiments. Both the illusion and performance curves similar to those of Fig. 2 were readily obtained in stabilized vision (*4*). Monitoring of eye position (*4*) (± 1 minute of arc) during performance showed that subjects were successful

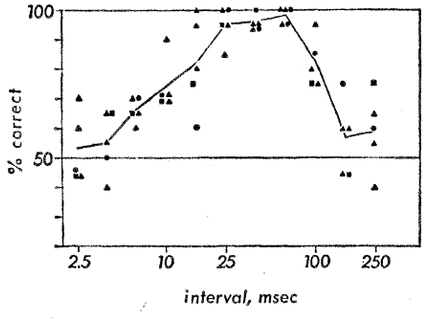

Fig. 2. Performance at guessing which of two spatially unresolved dots was presented first versus temporal separation (logarithmic interval scale) of the dot presentations. The guesses were based on the direction of a movement illusion. Two 3-minute-of-arc-diameter dots on a fast-phosphor oscilloscope, separated spatially by 7 minutes of arc, were presented monocularly for 1 msec each to the left eye, 22° to the left of a fixation point. The pair of dots (luminance 0.3 lambert) was centered in a 7°-diameter surround (luminance approximately 10^{-5} lambert), the remainder of the visual field being occupied by a black felt screen. Each point represents the percentage of correct responses in 20 computer-controlled trials (10 right-first and 10 left-first) at a particular time interval. The symbols denote three separate experiments for one subject (triangles) and one experiment for each of two other subjects (squares and circles). The solid line connects averages for the five experiments. The scatter of points at the smallest and largest intervals is about that expected for n successes in 20 independent trials with probability of success near .5.

in suppressing microsaccades during the approximate 1-second temporal neighborhood of the two flashes.

We have not been able to rule out the view that the above "fine-grain" movement illusion results from stimulation of the neural mechanism underlying the response to real movement. In fact, the characteristic cutoff near 100 msec in Fig. 2 is compatible with the usual range of velocity thresholds for perception of real movement (*2*), if it is assumed that correlated sequential stimulation of retinal locations separated by about 2 minutes of arc limits movement perception in this part of the periphery. The fact that the range of perceived real velocities (*5*) is greater than that of the temporal bandwidth in Fig. 2 follows naturally if there is a range of such contributory retinal spacings (greater than 2 minutes of arc).

Optimal interflash time intervals for the above illusion are similar to those for the phenomenon of metacontrast (*6, 7*), which is also stronger in peripheral vision than in foveal view (*7*) and difficult to induce unless the two stimuli are more closely spaced than about a degree (*7*). For metacontrast, Alpern (*8*) and Alpern and Rushton (*9*) concluded that the rod mechanism and Stiles' three cone mechanisms do not have cross interactions (each speaks only to its homonymous neighbors). The hypothesis that the two-flash illusion shares this property, as well, suggests a novel experiment. After a rod bleach, the sequence "blue-blue" should on this view induce the fine-grain illusion whereas "blue-red" should not.

JOHN THORSON
G. DAVID LANGE
MARGUERITE BIEDERMAN-THORSON
Department of Neurosciences,
School of Medicine,
University of California, San Diego,
La Jolla, 92037

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2. See, for example, C. H. Graham, Ed., *Vision and Visual Perception* (Wiley, New York, 1965).
3. The 24 stimuli comprised one left-then-right and one right-then-left sequence at each of 11 time intervals logarithmically spaced in the range of 2.5 to 250 msec, and two nearly simultaneous or "blank" stimuli. The randomized ordering was done by successive sampling from the uniform distribution over these stimuli, without replacement, until all 24 had been selected. Subjects reported that they were unable consciously to take advantage of the lack of replacement (basing guesses of direction on the "unused" stimuli toward the end of each 24-tuple), since such a small fraction of the 24 responses were based on certainty of the direction (see Fig. 2).
4. These controls, done with D. Fender and P. Nye, employed full-eye contact lenses. A stalk on the lens carried a mirror or light source for stabilized vision (at least 97 percent stabilization, with typical image-fading, was achieved in these experiments) or photomultiplier measurement of eye position, respectively. The optical system is nearly identical to that described by M. B. Clowes and R. W. Ditchburn [*Opt. Acta* **6**, 252 (1959)].
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10. We thank Professor D. Fender and Dr. P. Nye, who kindly shared their laboratory and collaborated in the controls on eye movement. We are also indebted to Professor T. H. Bullock for the generous loan of his digital computer and facilities. Supported by a research grant to J.T. from the Air Force Office of Scientific Research and by grants to Professor T. H. Bullock from the Office of Naval Research, the Air Force Office of Scientific Research, NIH, and NSF.

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Water on the Moon

O'Keefe (*1*) has given me much negative credit for a suggestion due to Gold as stated in my brief note in regard to where the sediment of the crooked rills of the moon was deposited (*2*). This note also mentioned the possibility of sediment at the end of the rill flowing out of a break in the western wall of Krieger. The sediment apparently has covered a rill flowing north from the region of Aristarchus. This may indicate a solution to the sediment problem. Probably, if the flow had continued, it would have flowed over or around this sediment, deepened the first part of the rill and left a shallow rill through or around the sediment, and this may be the mechanism applicable to the longer rills. All right, attack if you wish to. This is, so far as I recall, my suggestion, not that of my good friend, T. Gold. Possibly Lingenfelder *et al.* (*3*) considered some modification of this idea. I am not at all convinced that Gold's mechanism may not contribute to the problem to some extent.

HAROLD C. UREY
University of California,
San Diego, La Jolla

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