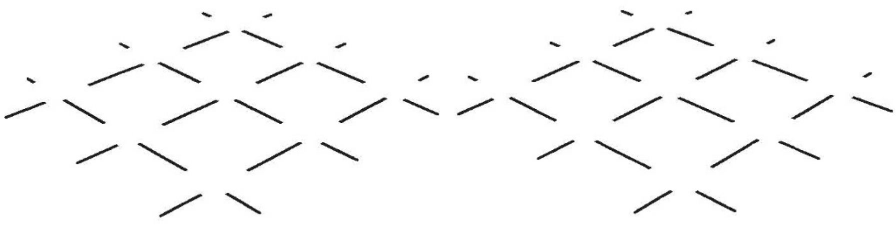
CARMAN AND WELCH REPLY — Redies and Watanabe claim a lack of view stability for the Ehrenstein grid[2]. But we found that only 4 out of 10 observers reported perceiving the distortion of the illusory circles into ovals when Fig. 1*a* is slanted and tilted in the manner suggested by Fig. 1*b*. We note that Fig. 1*b* presents monocular perspective cues consistent with a grid tilted away from the plane of the page, but binocular disparity cues consistent with a grid coplanar with the page.

That such inconsistent combinations of cues can result in perceptual ambiguity or distortion does not constitute evidence that illusory surfaces are induced by separate mechanisms for different figural cues. Indeed, when we simulate natural viewing of a three-dimensional Ehrenstein grid with consistent perspective and disparity cues, the illusory surface patches which are induced at the grid intersections are perceived as squares over a wide range of views (see Fig. 2). Furthermore, we find that we can induce various three-dimensional illusory contours and surfaces using random dots or line segments as well as luminance cues, and that perception of these illusory forms is characterized by the same cue invariance, view stability and morphic generality as reported in our original study[1].

Those who do perceive this illusion report only the deformation of the boundary contour, while the underlying shape of the illusory surfaces remains planar over change in view. Because any three-dimensional form can generate an infinite variety of boundary contours[7], we expect that two-dimensional boundary contours would deform, while their underlying three-dimensional shape would be preserved under conditions of inconsistent or ambiguous cues. Such observations are entirely consistent with our notion of view stability, which is properly understood as invariance of the perceived intrinsic three-dimensional shape or curvature of objects, but not necessarily of their apparent boundary contours, under changes in orientation with respect to the observer[1,8].



R L

FIG. 2 View stability of the three-dimensional Ehrenstein grid. Hold figure as close as possible while viewing L with the left eye and R with the right eye. This approximates the natural viewing of a three-dimensional Ehrenstein grid whose intersections were occluded by small planar squares having no contrast with the surround. Observers report perceiving planar illusory squares slightly raised above the intersections of the grid, and do not perceive the distortions seen under conditions of inconsistent perspective and stereo cues. (Methods described in ref. 1.)

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Diurnal cycles in savanna fires

SIR — Cahoon *et al.*[1] reported the temporal and spatial distribution of savanna fires in continental Africa derived from interpretation of hard-copy satellite images of the Defense Meteorological Satellite Program (DMSP) Block 5 satellites. In their study they examined images measured in the 0.4 – 1.1 μm range from the 1986 and 1987 fire seasons. All images were acquired at local midnight. They found, against their expectations, that "most fires are left to burn uncontrolled, so that there is no strong diurnal cycle in the fire frequency".

I found contrary results using field observation and thermal satellite images[2]. The field work was designed to provide fire frequencies in the Gambia at the four daily satellite overpasses of two orbiting NOAA (National Oceanic and Atmospheric Administration) satellites. The AVHRR (Advanced Very High Resolution Radiometers) of each of the two satellites scan over each surface area twice a day, once during the day and once at night, with a nominal time displacement of around 6 hours. Over a 2-week period in March 1988, 26 Gambian foresters reported all continuing and burned-out savanna fires which had occurred at the NOAA overpass times along pre-determined routes. The foresters drove along the routes twice a day, once just before sunset and once just after dawn. They reported a total of 115 fires which showed a strong diurnal cycle. The minimum fire frequency occurred at the 2.30 a.m. local time overpass (NOAA-9). At the 8.30 a.m. pass (NOAA-10) the fire frequency was 6.3 times higher; at the 2.30 p.m. pass (NOAA-9) 8.5 times higher; and at the 8.30 p.m. pass (NOAA-10) it was 2.8 times higher.

Further, I have analysed eight pairs of consecutive NOAA-10 evening and NOAA-11 early-morning images of Guinea-Bissau, the Gambia, Senegal and parts of Mauritania, Mali and Guinea from November 1989 to May 1990 using a physically based bispectral interpretation model[3]. The model uses AVHRR thermal night-time data in the 3.55–3.92-μm and 10.2–11.2-μm bands and has been tailored for night-time detection of savanna fires. These pairs enabled analysis of the relative frequencies of fires at around 10 p.m. and 3 a.m. local time. The relative fire frequencies between the two night-time passes were very similar to those obtained in the field; namely 2.7 to 1 for the late-evening pass compared to the early-morning pass.

Even though most savanna fires in West Africa are not controlled, this does not necessarily imply that night-time fire frequencies are close to day-time frequencies, as suggested by Cahoon *et al.* At least in the region covered by my study, the weather conditions counteract biomass burning at night because of increased air humidity and associated dew deposition on the vegetation, reduced wind activity and lowered air temperature. Under low wind speeds the normal duration of savanna fires, most of which are started, intentionally or accidentally, by the rural population, is determined by the time before the fire front is trapped by natural or artificial barriers. This usually happens within 12 hours, or before dawn the next day.

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