

The MacKay Effect

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Abstract

The *MacKay effect* is a visual aftereffect which is perceived following exposure to stimuli consisting of spatially repetitive patterns. Presently there is no widely accepted explanation of the effect in terms of the adaptation of neurons tuned to particular spatial orientations. Since its discovery several variants of the effect have been discovered, some of which co-occur with the better known *motion aftereffect*. Relatively little is known about the effect when compared to other forms of visual illusion like contour completion or the tilt illusion. This review discusses the established knowledge of the effect focusing primarily on the different variants of the stimulus and what this reveals about the mechanism which causes the effect.

1 Introduction

After prolonged adaptation to an image containing spatially repetitive patterns, observation of a homogenous background evokes the perception of an after image which is said to be approximately orthogonal to the original stimulus known as the *emph-Complementary Image* (CI) [2,3]. As is the case with many perceptual phenomena, the effect was originally described by Purkinje [5]. Since then the effect has been rediscovered numerous times [5], most famously by physicist D. M. Mackay [2].

2 Variants of the Effect

There are two primary variations of the stimulus: static and dynamic. In the static variant of the stim-

ulus the observer views a still image exhibiting repetitive spatial patterns. While this variant of the stimulus is robust and can cause the perception of an after image after only a few seconds, studies have shown that the effect does not occur under image stabilization [4].

In the dynamic variant a stimulus with spatially repetitive patterns which flickers at a constant speed is viewed. The dynamic variant has been shown to demonstrate several other interesting properties. For instance, if the center or surround portion of the image is homogenous, and flickers at the same rate as the rest of the image the CI can then extend to fill the rest of the visual field [1].

Both the static and dynamic variants can occur with a variety of spatially repetitive patterns, with the most well researched being radial patterns, concentric circles, and squared sinusoidal gratings. These each evoke CIs of wavy lines which are approximately orthogonal to the stimulus. Examples of these stimuli are presented below as figures 1, 2 and 3 respectively. The embedded images are examples of the static variants, however the images also serve as links to the dynamic variants of the stimuli.

A new variant of the effect currently being explored is a randomly shaded version of the dynamic stimulus, in which each homogenous component of the image is colored pseudorandomly to investigate if this has any effect on the strength of the CI perceived.

3 Conclusion

The MacKay effect is a significantly underresearched form of optical illusion, and exploration of its mechanism could lead to significant improvements in our

Figure 1:

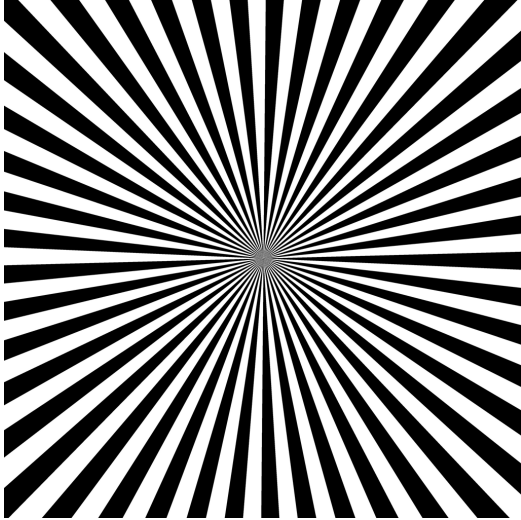
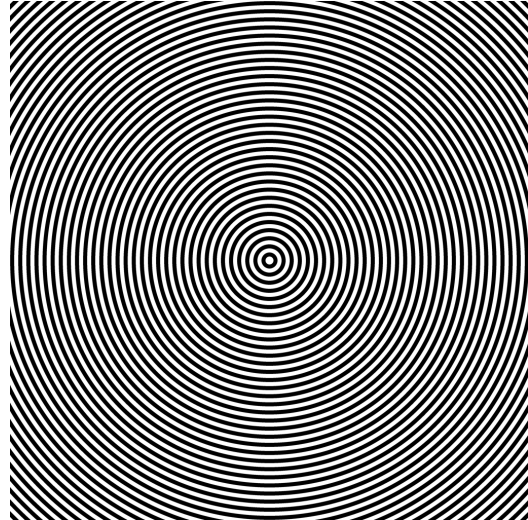


Figure 2:



understanding of the organization of visual processing in the brain by providing evidence of pattern opponency. However, further research is required to develop any credible theories.

References

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- [5] Nicholas J Wade. Distortions and disappearances of geometrical patterns. 6(4):407–433.

Figure 3:

