

# **‘Weaves’ and the Hermann grid**

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## **Stimulus pattern:**

“Weaves” consists of intertwined horizontal and vertical bars (Figure 1).

## **Illusory effects:**

There are 6 important aspects of the weaves:

- 1) When the horizontal and vertical bars differ in luminance, perceptual smudges appear at every other intersection (Figure 1; supplement 1). Smudges occur when the bars with the lower contrast to the background cross in front of the other bars (light smudges with a white background; dark smudges with a black background). With an intermediate background luminance, no smudges occur (Figure 2, mid-section).
- 2) When the horizontal and vertical bars have the same luminance, the smudges appear at every intersection, just as in the Hermann grid. This is true even if the horizontal bars are a different color than the vertical bars (Figure 3; try different values in supplement 2).
- 3) When the bars do not have the same luminance, the smudges are impervious to many different types of distortion that frequently disrupt the Hermann grid (shape, contrast, spatial frequency, contour changes etc.; Figures 4, 5, and 6). Equiluminant weaves smudges disappear whenever Hermann grid smudges do.
- 4) If the bars are gradients, there is a dramatic shift in the grouping of the intersections, and contrast-defined motion occurs in the static image as well as in the modulated background version (Figure 7; supplement 3).
- 5) The removal of high frequency information creates a scintillating grid pattern (Bergen, 1985) when the bars are equiluminant but not when the bars differ in luminance (Figure 8).
- 6) The perceptual smudges are represented in the high spatial frequency information, and weaves smudges can also be present in contrast-defined (contrast-contrast) weaves (Figure 9).

## **Why is this important?**

The famous Hermann grid and scintillating grid illusions are subclasses of the weaves stimulus class; i.e., the Hermann grid and scintillating grid arise when luminance edge and spatial frequency information are removed from a weaves display.

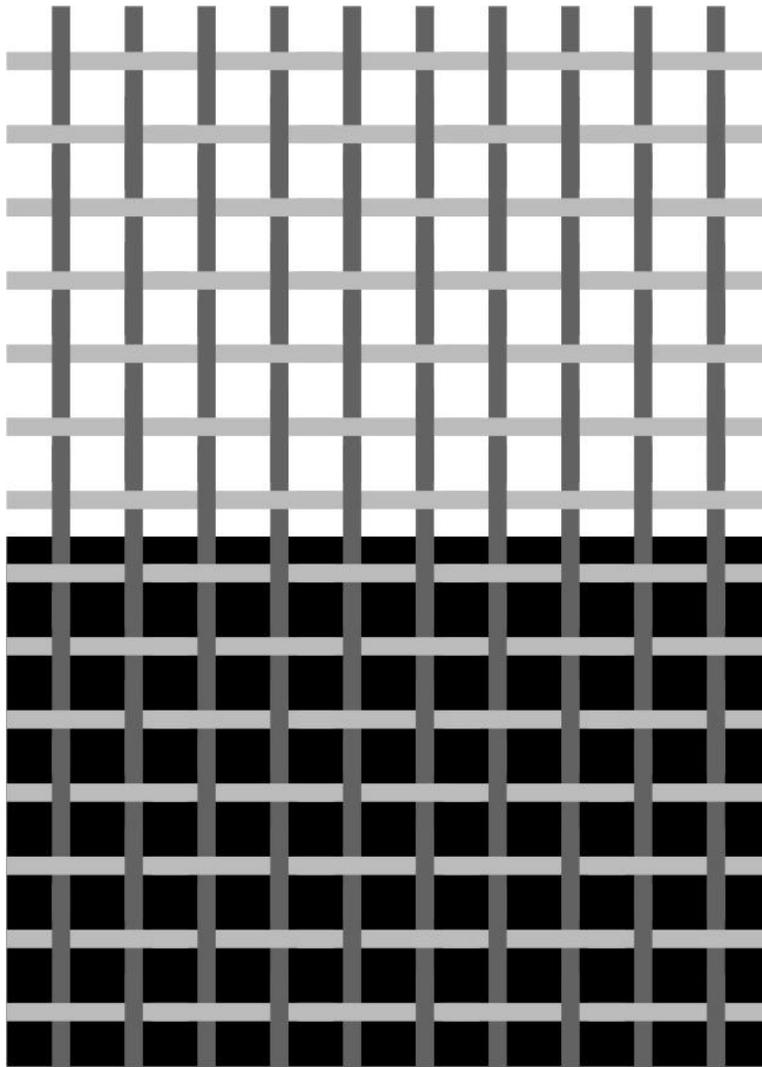


Figure 1: Basic 'weaves' pattern. Light and dark gray bars are intertwined. Perceptual smudges occur where the bar with the lower luminance contrast to the background crosses in front of the other bar (light smudges in the top section, and dark smudges in the bottom section). These smudges are also present when an intersection is fixated foveally. See supplement 1 for a modulated background.

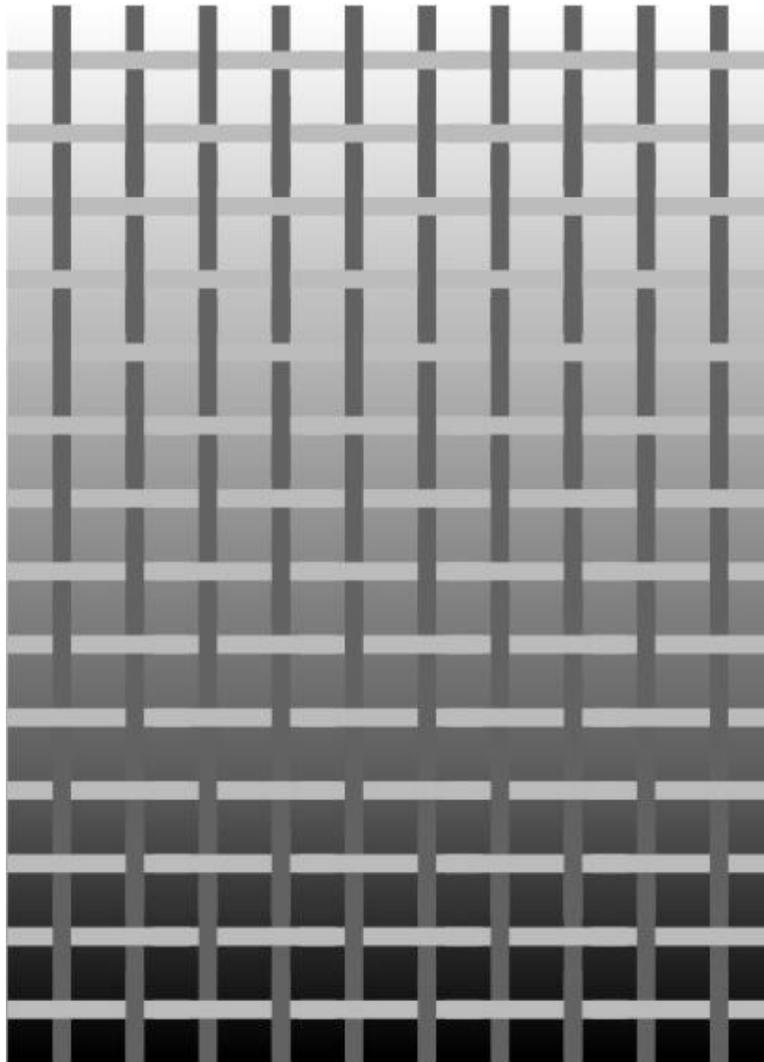
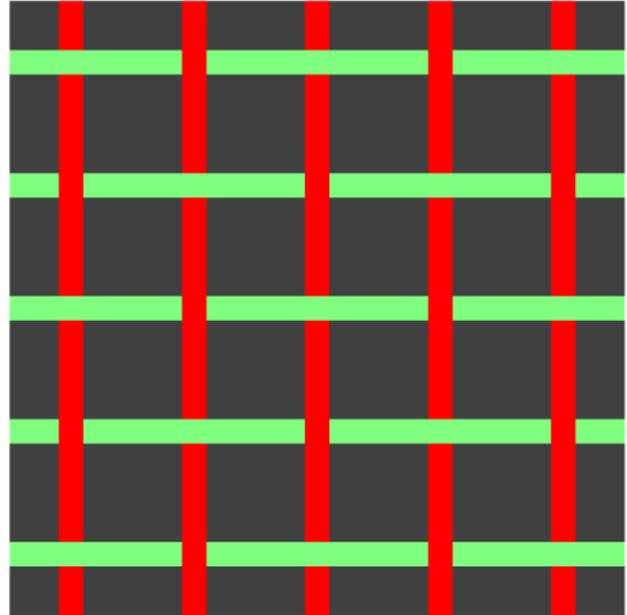


Figure 2: With an intermediate background luminance no perceptual smudges occur (mid section). The top and bottom sections follow the rules described for Figure 1.

## Weaves - RGB

You can set the RGB values for the vertical lines (Vert), the horizontal lines (Hor), and the background (Back) by typing any number between 0 and 255.

R	G	B	
255	0	0	Vert
128	255	128	Hor
64	64	64	Back



Do you perceive light and/ or dark intersections?

Do you see them at each intersection or just at certain ones?

Figure 3: The smudges in weaves can also be elicited with different colors. If the colors are equiluminant smudges occur peripherally at every intersection as in the classical Hermann grid. The colors of the bars can differ – creating an equiluminant Hermann grid – without affecting the smudges. If the bars (colors) differ in luminance, then the smudges occur again foveally and at every other intersection. Try supplement 2 for yourself by changing the different RGB values for the bars and background.

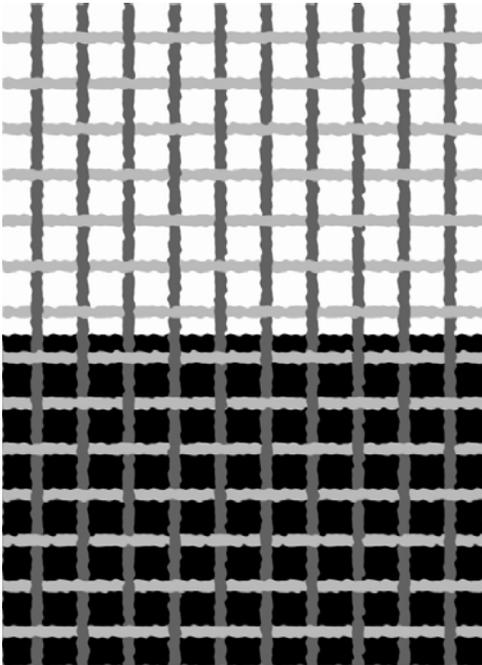


Figure 4: Jaggy bars.

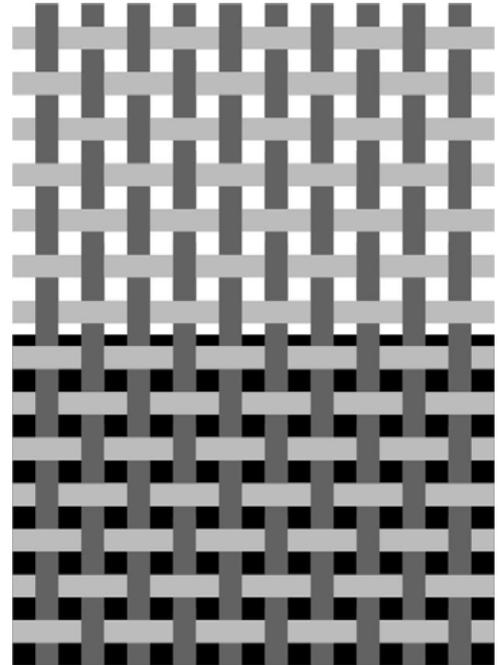


Figure 5: Wide bars.

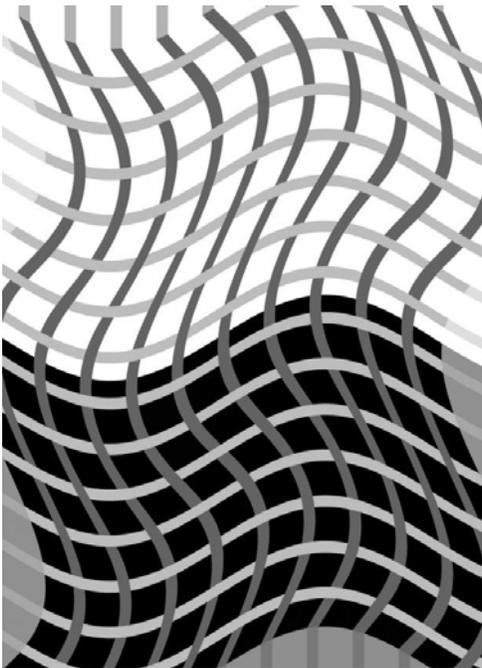


Figure 6: Wavy bars.

Figures 4, 5, and 6 demonstrate different variations of the weaves pattern. If these changes are applied to classical Hermann grids, the perceptual smudges are greatly diminished or absent. The weaves smudges remain unaffected by these changes.

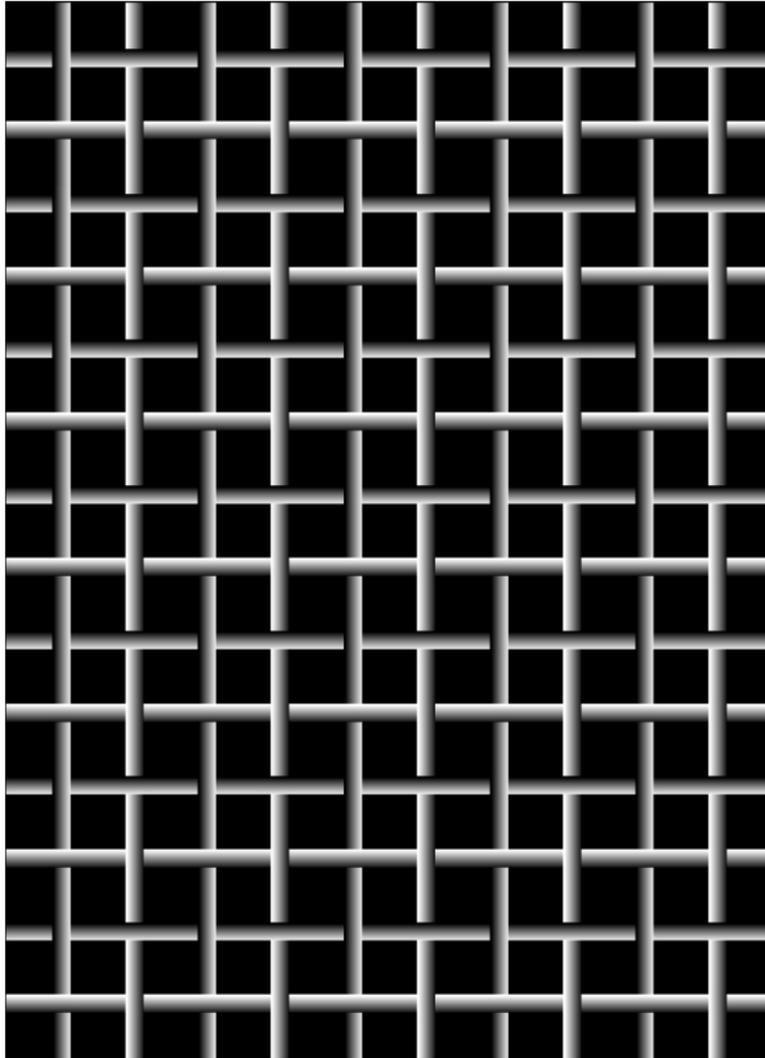


Figure 7: With gradient bars dramatic shifts in the grouping of the intersections occur. Contrast-defined motion occurs in this static image (by moving the eyes over the display) as well as with a luminance modulated background (expansion and contraction; supplement 3).

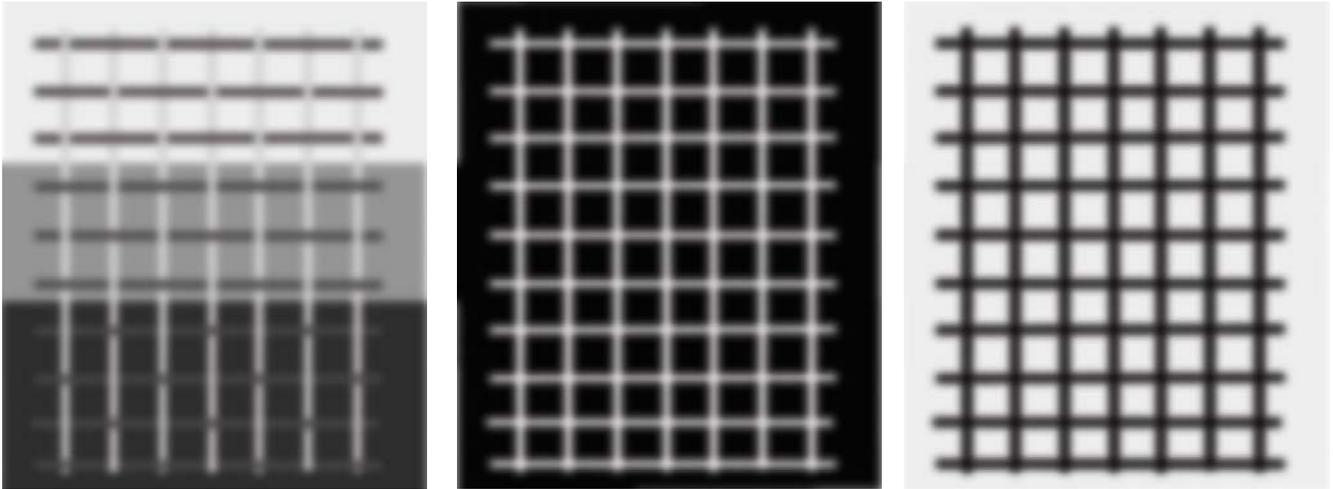


Figure 8: Removing the high spatial frequencies in a non-equiluminant weave does not reveal any effects at all (left). Removing the high spatial frequencies from an equiluminant weave (or Hermann grid) results in a scintillating grid (center and right).

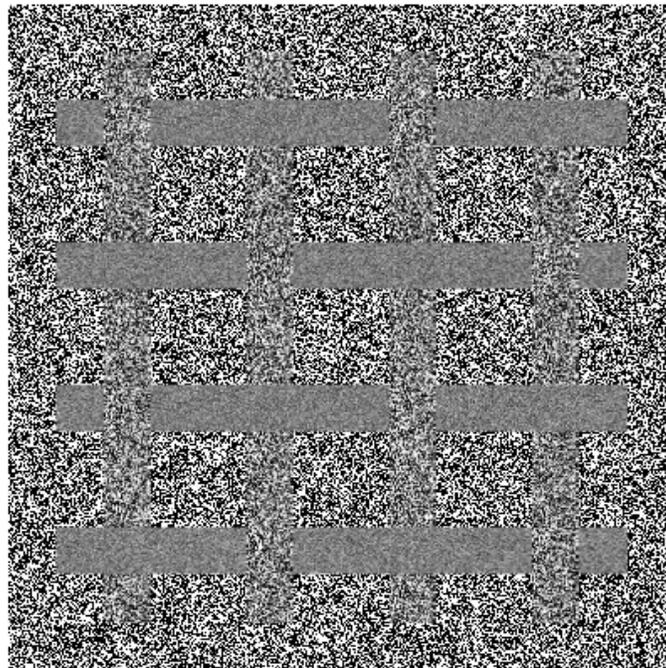


Figure 9: Contrast-contrast weave (2<sup>nd</sup> order). Perceptual smudges are present at the intersections where again the bar with the lower contrast difference to the background crosses in front of the other bars. Contrast-defined Hermann grids do not elicit perceptual smudges.