

## Figure-ground and occlusion depiction in early Australian Aboriginal bark paintings

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### Abstract

Aboriginal painting has been largely treated as conceptual rather than perceptual and its visual impact little examined. In this article, the author shows the perceptual skill and innovation demonstrated by Aboriginal bark painters in depicting figure-ground and occlusion. This has heuristic value for studying occlusion perception and adds visual meaning to the conceptual meaning of the paintings.

### Introduction<sup>1</sup>

Aboriginal people lived in Australia for over 40,000 years before European settlement in 1788. They had a rich ceremonial culture with beliefs and stories about creation, ancestral beings and the land. These stories had longstanding visual expression in rock art, body painting and sand drawing.

Beginning in the early 20th century, Aboriginal people in several locations minimally affected by European settlement were encouraged by anthropologists, missionaries and others to depict their stories in a more permanent form. In Arnhem Land, in the far north of Australia, painters developed an existing tradition of using natural ochres on bark stripped from trees, while in the desert regions of central Australia, acrylic paints on boards were used. Remarkably, these early paintings aroused international interest among institutions and collectors, not as cultural artifacts but as art. A critical step

was the success of the *Dreamings* exhibition at the Asia Society, New York, in 1988.

Australian Aboriginal painting is now widely regarded as a serious form of modern art (McLean 2011, Petitjean 2010) with a strong visual impact. Aboriginal writer Djon Mundine describes an exhibition he curated in Dusseldorf in 1993 as follows: “Antjara was hung as a visual art show. It was supposed to generate a visual-emotional response; to engage the senses and the imagination” (Mundine 2013).

Although the visual impact of Aboriginal painting is often mentioned (Tuckson 1964, Ryan 1996, Coleman 2004), it has received surprisingly little analysis. As Ryan says, “most of the writings on Aboriginal art ... tell us what it is about rather than why it compels the viewer as great art compels the viewer” (Ryan 1996, p. 128). An emphasis on “what it is about” is characteristic of anthropologists, who study Aboriginal art as an expression of cultural and spiritual themes (Berndt et al. 1982, Sutton 1988, Morphy 2010). In line with their focus on meaning, anthropologists have described Aboriginal painting “as having a more heavily conceptual than perceptual approach to

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representation” (Sutton 1988, p. 36). Similarly, Morphy, the foremost expert on the art of the Yolngu peoples of Eastern Arnhem Land, says:

Yolngu, rather than using techniques of visual representation to imitate the reality of the seen, are more concerned with conveying the reality of the unseen. In this respect, then, Yolngu art might also be deemed more conceptual than perceptual (Morphy 2007, p. 88).

Both authors deny that Aboriginal painting is “illusionistic,” by which they seem to mean that it does not attempt to create an illusion of reality. While I fully acknowledge the conceptual and spiritual purpose of Aboriginal art, as a psychologist working in visual perception, I also see it as strongly perceptual in ways I describe here.

Despite stressing the essentially conceptual nature of Aboriginal painting, anthropologists nevertheless do mention visual features.<sup>2</sup> To understand the apparent paradox here, it is necessary to unpack what is meant by “perceptual.” Traditional western art has tended to depict vistas; scenes receding into the distance as projected to a single viewpoint. To do this, Renaissance artists successfully analyzed the mathematics of linear perspective (Alberti 1435). When anthropologists say that Aboriginal art is more conceptual than perceptual, they seem to mean that it is not “perspectivistic” — it does not attempt to depict the projection of a scene from a single viewpoint nor even a single time frame. It does not attempt to simulate a retinal image of the real world. Although

this is true, Aboriginal art is nevertheless perceptual. It depicts real-world properties and relations. Like all art, Aboriginal art draws on the responses of the human visual system, honed by evolution and experience to register properties of the environment relevant to our species. Cultural factors and skill determine just what aspects of visual experience are emphasized in any given art tradition, but all traditions must draw on a common repertoire of visual responses, and these go well beyond our ability to perceive 3D layout from linear perspective.

Aboriginal painting strongly emphasizes the ground, which is of paramount importance for hunter/gatherers. Ground is depicted both on a small and a large (even cartographic) scale, but usually as if below rather than receding from the observer (Berndt et al. 1982). Not surprisingly, the perceptual responses Aboriginal painting draws upon are those relating to perceiving figures, surfaces and locations (or their symbolic representatives) on or in the ground, interacting with one another and often overlapping (partially occluding) one another. Aboriginal painting uses occlusion relations rather than linear perspective to depict depth. It may also combine local perceptual effects to create visual impressions and conjunctions that could not exist in the real world.

Here I analyze the depiction of figure-ground relations and surface occlusion in early (mid-20th century) Aboriginal bark painting from “the classical period” (Sutton 1988, p. 36).

Unlike linear perspective, which has received a great deal of attention in the art history literature, the depiction of occlusion, although ubiquitous in painting, is surprisingly neglected (Kanizsa & Masironi 1989). These authors attribute this

<sup>2</sup> Morphy (2007) has drawn attention to the shimmer produced by *narrik*, or cross-hatching, in Yolngu painting, as well as figure-ground reversals and other visual properties to be discussed later. Sutton (1988) discusses symmetry.

neglect to a misapprehension that occlusion relations are cognitive interpretations rather than immediate perceptual responses (Kahneman 2002). A similar view may account for anthropologists being aware of certain depictions of figure/ground relations in Aboriginal painting without considering them “perceptual.”

The perceptual problem to be solved by painters is that an object or surface intended to appear partially behind another (i.e. partially occluded by it in the field of view) must accommodate the fact that the two surfaces will often be *adjoined* in a two-dimensional representation, sharing a common border. In real-world viewing, the depth cues of stereopsis and motion parallax are available to resolve the depth order of surfaces. However, a painter (or even a photographer) must use

properties of the two-dimensional representation to create the impression that one of two adjoining surfaces is the foremost one and thus “owns” the common border and that the other surface does not end at the border but extends behind the front surface.

How can these impressions be conveyed in a painting with an immediate phenomenological (perceptual) impression of occlusion relations? This requires the skilled application of perceptual principles, which have been the subject of scientific study. These considerations apply to Aboriginal art, which as I shall show is very concerned with occlusion and depicts it with considerable sophistication and imagination. Figure 1 shows some quite early Aboriginal paintings that seem to have occlusion depiction as the major feature.

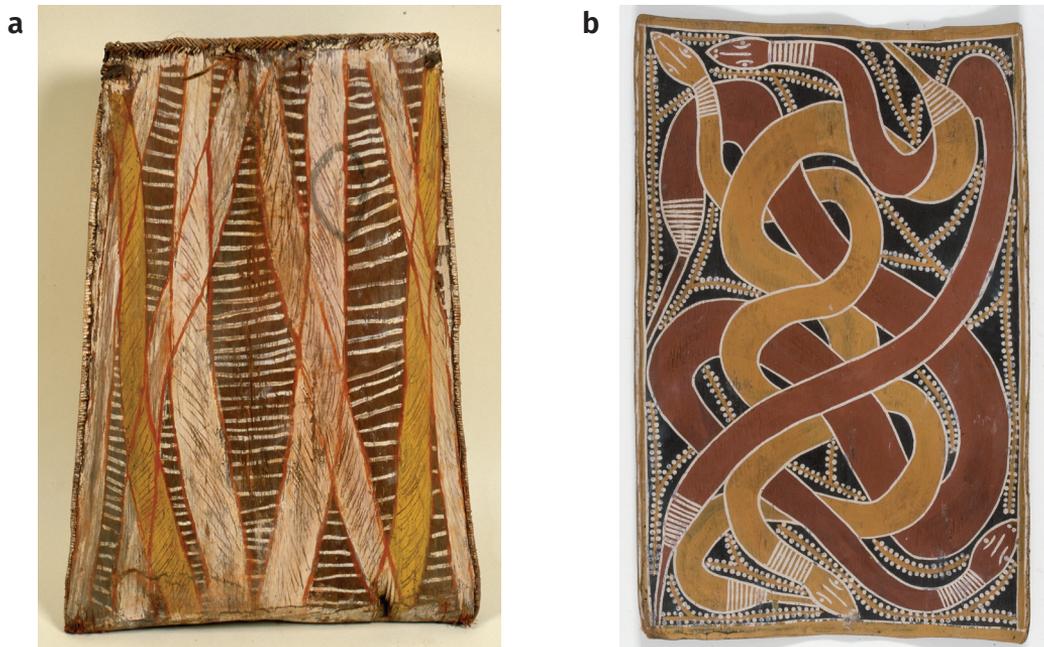


Fig. 1. Early bark painting featuring occlusion.  
 (a) *Water basket*, 1905, 69 × 38.5 × 29 cm, A338, South Australian Museum;  
 (b) David Malangi, *Serpent at Gatji waterhole*, 1969, 45.1 × 28.9 cm, MCA  
 (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.)

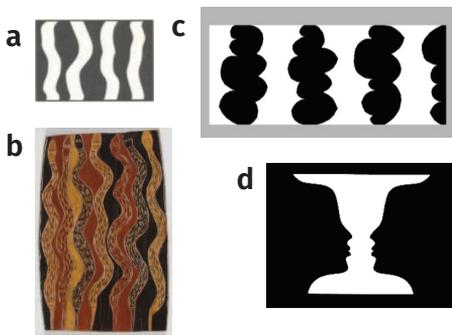


Fig. 2. Illustrating some figure/ground principles. (a) Parallel contours define figure; modelled after Metzger (1953); (b) Binyinyiwuy, *Rain snakes*, c. 1960, 41.5 × 26.4 cm, MCA (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.); (c) Convex areas tend to form figures with concave areas forming ground, modelled after Kanizsa & Gerbino (1976, pp 25–32); (d) Faces and vase alternate as figure, from Rubin (1915).

### Scientific Studies of Occlusion

Psychologists have explored the perception of occlusion and border ownership in three major paradigms: figure-ground, occlusion at contour T-junctions, and amodal completion. These each reflect perceptual responses to different aspects of the ecological properties of occluding/occluded surfaces. I shall first briefly describe the effects revealed by these paradigms, then show how Aboriginal painting uses them, extends them and sometimes deliberately violates them.

#### Figure-Ground

The oldest form of perceived occlusion studied scientifically is figure-ground, first described by the Danish psychologist Edgar Rubin (1915). Using 2D drawings, Rubin juxtaposed black and white areas side by side with common borders between them (see Fig. 2).<sup>3</sup> He explored the 2D properties of

<sup>3</sup> Figure-ground is a continuing focus of research on perceptual organization. (For a summary, see Wage-

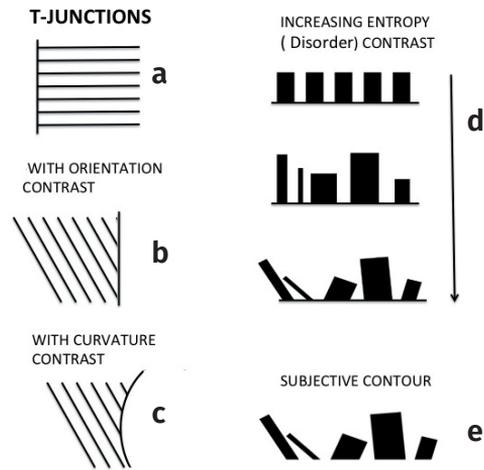


Fig. 3. Different arrangements of T-junctions. (a) “Top” orthogonal to stems; (b) “top” not orthogonal to stems; (c) “top” curved; (d) stems are disordered but with linear alignment; (e) as d but with a “subjective contour.” Based on figures by Gillam & Chan (2002).

an area that will increase the likelihood of it appearing to be the figure rather than the (back)ground. He found that areas whose shapes are symmetric, surrounded, predominantly convex and with parallel sides tend to be seen as figure, while adjoining areas that are asymmetric, surrounding, nonparallel and predominantly concave tend to be seen as ground (for examples, see Fig. 2). The figure takes ownership of the common border and has a shape determined by this border. The adjacent area, having lost the border, appears as background, extending behind the area seen as figure. The ground does not appear to have shape because it is not bounded. Two adjacent regions with balanced figural properties may alternate between figure and ground status (see Fig. 2d). Of relevance to later discussion, Peter-

mans et al. 2012). Rubin’s principles have been confirmed and others added (e.g. Palmer & Ghose 2008).

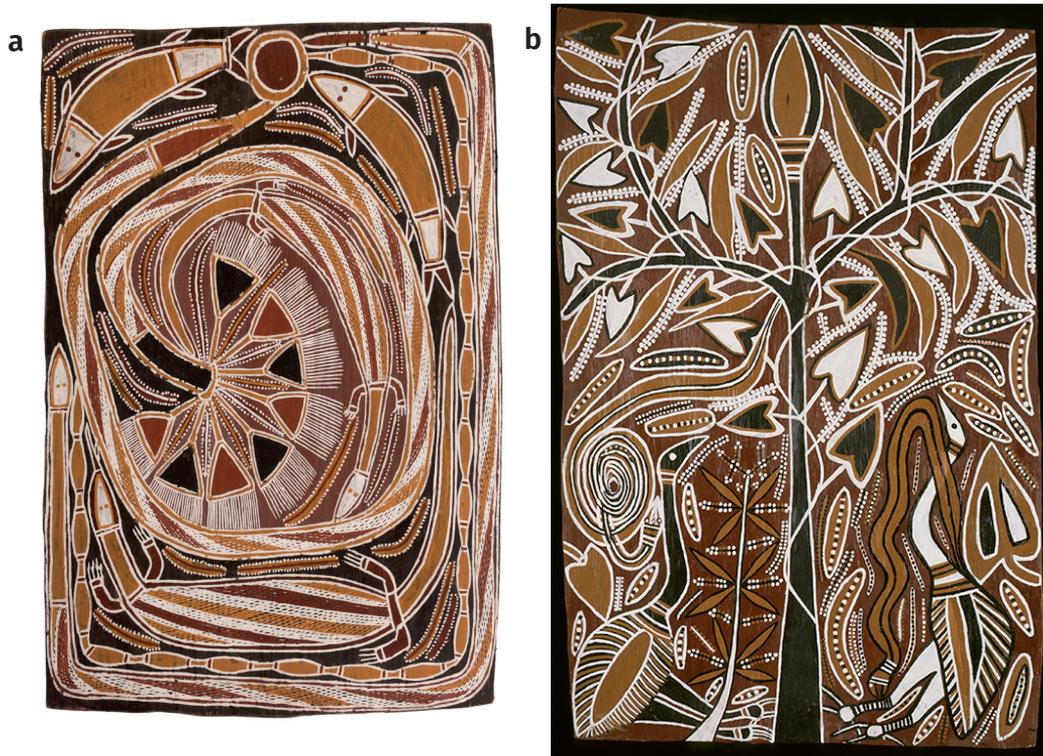


Fig. 4. Paintings from Central Arnhem Land.

(a) Dawidi, *Dhalngurr*, 1967, 54 × 78 cm, Museum and Art Gallery of the Northern Territory (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.);

(b) David Malangi, *The Hunter's Tree—Gurrmirringu, Ancestor*, 1965, 106 × 68.2 cm, State Art Collection, Art Gallery of Western Australia (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.).

son & Salvagio (2008) found that if the ground colour between successive convex shapes, like those in Fig. 2c, is varied, the figures dominance of those shapes is reduced.

### Occlusion at T-junctions

Figure-ground research examines the *shape* factors that cause one area to take possession of a border and appear as a figure. However, shape is not the only factor that influences apparent occlusion. The boundary of an occluding surface often cuts off more remote contours forming “T junctions” at the intersection. The occluding surface edge forms the top of the Ts and the occluded contours

form the stems (see Fig. 3a) (Ratoosh 1949, Rubin 2001).

T-junctions become much stronger occlusion cues when the line forming the top of the Ts is curved or when it is not at right angles to the stems (Gillam et al. 2014). This can be seen by comparing Fig. 3a with Figs 3b and 3c, and reflects the ecological fact that an edge cutting off a set of contours is more likely to be an occluding edge if it is unrelated to those contours. We use the terms “orientation contrast” and “curvature contrast” to refer to the cases shown in Figs 3b and 3c, respectively.

The sense of occlusion is also stronger for a line when it forms T-junctions with stems unrelated *to each other* in orientation, length, separation, etc., having high disorder (Gillam & Chan 2002, Gillam & Grove 2011) For example in Fig. 3d, the line along the bottom of the five shapes elicits an increasingly strong sense that it is occluding the shapes as their disorder (entropy) increases. This reflects the ecological fact that a set of unrelated objects are very unlikely to be aligned along a linear edge unless that edge is an occluding edge. We refer to this factor as “entropy contrast.” Interestingly, the occlusion in Fig. 3d can be shown to be “perceptual” rather than “conceptual” by the observation (Gillam & Chan 2002) that a “subjective” occluding contour appears when the physical contour is removed (see Fig. 3e).

#### **Amodal Completion and Relatability**

Another common visual outcome of occlusion is that contours cut off by an occluding surface often continue on its other side. Such a continuation is usually accompanied by “amodal completion” or the apparent continuation of the interrupted contours behind the apparently occluding surface, even though the continuation is not sensorially present (Michotte et al. 1964). Amodal completion requires the two disjointed elements to be “relatable” (joinable by an uninflected curve) (Kellman & Shipley 1991).

#### **Occlusion in Bark Paintings of Arnhem Land**

Aboriginal bark painting has used all the principles described in the previous sections to varying degrees. Its interest for vision science derives from the innovative ways figure/ground and occlusion are depicted and manipulated to serve narrative and symbolic purposes.

#### **Paintings with Minimal Occlusion**

A number of early bark paintings, especially those from Western Arnhem Land, depict either a single figure or a number of separated figures on a single homogeneous ground (see supplemental Appendix 1; appendixes provided with online version of this article<sup>4</sup>). Overlap is almost entirely avoided in this tradition, which seems to be influenced by the rock art common in Western Arnhem Land. Because these paintings show little juxtaposition of surfaces or overlap, they are of limited interest for the study of occlusion.

Central Arnhem Land painters often cover the entire field with luxuriant details forming a complex, integrated organization with very little background visible. In the examples shown in Fig. 4, the contours of one form often follow the contours of another, so that there is minimal overlap. There are nevertheless subtle occlusion effects. In Fig. 4a, by Dawidi, a snake figure appears to bend out of and back into the picture, with its head becoming a sacred cabbage palm. The powerful sense that the palm is occluding something behind it is (unusually) based on its perspective bending rather than on T-junctions. Figure 4b, by David Malangi, is discussed by art historian Nigel Lendon, who points out the role of the tree as structural architecture and the presence of multiple vantage points in the painting, with some figures depicted in plane and some in elevation (Lendon 2004). Overlapping features, which Lendon also mentions, seem sparse, although the thin white occluding vine with its curvature contrast, reinforces and softens the rigid structural architecture of the tree. The subtle occlusion in this painting con-

<sup>4</sup> See the issue web page, at <https://royalsoc.org.au/council-members-section/436-v152-2>

trasts with the much bolder occlusion in the snake painting shown in Fig. 1b, also by Malangi.

### Eastern Arnhem Land; Incorporating Clan Designs

The painting of the Yolngu people of Eastern Arnhem Land is particularly conducive to occlusion manipulation, because of its use of clan designs. These are repeating geometric patterns, which often form backgrounds as well as standing for a variety of features such as fire, sand hills or water. The two best-known clan designs are associated with different Yolngu kin groups, or moieties. The pattern of alternating vertical and horizontal strips is associated with the Dhuwa moiety (Fig. 5b), while the diamond-shaped honey design is associated with the Yirritja moiety (Fig. 5a). The honey design is especially conducive to figure-ground reversal. For example, on the upper left of Fig. 5a, the black diamonds alternate as figure with the lighter hourglass shapes.

All three aspects of occlusion perception studied by psychologists (figure-ground, contour junctions and amodal completion) play a role in the seminal paintings of Yolngu painter Mawalan Marika (circa 1908–1967) of the Dhuwa moiety. These factors will be discussed as they are used complementarily to create occlusion effects in a chronological succession of his paintings from 1941 up to 1958. Other paintings by Yolngu artists will be introduced where relevant. Of particular interest for perceptual psychology are the cases where Mawalan and others manipulate or violate the known “principles” of figure and ground. In some cases, the figure-ground impression nevertheless survives, while in other cases it seems to be deliberately destroyed.

Figure 5b shows one of Mawalan’s paintings incorporating the Dhuwa clan design. On the left panel, the horizontal strips appear to occlude the vertical strips based on T-junctions and a degree of entropy contrast (the stems of the Ts outline surfaces with a variety of shapes that are cut off by a single linear contour). The goanna (lizard) on the right panel is seen as occluding the background strips, based on curvature contrast, convexity and the relatability of the horizontal contours across its body, giving a sense of amodal completion. Interestingly, the winding figure on the middle panel, which represents the goanna’s track, also appears to occlude the background strips, even though they are not relatable across it. Curvature contrast between track and strips seems sufficient here to support the perception of occlusion without amodal completion.

Figure 6a, painted in 1946, is a more abstract painting in which vertical and horizontal strips are in a complex arrangement of textures and layers maintaining the orthogonal relationships of the clan design. It is difficult to imagine that Mawalan was not thinking of perceptual as well as narrative effects when arranging the textures and geometries for this picture. The whole composition gives an impression of complex depth layering based on nested T-junctions.

Mawalan’s work in Fig. 6b, from 1948, is a tour de force of occlusion effects. It includes many examples of the clan design, largely using nonorthogonal components, so that orientation contrast adds a strong additional sense of occlusion. Furthermore, the snakes are perfect for giving a sense of occlusion by curvature contrast, since they are seen against backgrounds of linear contours. They also terminate a *variety* of contours, with entropy contrast enhancing the sense of

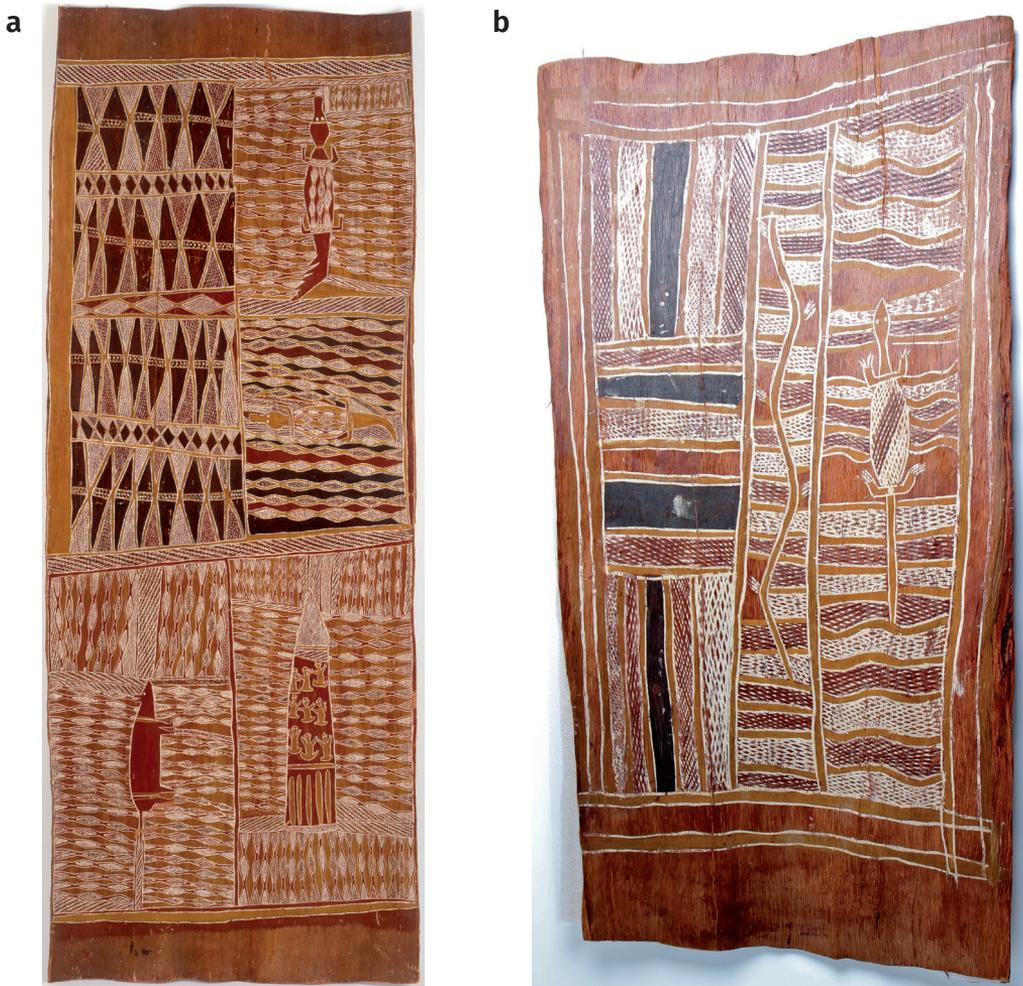


Fig. 5. Two major Yolngu clan designs (Eastern Arnhem Land).  
(a) Munggurrawuy Yunupingu, *Lany'tjung story (Crocodile and Bandicoot)*, 1959, 193 × 72 cm, AGNSW (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.);  
(b) Mawalan Marika, *Djang 'kawu at Yalangbara*, 1941, 102 × 53cm, Australian Museum (© Mawalan Marika/Copyright Agency). Note figure-ground reversal.

occlusion. But the really interesting innovation is the presence of nested occlusions (up to four layers of contours superimposed on each other by a succession of orientation contrasts [see lower left]). This produces not only a very strong impression of occlusion but also considerable depth.

The snakes in Fig. 6b suggest another novel perceptual effect. They are starkly black against a patterned surround. This gives them a sinister ambiguity, suggestive of either a figure or a hole or both at once. Figure 7a, by Gimindjo, shows even more clearly the tendency of a black region within

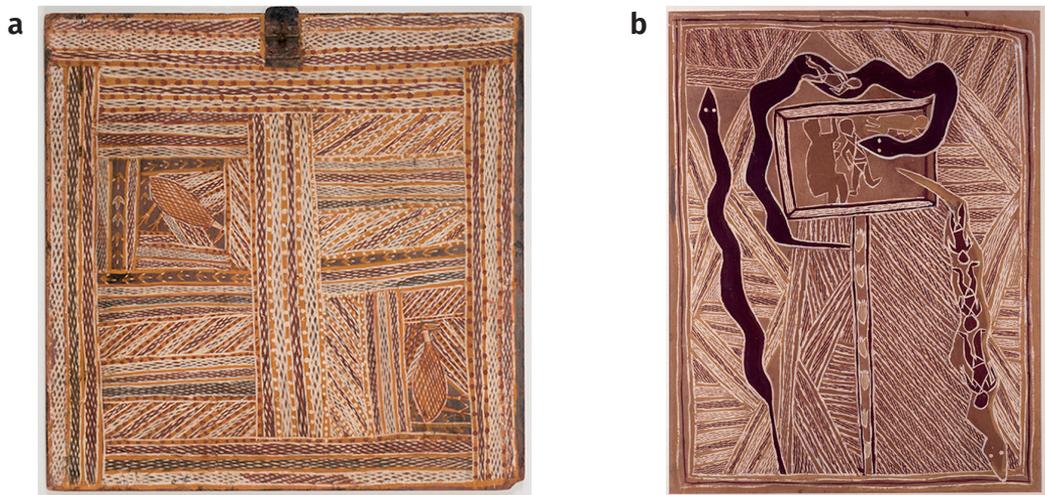


Fig. 6. Paintings by Marika with strong occlusion features.

(a) Mawalan Marika, *Yalanbara*, 1946, 45 × 45 cm, Macleay Museum (© Mawalan Marika/Copyright Agency);

(b) Mawalan Marika, *The Wagilag Sisters*, 1948, 56 × 42 cm, Kluge-Ruhe Aboriginal Art Collection (© Mawalan Marika/Copyright Agency)

a context of texture to appear as a hole. The hole has considerable visual depth, presumably because of its lack of surface quality in contrast with the patterning of the surrounding ground. Gimindjo's painting also illustrates another feature of a number of bark paintings. The orientations of the bands of texture next to the snake change their angle systematically around its curved outline, as if dragged around by the snake's movement. Figure 7b, by Mawalan, shows similar changes in the orientations of background contours associated with the snake's changing curvature. In both cases, the lack of independence of the figure (the snake) and the pattern surrounding it militate against seeing occlusion by orientation contrast, although curvature contrast and texture differences are still present. Appendix 2 shows more examples of figure influencing ground.

Another Mawalan painting (Fig. 8a) shows another kind of relationship between

figure and ground. The necks and tails of the goannas merge into the background strips. This is clearly symbolic of the belongingness of the goanna to the land and perhaps its tendency to be at least partially camouflaged by it. The goanna was also a clan totem for Mawalan. Morphy describes other examples of Yolngu painting in which figures merge with a design or become absorbed into it by *buwayak*, or the process of becoming invisible, for example by reproduction of the same design within the body of the figure and in the background outside (Morphy 2007).

A much later picture by Mawalan, *Hunting Scene* (1959) (Fig. 8b), depicts animals on various backgrounds. It is interesting that the scenes with buffaloes, which are introduced animals, have chaotic backgrounds, while the scenes with native animals have backgrounds that are more calm and orderly. This may be symbolic. The buffaloes are dangerous and disruptive in the context of



Fig. 7. Paintings in which the figure influences the ground.  
(a) Gimindjo, *The Gadadangul snake*, 1960, 68.6 × 46 cm, MCA (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.);  
(b) Mawalan Marika, *Wagilag Creation Story*, 1966, 116 × 40 cm. Courtesy Lauraine Diggins Fine Art (© Mawalan Marika/Copyright Agency).

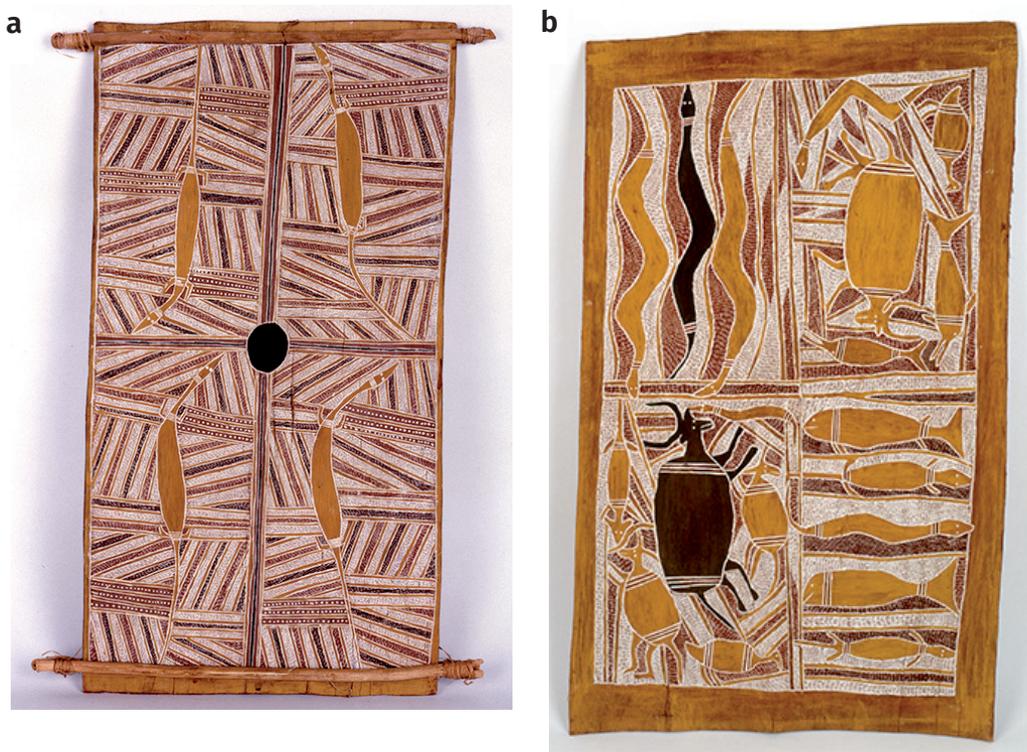


Fig. 8. Further paintings by Marika.  
(a) Mawalan Marika, *Goannas at Yalangbara*, 1959, 73.98 × 40.64 cm, Kluge-Ruhe Aboriginal Art Collection (© Mawalan Marika/Copyright Agency);  
(b) Mawalan Marika, *Bark painting (hunting scene)*, 1959, 102.9 × 62.3 cm, AGNSW (© Mawalan Marika/Copyright Agency). Panels with introduced animals (top right and bottom left) have chaotic backgrounds. Panels with native animals (top left and bottom right) have orderly backgrounds.

Aboriginal life and, unlike the native animals, move roughly across the terrain. The painting has another interesting detail. The snakes on the upper left appear as figure, while the irregular regions between them appear as ground, providing another example of E. Rubin's figural principle of parallelism (Rubin 2001). The goannas, sharks and snake in the panel at the bottom left all appear strongly as figures, even though the background changes its contrast polarity behind them (i.e. the background is darker on one side of the figure and lighter on the

other). Clearly parallelism and convexity are sufficient here to support figure without continuity of background.

A later painting by Mawalan, *Tribesmen at Sea and Land* (Fig. 9a), is very different from his earlier paintings in that it totally disrupts figure and ground relations. The many and varied figures of people, boats and spears are strewn across the painting at various orientations. They do not occlude each other and are all the same light brown color. However, the background is not homogeneous as in earlier traditions of depicting



Fig. 9. Paintings with deliberately disordered ground.  
(a) Mawalan Marika, *Tribesmen at sea and land*, 1958, 101.4 × 58 cm, MCA (© Mawalan Marika/Copyright Agency);  
(b) Munggurawuy Yunupingu, *Creation story*, 1970, 156 × 65 cm, NMWC, Utrecht (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.).

multiple figures demonstrated in Appendix 1. It is a chaotic mixture of irregular patches of black, dark brown and white with some patches attached to the figures and some not. The figures only become obvious after local scrutiny. By destroying the homogeneity of the ground, Mawalan has demonstrated a major advantage of a homogeneous ground in the depiction of a scene: It allows multiple figures to be seen more or less in parallel. Although Mawalan figures and patches of ground are much more varied in shape, size and orientation than those used by Peterson and Salvagio (2008), his disorder effect may

be related to the effect of ground inhomogeneity shown in their (much later) studies. Figure 9b shows a less dramatic example of the background disorder effect, also by a Yolngu painter.

#### Layering in Aboriginal Bark Painting

An important feature of certain Western and Central Arnhem Land bark painting is the segregation of texture into two layers. This effect occurs as early as 1937 in a work by Yilkari Katani (Fig. 10). An arrangement of thin lines is superimposed on a coarser texture of crosshatched alternating dark



Fig. 10. Yilkari Katani, *Wagilag Sisters Dhawu*, 1937, 126 × 68.5 cm, Donald Thomson Collection (© Albert Djiwada)

and light areas. The patterns appear to segregate into two layers, with the fine lines appearing as a nearer grid through which the coarser pattern can be seen. Appendix 4 shows later, more compelling examples of segregation into layers. John Mawurndjul's painting (Appendix 3a), by comparison with Yirawala's (Appendix 3), suggests that segregation is enhanced when the coarser grid is relatable across the contours of the fine grid.

A later development enhances the spiritual effect of layering by combining it with

a form of what Morphy (2011) refers to as “buwayak” in which low luminance contrast produces a ghostly appearance appropriate to the depiction of sacred ceremony and ancestral beings. Figure 11a, a much later painting by Katani, uses these combined effects to depict the Mayadin ceremony. The beings outlined by the thin lines tend to look transparent as well as ghostly so long as their inner texture has the same spatial frequency as the background. The central snake on the other hand looks ghostly without appearing transparent because it has a different spatial frequency from the background. The rainbow snake (Fig. 11b) by Mawurndjul shows a similar ghostly effect within a single figure, with the snake's internal outlines barely visible against a coarser cross-hatched texture. Mawurndjul is a master at depicting ancestral beings and ceremonies. In his painting in Appendix 5A the outlines of the rainbow snake are again almost camouflaged by lack of luminance contrast with the background of broader cross-hatching. One of the yawkyawk girls of the title (these are one such being) is partly absorbed within the snake by their common texture. Appendix 4B shows Mawurndjul painting his version of the Mayadin ceremony, with layering but without the ghostly effect of Katani's version (Fig. 11a), because of strong luminance contrast between the layers.

#### Occlusion Depiction with a Strong Conceptual Purpose

Figure 12a is another painting by Malangi, in which he manipulates figure and ground to create a polysemic effect. The pelican on the lower left is seen against a land background above and a sea background below. The background behind the figure changes for a semantic purpose without destroying its figural status perceptually.



Fig. 11. The fine/coarse layering effect combined with low luminance contrast to depict ancestral beings.  
(a) Yilkari Katani, *Myth of the Wawilak Sisters*, before 1957, 39 × 78 cm, Museum der Kulturen, Basel (© Va 905);  
(b) John Mawurndjul, *Ngalyod — the rainbow serpent*, 1985, 125 × 59 cm, AGNSW (© John Mawurndjul/Copyright Agency).

Figure 12b by Djunmal (1966) depicts forms of communication between the two moieties of the Yolngu people of eastern Arnhem Land and includes a rich mixture of occlusion effects. To the left is the clan design of the Yirritja moiety and to the right the design of the Dhuwa moiety. The middle crossing of the vertical strip dividing

the moieties is fully modal, while the upper and lower crossings are amodal, with perceived completion occurring on the basis of contour relatability (despite a lack of texture relatability). These different forms of connection suggest both fully public and more private forms of communication between the moieties.

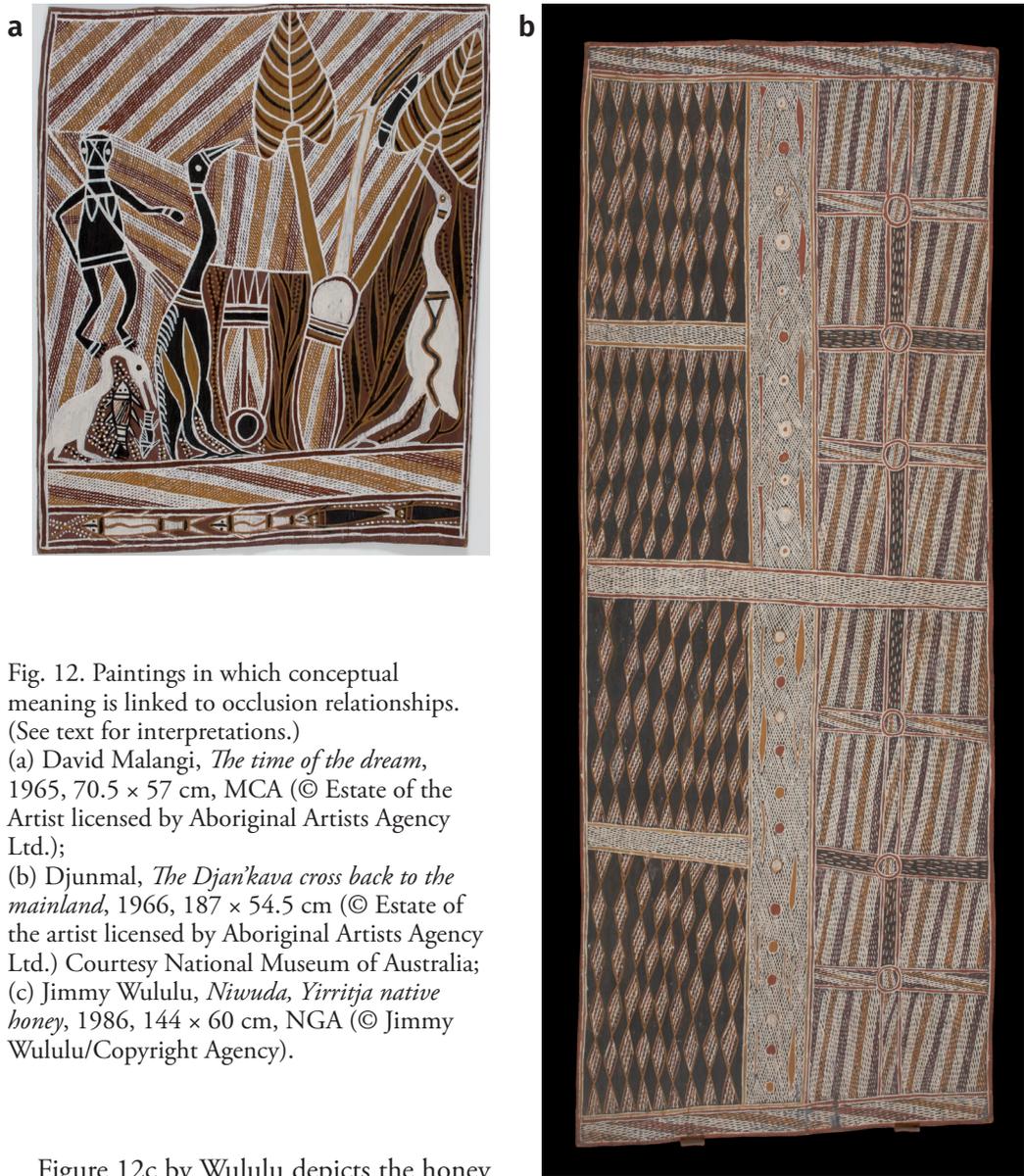


Fig. 12. Paintings in which conceptual meaning is linked to occlusion relationships. (See text for interpretations.)  
(a) David Malangi, *The time of the dream*, 1965, 70.5 × 57 cm, MCA (© Estate of the Artist licensed by Aboriginal Artists Agency Ltd.);  
(b) Djunmal, *The Djan'kava cross back to the mainland*, 1966, 187 × 54.5 cm (© Estate of the artist licensed by Aboriginal Artists Agency Ltd.) Courtesy National Museum of Australia;  
(c) Jimmy Wululu, *Niwuda, Yirritja native honey*, 1986, 144 × 60 cm, NGA (© Jimmy Wululu/Copyright Agency).

Figure 12c by Wululu depicts the honey cells of his clan design but also refers at another level to a post-funeral ceremony in which the bones of the deceased are placed in a painted hollow log (depicted vertically in the centre of the painting) while the soul enters the ancestral realm (Cubillo & Caruana 2010). One diagonal passes behind the centre column, while the other

diagonal passes in front of the column partly occluding it. These effects both depend on T-junctions and relatability. Arranging the edges of the diagonals to be in line with the diamonds within the column creates a certain tension between perceiving occlusion and non-occlusion. The carefully organized



spatial relationships in this painting (characteristic of Wululu) undoubtedly relate to its ceremonial meaning.

### Conclusion

Figure-ground and occlusion are skillfully depicted in Aboriginal bark painting. Perceptual principles known to psychologists, such as convexity, parallelism and contrast, are used in interesting ways, while novel

effects, such as changing ground, disruption of ground, nested occlusions and texture layering, are explored. Although this was not their purpose, these paintings, like Rubin's (2001) demonstrations, have considerable heuristic value for scientists interested in the perception of occlusion.

I have also pointed to possible conceptual meanings specifically associated with the depiction of figure-ground and occlusion and their disruption. Even if one's interest in Aboriginal art is solely conceptual, a greater awareness of its visual meaning should enhance this appreciation.

### Acknowledgements

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