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Closure as a Working Condition: Gestalt Organisation in Kelantan and Shaanxi Shadow Puppet Design

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Abstract:

A shadow puppet cannot be drawn. Every line on it is either cut through the hide or left as hide, and a form cannot be described by a continuous incised outline without falling apart. The maker must therefore rely on the viewer's perceptual system to join what the knife cannot. This paper argues that the Gestalt laws of grouping are, for this medium, not an interpretive lens applied after the fact but a working condition of the craft, and it examines how two unrelated traditions, the wayang kulit of Kelantan (Malaysia) and the shadow play of Shaanxi (China), satisfy that condition. Thirty museum and field samples, fifteen from each region, were analysed against the seven laws of grouping: similarity, proximity, continuity, closure, figure–ground articulation, symmetry and common fate. All seven are found in operation in both traditions and doing the same work, but the two traditions distribute the perceptual load differently. Kelantan figures, whose contours are rows of punched dots, ask the viewer above all to complete lines; Shaanxi figures, whose contours are continuous cuts interrupted only where structure requires, ask the viewer to complete forms. The reversibility of figure and ground, which the backlit medium makes literal, is shown to govern the maker's choice between positive and negative treatment of every zone. The findings support the view that the principles of design are culturally inflected expressions of universal perceptual tendencies, and extend it to a folk medium in which those tendencies are conditions of legibility rather than aesthetic preferences.

Keywords:

Gestalt Theory, Perceptual Grouping, Closure, Figure–ground, Shadow Puppet, Kelantan Wayang Kulit, Shaanxi Shadow Play, Folk Design

1. Introduction

Gestalt psychology began, a century ago, with the proposition that perception organises the visual field into wholes rather than assembling it from independent parts [1,2]. The laws of grouping that follow from this proposition, similarity, proximity, continuity, closure, figure–ground articulation, symmetry and common fate, have since been elaborated into a mature experimental field [3] and have been applied, with varying rigour, to painting [4], to graphic design and colour [5,6] and occasionally to folk art, notably Chinese cut-paper [7]. In most of these applications the laws explain

why a composition succeeds: the artist could have done otherwise, and Gestalt analysis shows why what was done works.

Shadow puppets present a different case. The figure is a sheet of hide seen in silhouette against a backlit screen. Any region cut away becomes light; any region left standing becomes shadow. A continuous closed outline cannot be incised, because the piece inside it would drop out; a face cannot be fully described by cut lines, because the face would disintegrate. The maker is therefore not free to do otherwise. Whatever the tradition, the figure must be constructed from discontinuous marks that the viewer's perceptual system completes, and the laws of grouping are the only means by which a disjointed pattern of light and shadow becomes a prince, a monkey or a general. Closure, in particular, is not a device the maker may elect to use; it is the condition under which the craft is possible at all.

This paper examines how two unrelated shadow traditions meet that condition. The Kelantan wayang kulit of north-eastern Peninsular Malaysia and the shadow play of the Shaanxi region of China developed without documented contact [8,9], use different tools and different hide preparations [10], and organise their decorative patterns according to opposed grammars, rhythmic repetition in Kelantan and bounded enclosure in Shaanxi, as a companion study has shown. If the same perceptual laws are found at work in both, doing the same work, the comparison supports the claim that these laws are universal conditions of the medium rather than regional conventions; if the two traditions exploit them differently, the comparison shows where cultural choice enters. The paper asks, first, which laws of grouping each tradition relies upon and for what; second, how the backlit medium's literal reversibility of figure and ground shapes the maker's decisions; and third, what the comparison implies for the relation between design principles and perception.

2. Theoretical Framework

2.1. The laws of grouping

Wertheimer’s original paper on perceptual organisation identified proximity, similarity, continuity (good continuation), closure and common fate as factors by which elements are grouped; subsequent work added figure–ground articulation, following Rubin, and symmetry [11,3]. Table 1 summarises the seven laws as used here and pairs each with the design principle that depends on it, since the design principles of rhythm, proportion, emphasis, balance, unity and repetition [12] describe what a composition should achieve, while the Gestalt laws describe why the perceptual system allows it to be achieved.

Two of these laws require comment because they bear directly on the medium. Closure, the tendency to perceive an incomplete contour as a complete form, was given its most striking demonstration by Kanizsa [13], whose illusory figures show that the perceptual system will construct a contour where none is physically present, provided the inducing elements are arranged consistently with one. Figure–ground articulation, first analysed by Rubin, is the assignment of one region of a two-colour field as the object and the other as the background; the assignment is reversible, and the perceptual system prefers to assign figure to the smaller, enclosed, convex or symmetrical region [3]. In ordinary pictures both laws operate on marks that are themselves complete; in a shadow puppet they operate on the only kind of mark the medium permits.

Table 1. *Gestalt laws of grouping and the design principles they underpin.*

Gestalt law	Perceptual tendency	Design principle served
Similarity	Elements sharing shape, size or colour are grouped	Unity, rhythm
Proximity	Elements close together are grouped; outweighs similarity	Unity, emphasis
Continuity	Elements arranged along a path are read as one line	Repetition, rhythm
Closure	Gaps in an outline are filled to complete a form	Unity, economy of line
Figure–ground	A smaller, bounded area is read as figure against a larger ground	Emphasis, depth
Symmetry	Mirrored elements are grouped and read as stable	Balance
Common fate	Elements oriented in the same direction are grouped and read as moving	Rhythm, implied motion

2.2. The constraint of the cut

Hu [7], analysing Chinese cut-paper, observed that the yin cut (removed paper) and the yang cut (remaining paper) make figure and ground interact in a way that painting does not, and that the closure of a split petal or the continuation of a row of arrow-shaped cuts is what animates the design. The shadow puppet shares the constraint of cut-paper and adds two more. First, the hide must bear manipulation and projection for decades, so that the structural integrity of the sheet limits how much may be removed and where. Second, the figure is seen as transmitted light rather than reflected colour, so that the positive–negative distinction of cut-paper becomes a light–shadow distinction and the reversibility of figure and ground becomes literal: the audience may equally read the cut-away eye as a bright figure on a dark face or the dark face as a figure around a bright hole. These constraints make the laws of grouping conditions of the craft. The following sections examine how each law is satisfied in the two traditions.

3. Materials and Method

Thirty puppets were examined, fifteen from each region, selected by purposive sampling to cover the recognised character categories of each tradition [14]. The Kelantan figures come from the British Museum, whose Kelantan holdings were purchased as a single dated lot from the puppeteer Tok Awang Lah [15], the Victoria and Albert Museum and the Asian Civilisations Museum in Singapore, supplemented by figures examined in the workshops of the puppeteers Eyo Hock Seng (Kelantan) and Mohd Jufry Yusoff (Penang). The Shaanxi figures come from the China Shadow Play Digital Museum, the Xi'an Shadow Puppet Art Museum, the Shaanxi Fine Arts Museum, the collection of the Langzhong puppeteer Wang Biao and the authors' own collection. The samples, their provenance and their pattern organisation are described in full in the companion study and in the authors' earlier work on craftsmanship [10]; only the perceptual analysis is reported here.

Each decorated zone of each figure was assessed against the seven laws of Table 1 by systematic observation [16], recording which grouping tendencies the arrangement depends on for its legibility and whether the zone is treated positively (motif left standing, reading as shadow) or negatively (motif cut away, reading as light). The analysis is qualitative; its claims about legibility are inferred from perceptual theory and from the consistency of the makers' practice rather than measured on viewers, a limitation taken up in the conclusion.

4. Findings: the Laws at Work

4.1. Similarity and proximity

The sarong of Siti Dewi in the Asian Civilisations Museum illustrates how a densely decorated surface is kept legible by similarity and proximity (Figure 1). The garment is packed with elements of several shapes, yet it reads as orderly because identical shapes are placed closer to each other than to non-identical ones. Similarity groups the shapes into families; proximity, which outweighs similarity when the two conflict [11], confirms the grouping by distance. The families are then laid along paths, so that continuity converts each family into a band. The bands alternate so that two neighbouring bands never share a unit, which prevents the repetition from collapsing into an undifferentiated texture and gives the garment its rhythm.



Figure 1. *The sarong of Siti Dewi, Asian Civilisations Museum XXXX-05379, and its extracted design elements.*

Colour reinforces similarity grouping in Kelantan more strongly than in Shaanxi, because Kelantan pigments are applied flat and opaque. On the Maharaja Wana in the same collection, triangular units on the lower garment point in several directions and would, by common fate, fall into separate directional groups; the maker has coloured all of them alike, and colour similarity overrides direction so that the triangles read as one field (Figure 2). The headdress uses the same device. Colour is, as Wong[6] notes, the first attribute by which the visual system sorts a field, and the Kelantan maker uses it to impose unity on a surface that its own vocabulary of angular units would otherwise fragment.



Figure 2. *Maharaja Wana, Asian Civilisations Museum XXXX-05442.*

4.2. Continuity and the completion of lines

The Kelantan Jinn in the British Museum shows the law of continuity operating at the level of line (Figure 3). Every contour on the figure is a chain of short cut marks arranged along a path. The eye, following the path, reads each chain as a single line and extends it in the direction of the elements, straight where the elements are straight and curved where they curve. This visual inertia is what allows the maker to describe

a garment without ever cutting a continuous slit that would weaken the hide. Kelantan puppeteers attribute the century-long working life of their figures to this construction, and the perceptual law is thus directly in the service of the structural requirement.



Figure 3. *Jinn, British Museum As1970,02.118.*

In Shaanxi continuity is served by the cut line itself, which is long, smooth and tapering, and the law is called upon not to complete the line but to bridge the few interruptions that structure demands. The consequence is that the perceptual load is distributed differently in the two traditions. A Kelantan figure asks the viewer to complete lines, continuously and everywhere; a Shaanxi figure asks the viewer to complete forms, at the specific points where a closed outline has had to be broken. The difference follows from the tool, the punch in Kelantan and the pushed knife in Shaanxi[10], but its perceptual consequence is the same: in neither tradition does the viewer see the lines that are physically there.

4.3. Closure and the completion of forms

Closure is the law most obviously demanded by the medium and is exploited in both traditions. The head of Sun Wukong in the Xi'an Shadow Puppet Art Museum bears many lines across the face that mark him as non-human; on inspection every one of them is disjointed, since a continuous cut would detach the pieces, yet the viewer joins them without effort (Figure 4). A Shaanxi supernatural being whose abdomen is replaced by a second head lacks part of its outline altogether; the missing contour is supplied perceptually, in the manner of a Kanizsa figure, because the surrounding elements are consistent with it (Figure 5).



Figure 4. *Head of Sun Wukong, Xi'an Shadow Puppet Art Museum.*



Figure 5. *A supernatural being, Xi'an Shadow Puppet Art Museum.*

Confined and radial patterns in both regions rely on closure in a further way. The bounded space of a sleeve, a waist panel or a crown element is read as a complete enclosing frame even though the frame is interrupted by the elements it contains; the semicircular panel on the costume of Sun Wukong, illustrated in the companion study, is an example. Hu [7] observed the same effect in the split petals of cut-paper flowers, where yin-cut curves “try to form a circle closing the gap”. In the shadow puppet the

effect is not decorative but structural: the frame must be interrupted so that the panel remains attached to the sheet, and closure is what allows the interruption to go unnoticed.

4.4. Figure–ground and the choice of positive or negative

Because a shadow puppet is seen as light through hide, the relation of figure to ground is reversible in a way that has no counterpart in drawn pattern. On the Shaanxi head of Guan Yu the eyes are cut through and read as figure against the red face; but the hollow surrounding the eyes, taken as a whole, can equally be read as figure with the face as ground (Figure 6). The reversibility is not a curiosity; it governs a decision the maker must take for every zone of every figure, namely whether a motif is to be cut away (negative, reading as light) or left standing (positive, reading as shadow). Rubin's finding that the perceptual system assigns figure to the smaller, enclosed region[3] explains why the choice matters: a small cut motif on a large standing field will be seen as a bright figure, whereas a small standing motif on a large cut field will be seen as a dark one, and the two produce entirely different images on the screen from the same drawing.



Figure 6. *Head of Guan Yu, Xi'an Shadow Puppet Art Museum.*

The two traditions make this choice differently. Kelantan makers treat the face and body predominantly in the negative, cutting the shapes through so that the figure is bright and open, and retain large amounts of negative space; the thick Kelantan hide tolerates this. On Siti Dewi the fan is positive and every other ornament negative, so that the fan alone reads as a dark object held against a bright body. On the trousers of Lakshmana the motifs are positive while the surrounding negative space is itself filled with a fine hollowed repeat, so that ground becomes a second, subordinate figure. Shaanxi makers decide zone by zone according to the character: the face of the villain Cao Cao is cut positive so that it reads white, as the opera convention for treachery requires, while the face of the loyal Guan Yu is cut negative so that it can be coloured red; on the same figure the eyes are positive and the face negative. Garment motifs are generally positive and the fillers around them a mixture, so that the standing motif reads as a dark shape on a lighter patterned ground.

The cloud scenery board depicting the three generals exploits figure–ground assignment to create depth (Figure 7). Each small cloud is a bounded form smaller than the cloud behind it and lighter in contour, so that it is read as figure above a ground, and the graded shrinking of successive clouds towards the centre produces the illusion of receding layers on a flat sheet. The device is the one Arnheim [4] describes for overlapping shapes in painting, but here it is achieved without overlap, by the perceptual preference for assigning figure to the smaller enclosed region.



Figure 7. *Cloud scenery board SXY2, China Shadow Play Digital Museum.*

4.5. Symmetry and balance

Bilateral symmetry is among the strongest grouping cues [17,3], and both traditions use it wherever the figure allows, most fully in wings, headdresses and scenery. The Kelantan bird Jentayu in the British Museum is composed almost entirely of mirrored feather groups, and the mirroring is what gives an otherwise complex outline its stability (Figure 8). Radial rosettes in both regions are the same principle applied around a point. Symmetry also serves closure: a mirrored pair of interrupted contours is completed more readily than a single one, because the perceptual system has the second half as a template for the first.



Figure 8. *Jentayu, British Museum As1970,02.107.*

4.6. Common fate

Static figures must nevertheless convey action. In both corpora this is achieved by orienting a series of similar elements in one direction so that they are grouped as a moving field. The feathers of Jentayu, shown in combat with Maharaja Wana, all sweep the same way; the flames around the Shaanxi thunder deity Lei Zhenshi, who spins a drum-like weapon, all trail in one direction (Figure 9).



Figure 9. *Lei Zhenshi, Xi'an Shadow Puppet Art Museum.*

The device is identical although the motifs, feathers and flames, are regionally exclusive. On the screen, where the figure may in fact be moving, common fate within the static design and the real motion of the rod reinforce each other.

5. Discussion

5.1. The same laws, differently loaded

All seven laws of grouping are found in operation in both traditions, and they are found doing the same work: continuity and closure compensating for the impossibility of a continuous cut outline, similarity and proximity ordering dense decoration, symmetry stabilising complex silhouettes, figure–ground reversal exploited to create emphasis and depth, and common fate conveying motion in a static object. Makers in neither tradition had access to Gestalt theory, which was formulated in Germany in the 1910s[1]; they arrived at the same devices by generations of trial in front of the screen.

What differs is the distribution of the perceptual load. The Kelantan figure, built from punched rows, places the burden on continuity: the viewer completes every line, and closure follows almost automatically because the lines, once completed, enclose. The Shaanxi figure, built from continuous cuts, places the burden on closure at the points of structural interruption and on figure–ground assignment across the whole surface, since the choice of positive or negative is made zone by zone according to the character. Kelantan figures are, as a result, perceptually uniform, the same operation repeated everywhere, and Shaanxi figures perceptually heterogeneous, different operations in different zones. This difference maps directly onto the two pattern grammars, rhythmic repetition and bounded enclosure, described in the companion study, and onto the two tools that produce them. The Gestalt laws are universal; which law a tradition leans on is a consequence of its tool.

5.2. Closure as a working condition

The central claim of this paper is that, for the shadow puppet, closure and its companion laws are not an interpretive lens but a condition of the craft. The claim can be stated precisely. In a painting, the Gestalt laws explain why a composition the artist chose is perceived as it is. In a shadow puppet, the laws determine which compositions are possible: a design that does not satisfy them is not a weaker design but an unreadable one, since the physical marks never form a closed figure on their own. The maker's skill consists in knowing, without the vocabulary, where a line may be broken without being seen to break, how small a cut motif may be before it ceases to read as figure, and how many interruptions a frame will bear before closure fails. Hu[7] made a similar observation about cut-paper, where the yin and yang cuts likewise cannot describe a form completely; the shadow puppet adds the requirement that the sheet survive handling and the transformation of positive and negative into shadow and light, which makes the constraint stricter and the reliance on the viewer greater.

5.3. Implications for the theory of design principles

The comparison bears on a long-standing question about the principles of design: whether they are conventions of a particular aesthetic culture or culturally inflected expressions of universal perceptual tendencies. Arnheim[4] argued the latter for Western painting; O'Connor[5] argued it for contemporary graphic design. Two unrelated folk traditions, working with different tools in different decorative cultures, are found here to satisfy the same seven laws in the same ways, differing only in which laws carry the greater load. This supports the universalist position, and extends it to a medium in which the perceptual tendencies are not preferences that a designer

may follow or flout but conditions of the object's legibility. It also suggests a practical reading of the design principles: repetition, unity, balance and emphasis are the names given, in the language of the studio, to compositions that let similarity, closure, symmetry and figure–ground do their work.

5.4. Implications for contemporary adaptation

The findings have a practical bearing on efforts to carry shadow puppet imagery into contemporary design and digital media, where it is increasingly used as a marker of cultural identity. A design that reproduces the motifs of a tradition but draws them with continuous lines, as a vector illustration naturally does, loses the perceptual structure that gave the originals their character: the viewer is no longer asked to complete anything, and the figure, though recognisable, reads as a picture of a shadow puppet rather than as one. Conversely, a design that keeps the interrupted line, the reversible figure–ground and the bounded frame retains the tradition's perceptual signature even when the motifs are new. The signature of a shadow tradition lies in what it leaves for the eye to finish.

6. Conclusions

This paper has examined the Gestalt organisation of Kelantan and Shaanxi shadow puppets and has argued that, for a medium in which no closed outline can be cut, the laws of grouping are a working condition of the craft rather than an interpretive device. All seven laws are found at work in both traditions, doing the same work, because the medium demands it. The traditions differ in how they distribute the perceptual load: Kelantan figures, built from punched rows, ask the viewer to complete lines; Shaanxi figures, built from continuous cuts, ask the viewer to complete forms and to assign figure and ground zone by zone. The reversibility of figure and ground, literal in a backlit medium, governs the maker's choice between positive and negative treatment and is exploited in Shaanxi to encode character and to create depth without overlap.

Two limitations should be stated. The analysis rests on the authors' systematic observation and on perceptual theory; it has not been tested against audience perception, and the claims about legibility, though consistent with the makers' practice, remain inferences. The sample of fifteen figures per region cannot represent the full variation within either tradition. Future work might test the central claim directly, by presenting viewers with backlit figures whose interruptions are systematically varied and measuring the point at which closure fails, and might extend the analysis to the shadow traditions of southern Thailand, Java and southern India, in which the punched construction of Kelantan is also found, to establish whether the Kelantan distribution of perceptual load is shared across the whole southern family.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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