THE ROLE OF SYMMETRY IN JAVANESE BATIK PATTERNS

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Abstract—Batik has a long tradition in Java, Indonesia. The ancient periodic patterns contain meaningful symbols some of which have a meaning for the Javanese people even today. Only certain plane groups are used frequently while others rarely appear in a batik pattern. There is a strong relation between symmetry groups present and the symbolic content of a pattern.

INTRODUCTION

Basic textiles as weavings, knitwear etc. are the result of periodic intersections of threads forming a homogeneous texture. These textures can become decorated in different ways.

Embroideries often follow the natural symmetry of the basic textiles. Prints are bound to the printing tools—blocks or machine—which ask for periodic repetition of the unit. However, there is no practical necessity in doing paintings or drawings symmetrically.

What does “batik” mean?

Batik is an ancient method of textile decoration which has been practiced in many places all over Asia since prehistoric times.

In Java, Indonesia the technique was developed more than anywhere else. From here it spread out to European countries during the last 100 years. The names of the tools and even the name “batik” were adopted from the Indonesian language. “Batik” means “drawing with wax” (Fig. 1). Batik is a dyeing process: melted wax is applied on the cloth with a special pen called “canting”. It reserves parts of the cloth which shall remain white (or in the present colour) from the hydrous solution of the dyestuff. After dyeing and fixation the wax is removed by boiling. Repetitions of these steps lead to multicoloured patterns.

The vegetable dyes which were the only ones available in the past needed a long time to penetrate the cloth. Under these circumstances direct painting or printing would not give sharp contours.

Fig. 1. Applying of wax with the “canting”. 

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because the dye solution would run in all directions without control. Therefore, the resist dye was the only possible way to get colourfast fabrics with distinct patterns [1].

*For whom and for what purpose were batiks produced?*

In Central Java a limited range of colours were used to produce loin cloths with patterns of highly symbolic content for the royal courts of Surakarta (Solo) and Yogyakarta. The traditional colours for batiks here are dark blue from indigo and all shades of brown/yellow/red from native plants.

The symbols on these cloths (size \( \approx 1 \times 2.40 \text{ m} \)) and their relative positions were regarded as a protection against evil influences. In the eighteenth century a law was enacted which prohibited the use of certain patterns for the public; this law was followed strictly until the Second World War [2].

**SYMBOLIC CONTENT AND SYMMETRY OF TRADITIONAL PATTERNS**

*A Systematics of Traditional Javanese Batik Patterns [3]*

1. *So-called “geometric patterns”*
   1. “Banji”; crossing bands; Bronze Age pattern, maybe, of chinese origin; (Banji means Chinese “10000”), see Fig. 2.
   2. Stencil patterns (stylized flower and fruit profiles, sometimes containing creatures) [Figs 3(a)–(f)].
      - (a) “Ceplok”: rosettes, stars, squares etc. (Ceplok means metal ornament) [Figs 3(a)–(c)].
      - (b) “Ganggong”: special form of “Ceplok” named after cryptocoryne ciliata, a water plant with long seed hairs [Fig. 3(d)].
      - (c) “Kawung”: intersecting circles (Kawung means fruit of arenga saccharifera) [Figs 3(e), (f)].
   3. Inclining borders “Lereng” or “Garis Miring” (including the most popular varieties “Parang”; Parang means dagger, knife) [Figs 4(a), (b)].
   4. “Nitik” and “Anyaman”: imitation of weaving patterns (Nitik from “tik” = dot; Anyaman means wickerwork); the shape of the ornaments of this group is similar to “Ceplok” or “Garis Miring” types [Figs 5(a), (b)].

**Fig. 2.** “Banji” patterns (B. = Chinese: 10000) intersecting bands, like a weaving, the basic pattern is in use from prehistoric times; it is the symbol for lucky life. Symmetry \( p4g \). (a) “Kerton” from Central Java, \( a_0 = 11 \text{ cm} \); (b) the pure Chinese form from the coast, \( a_0 = 15 \text{ cm} \).
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Fig. 3. Stencil designs. (a) "Slobok" (means wiggle), a pattern which is also well-known in the Pacific archipelagos. Symmetry: p4mg; $a_0 = 7.5$ cm. (b) Ceplok "Peksi Kreno" (Peksi means bird, Kreno means many fruits). Symmetry: conceptional c1ml; $a_0 = b_0 = 9$ cm. (c) Ceplok "Sekar Arum" (Sekar means flower, Arum means smell, taste). Symmetry: p2gg; $a_0 = b_0 = 10$ cm. (d) Ganggong "Satryo Wibawa" (Satryo means knight, Wibawa means mighty). Symmetry: p4mm disturbed by a five-leaf flower in one of the four-fold axes; from this centre the name giving seed hairs originate (compare with systematics [1 12(b)]), $a_0 = 10.5$ cm. (e) "Kawung Picis" (Kawung means fruit of a sugar palm, Picis means small). Symmetry: p4mm, $a_0 = 3$ cm. (f) "Kawung Sen" (Sen means Dutch coin). Symmetry: p4mm, $a_0 = 7$ cm.
Fig. 4. Inclining borders. (a) “Parang Ukel” (Parang means dagger, Ukel means curl). $a_0 = 2\, cm$, $b_0 = 10\, cm$. (b) “Parang Plentong” (Plentong means round). $a_0 = 6\, cm$, $b_0 = 13\, cm$.

II. So-called “non-geometric patterns”

1. “Semen”-patterns: arrangements of plants, creatures and Hindu symbols without regarding the background structure; (semen from “semi” means sprout).
   (a) Patterns of stylized plants only (see Fig. 10).
   (b) Patterns of stylized plants and creatures.
   (c) Landscape-like patterns containing Hindu symbols [Figs 6(a), (b)].

2. “Buketan”: influenced by European paintings, not really traditional.

III. Samplers

1. “Tambal”: (means patchwork); triangles, squares or other shapes are filled with various patterns from group I and/or II (Fig. 7) [4].

2. “Sample-piece”: a catalogue of available patterns of a batik painter (the names of the patterns are mentioned in each field).

3. Compositions: from patterns of group I and II new designs originate—often with ostensible symmetry (Fig. 8).

Fig. 5. Weaving imitations. (a) “Nitik Cinde” (Nitik from “tik” meaning dot; Cinde means silk patola originating from India, which were saved as family heirlooms). Symmetry: $c2mm$; $a_0 = 5.5\, cm$, $b_0 = 5.4\, cm$.
(b) “Tirtateja” (meaning glittering light on water). Symmetry: $p2mg$; $a_0 = 4\, cm$, $b_0 = 12\, cm$. 

Fig. 6. "Semen" patterns with Hindu symbols. (a) "Semen Sido Asih" (meaning happy life in love); the central motifs are "pohon hayat" (tree of life) and "meru" (mountain of gods) flanked by Garuda wings, peacocks, and deers (very tiny). Symmetry: p1m1; $a_0 = 42$ cm, $b_0 = 38$ cm. (b) "Semen Gurda" (Gurda meaning Garuda or banyam tree; see also Fig. 14). Symmetry: c1m1; $a_0 = 39$ cm, $b_0 = 61$ cm ($a_0 = 38$ cm).
Fig. 7. "Tambal" (meaning patchwork); each patch contains its own pattern from I and II of the systematics [4]. (By courtesy of Galerie Smend, Köln.)

Fig. 8. "Ceplok Prabu Anom" variety (Prabu means prince, Anom means second), a composition with patterns of group I and II of the systematics. Usually the filling patterns lower the ostensible symmetry of the composition. $a_0 = 22$ cm, $b_0 = 23$ cm.
IV. "Pasisiran"-batiks (Pasisiran means coast, beach)

All coastal patterns show foreign influence during the last centuries [Figs 9(a), (b)] [5].

The symmetry in these patterns, especially in the old court patterns, bears much information about the Javanese people—their beliefs and the origin of their philosophy [3].

The magic power of a pattern—caused by the order of symbols, for example—played an important role in the life of a Javanese. It is said that some people checked a cosmic calendar every morning and compared it with their personal horoscope. By choosing a particular piece of batik to wear, which was supposed to have a corresponding magic power, they tried to diminish negative and intensify positive effects on their projects for the day.

Fig. 9. "Pasisiran" batiks (Pasisiran = coast). (a) "Langko-lengko" (meaning zig-zag) from Pekalongan in bright blue/white. This type often has a "kepala" (= head) and narrow borders at the edges, (height 100 cm). (b) "Peksi Naga Liman" (bird, snake, elephant) a court pattern from Cirebon, where family relations between the Islamic sultanate and the Chinese imperial Ming dynasty (fifteenth century) caused a strong Chinese influence on the arts. Due to the size of the patterns there is no plane symmetry, \( a_0 = 90 \) cm [5].
Some patterns were reserved for special people (nobility) or special occasions (weddings, circumcisions, cremations, for example, see above) [6]. For centuries all this accurate work was done by drawing without knowledge of the mathematical laws of plane symmetry. The perfect realization of a design was one of the conditions for the magic power of a cloth. However, sometimes “mistakes” were built in intentionally to disturb the perfect symmetry. The reason may be the Islamic belief that only Allah can be faultless [7].

Most of the patterns of Central Java have been in use for generations—and already a long time before the “cap” (a copper printing block for the wax resist) had been developed about 1820 A.D. The symmetry was not caused by this tool, but the tool was created to produce the batik more efficiently to cover the increasing demand for batik clothing for exports and for everyday use.

Fig. 10. “Pisang Bali” (meaning turned banana). The name of the pattern contains a two-fold rotation: Alternating rows of upward and downward growing plants. (a) A handdrawn example of the Central Javanese pattern. Symmetry: p2mg; $a_0 = 57$ cm, $b_0 = 21$ cm. (b) Part of a stamped batik cloth from Jakarta; the mirror-related pair of stamps was not used to construct the complete design. Symmetry: p1. (c) The same pattern, as it should have been done.
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The "cap" work is interesting for symmetry reflections in another respect: for good results the resistant wax has to be applied on both sides of the cloth; and that asks for a set of blocks with patterns related by a mirror line. For these patterns such a pair of caps generates a full design. The man who uses these tools must know the intended pattern exactly. Otherwise the lack of a certain symmetry in a classic pattern will easily show that the caps were "borrowed".

A good example for the latter is an old pattern: "Pisang Bali". (Pisang means banana, Bali means balik which means (see Manuser) "turned over"). The name already contains the rotational symmetry. The original pattern has always p2mg symmetry, but the copy often has pm or p1 only [Figs 10(a–c)].

Batiks are also produced and worn outside of Central Java, but the patterns do not have the protective value as those of this area. The coastal regions of Java—influenced by various foreign cultures—developed a quite different style. Large motifs—mostly of Chinese or European origin mixed with Javanese symbols—which are degraded to be just decorations without any magic content. Due to the size of the motifs those cloths show one-dimensional symmetry only and are of lesser interest for plane symmetry—in spite of their evident beauty [see Figs 9(a), (b)].

SYMMEpRY ELEMENTS AND TRADITION

Hundreds of old and new drawn Javanese batiks have been investigated referring to symbolism and plane symmetry groups.

It seems that symmetry elements reveal the principles of Javanese philosophy (Fig. 11) [3].

1. Translation

It is striking to notice that even the symmetry of patterns with a tiny unit is carried out thoroughly over the whole cloth (≈1 × 2.4 m). Meditation is very common all over Asia since ancient times. The concentrating on the steady and neat repetition of a motif had a meditative effect on the creating person: the order of the pattern was transmitted to her spirit (Batik making is a female domain). Another reason for the repetition of a motif was the wish to multiply its power and transmit it to the wearer of the batik cloth [7].

2. Rotation

In old court designs one will not discover a hexagonal lattice. However, there are plenty of examples for the square, the rectangular (primitive or centred), and the oblique lattice. A great number of the stencil patterns as "Ceplok", "Ganggong", "Kawung" and nearly all of the "Nitik" belong to space group p4mm (compare with above systematics (I), Figs 3(a)–(f) and 5).

Some of the first three types and the "Banji" (Fig. 2)—a prehistoric motif which equals a basic weaving—have symmetry p4gmg. The majority of the "inclining border" patterns follows symmetry

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Fig. 11. The 17 plane groups [3].
Fig. 12. "Parang Barong", a "Parang Rusak" variety. (Parang means dagger, Rusak means destroying or destroyed, Barong means giant). In this size it was reserved for the sultan, his first wife, and his crown prince only. Symmetry: p2; \( a_0 = 10 \text{ cm} \), \( b_0 = 24 \text{ cm} \).

p2, but there are also examples for p1 and even one-dimensional repeat. The main royal design "Parang rusak" (means destroying dagger) and countless variations of it represent this group (Fig. 12).

The predominance of two- and four-fold axes is a matter of the ancient Asian philosophy models "Mancapat" (Mandala) and "Dualism". The latter has entered batik patterns in various forms beside the two-fold rotation axis (see section 3, mirror-line). The model of Mancapat is a relic of the Hindu-Javanese era which was ended by the entry of Islam \( \approx 1580 \text{ A.D.} \) However, it was still kept as an heirloom in the palaces and huts. It represents a compass; its directions and centre are synonymous with Hindu gods, colours, days etc. The centre has always the highest rank,

Fig. 13. "Jelamprang", the imitation of an Indian "ikat" weaving (reservation of the threads before weaving). It represents "Mancapat", the compass model of Eastern philosophy, but it is interpreted in two ways: "Wishnu's Weapon" (Hindu) and "Nine Holy Saints of Java" (Islam). Symmetry: p4mm; \( a_0 = 6 \text{ cm} \).
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Fig. 14. Main symbolic figures in semen patterns. 1—“Meru” (mountain of gods), here crowned by a fire symbol and stylized plant; 2—“Pohon Hayat” (tree of life); 3—“Sawat Garuda” (Sawat means double wings with tail). These main centre motifs are flanked by: 4—Merus with small birds; 5—“Binatang” (land animal, deer); 6—“Bangunan” (building, temple); 7—“Pusaka”, (heirloom, weapon); 8—“Kupu-kupu” (insect); 9—“Burung” (bird, here peacock) [see also Figs. 8(a), (b)].

e.g. “Bathara Guru” (Shiva), “multicoloured” and “Kliwon” the highest day of the Javanese five-days week, the four directions mean the other days, colours, gods, respectively (Figs 13) [6].

Considering the fact that more than 90% of the Javanese population have been followers of Islam for 400 years it is astonishing that there are very few examples of three- or six-fold rotational symmetry in batiks; and these rare examples are of later origin than the mentioned symbolic patterns.

Some historians wrote about an inner opposition against the entry of Islam in the courts of Central Java. Indeed, there are many residues of Hinduism and Animism which Javanese practice in their religion today. Therefore the lack of three- and six-fold symmetries, which are very common in Islamic art of the past and of today, could be another point in favour of this theory [3].

3. Mirror-line

This fundamental symmetry element is very common in “Semen” patterns. The main Hindu symbols—as “Meru” means mountain of gods, “Pohon Hayat” means tree of life, or “Garuda” means mythical bird, the symbol for sun—contain their own mirror line [Figs 14(a), (b)]. Pairs of other motifs are arranged on both sides of the line. “Dualism” means roughly “coexistence of opposites”. The mirror is generating such coexistence. Many other examples of this principle can be found in a Semen batik: dark/light, eagle/snake symbolizing upper and lower world, or heaven and sea, e.g. (compare with the above section rotation).

CONCLUSIONS

In traditional Javanese batiks symmetry is a matter of the ancient Asian philosophy models “mancapat” (Mandala, windrose) and “dualism” (coexistence of opposites).

The entry of Islam (~1580 A.D.) could not banish these principles from the royal courts of Central Java.

—Three- and six-fold axes (common in Islamic patterns) are rarely found in Java.
—“Mancapat” is present in form of the four-fold axis—mainly as p4mm.
"Dualism" is expressed in the change of colour, the combination of Hindu symbols and the symmetry elements two-fold axis and mirror line.

The steady periodic repetition of a unit (translation) is proved to have meditative effects on the creator of a batik.

Batik patterns which were subject to foreign influences during the last century (see "Pasisiran"-batiks) have no symbolic content. Instead of plane symmetry they have at most band-symmetry. In Javanese batiks loss of symmetry means also loss of symbolic content.

Please note: The pronunciation of Indonesian "c" in English is "ch".

REFERENCES