



Javanese hand-drawn (*tulis*) batik. University of Leeds International Textiles Archive (ULITA).

Resist Dyeing and Patterning – An Explanation of Alternatives

by

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1. Introduction

The terms “resist dyeing” and “resist patterning” refer to a wide range of techniques used to decorate textiles by selectively dyeing areas on a yarn or fabric's surface. This selective dyeing is facilitated by folding or knotting, the use of stencils or shields, wrapping thread (or similar material) round folded fabric or hanks of yarn, stitching thread into fabric and drawing it tight, or applying resist materials such as wax, starch, or other pastes to the fabric's surface. Variants are found worldwide and have been used to decorate fabrics throughout much of recorded textile history. The objectives of this paper are to identify, and explain the principal resist-dyeing techniques, and a few of their variations. Indirectly, it is hoped to stimulate the interest of modern design practitioners, particularly through encouraging an awareness of the vast range of aesthetic possibilities offered through such techniques.

2. Wax- and Paste-resist Techniques

The word *batik* is used to refer to wax (or sometimes paste) resist patterning techniques and the resultant textile products. The derivation is apparently from the Javanese *ambatik* meaning to “mark with small dots” [Steinmann, 1947]. The process, as it is practised in many parts of the world, involves the application of hot molten wax to selected areas on the fabric's surface. On solidification of the wax, the fabric is immersed in a dye bath. The wax acts as a barrier to the dye and take up only occurs in the unwaxed areas of the fabric.

Wax may be applied by one of several methods, using various implements. Most common is the Javanese *canting* (pronounced “tjanting”), an implement consisting of a small vessel of thin copper (which holds the molten wax) with one or more capillary spouts (through which the molten wax flows) and a handle of reed or bamboo. The equivalent Indian implement is known as a *kalam*. This consists of a handle of wood attached to a short pointed metallic rod around which a wad of fibre is wound; in this case the wad of fibre holds the molten wax which in turn is allowed to flow, via the tip of the metallic rod, onto the surface of the cloth. Wax may also be applied using blocks of various kinds as well as stencils. In the production of monochromatic batiks, the wax is appli-

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ed only once and the cloth subsequently dyed. With polychromatic batiks, more than one dyeing takes place together with an equivalent number of wax applications. Subsequent to dyeing, the wax resist is removed either by scraping, especially when brittle waxes have been used, or by boiling.

Occasionally batiks show a peculiar veining effect, caused if a brittle wax mixture is used which, on cracking during immersion in the dye bath, permits dye to penetrate through to the fabric's surface. Although this cracking effect is popularly associated with batik products the world over, and is typically evident on screen-printed imitations, it is generally not pronounced on the higher quality batiks (such as the finer qualities produced in central Java). Often, especially in cases where the batik is destined for a tourist market, the cracking effect is encouraged deliberately.

Generally, machine-woven cotton fabrics are used since these allow finer graphic details than can be achieved using coarser hand-woven fabrics. The traditional use of batik, particularly in Asia, is in festive or ceremonial dress. In recent times the fabric has been made up into various western-style apparel items including men's shirts and women's dresses, blouses and skirts. Whilst batik has developed as a craft in many parts of Asia, Africa and Europe, it is probably in Java, one of the principal islands of the Indonesian archipelago, where the product has reached its highest level of aesthetic excellence.

In Japan, rice paste was employed rather than wax to resist the penetration of dyestuff through to the fabric's surface. Application was by tube or stencil. With the former method, resist paste was squeezed directly onto the fabric's surface from a tube, and with the latter method the resist paste was applied to those areas of a fabric surface not covered by a stencil. When the paste was dry the fabric was dyed and the paste subsequently removed by washing off. When using stencils (*katagami*) these were cut from paper and were often comprised of several layers between which a network of human hair or silk thread was inserted, in order to ensure that the various parts remained

secure during dyeing. The paste was applied with a spatula into those parts of the fabric not covered by the stencil. When the paste was dry the fabric was immersed in a dye bath and the paste subsequently washed off [CIBA Review, 1967/4, p.26]. The so-called "dye pouring" (*chusen*) technique also relied on the use of stencils. In this case the resist paste was applied by stencil to a piece of fabric which when dry was folded several times, each fold corresponding in dimensions to the size of the stencil. Dye was then poured onto the upper layer of the fabric (i.e. the area to which the resist paste had been applied), allowed to seep down through the folded fabric and to colour those areas not directly below the pasted areas on the top layer [CIBA Review, 1967/ p.29].

In Japan, stencils were used in combination with other techniques. Various ornamental effects were achieved when combined with direct printing or free-hand drawing techniques. The name *yuzen* designates a method of decorating fabrics which combines various printing and dyeing operations with free-hand additions of details [CIBA Review, 1967/4, p.27]. Stencils were used to directly print motifs in one or more colours. Printed motifs were further enhanced by hand painting, and were then covered with a resist paste. The background colour was then applied using a squeegee [CIBA Review, 1967/4, p.29].

Starch-resist, indigo-dyed cloths are produced by the Yoruba of West Africa and are known as *adire eleko*. Designs are composed in a structure of squares and rectangles. Motifs within the structure include leaves, plants, various animals and representations of other natural and man-made objects.

Indigo resist-dyeing, using beeswax, was used, in conjunction with various mordant dyeing techniques, to produce the so-called *kalamkaris* of the Coromandel coast of India. These textiles were traded in many parts of Asia and were brought to Europe in the eighteenth century where they acted as a stimulus to developments in dyeing chemistry and printing techniques.

Ajrak textile, Sindh province, Pakistan. Mordant, hand-block printed using indigo and madder. University of Leeds International Textiles Archive (ULITA).





Laharia turban cloth, India. Patterned in one direction only.

Ajrak printing, which is associated with Sindh province in Pakistan and with the Kutch region in Gujarat, uses a combination of mud or clay and mordant printing, direct printing of black outlines and immersion in dye baths of indigo blue and madder red [Sreenivasam, p 19]. The mud or clay resists the dyestuff and the mordant attracts it. Typical designs are comprised of a central field of squares, diamonds and star-shaped motifs, bordered by several rows of larger diamond shapes interspersed with rows of stylised flowers.

Batik is practiced widely by modern craft workers in Europe. Wax is the most common choice of resist. A variety of implements may be used, but to achieve fine lines a Javanese-style *canting* is best employed. The wax must be applied in its molten state and should therefore be heated and kept to a working temperature of around 80 degrees Celsius. When the wax is too hot it has the tendency to spread too rapidly and when too cool it tends to solidify too quickly; clarity of design is lost in each case. With a monochromatic design the fabric can be dyed soon after the wax has set. With polychromatic pieces the wax is applied in successive layers, each after a dyeing. It is important to use cold temperature dyes; cold water reactive dyes are particularly suitable to both cotton and silk fabrics. Once waxed, it is important to keep the fabric as flat as possible during the dyeing process, otherwise the wax may crack and allow the penetration of dye. Once dyeing has taken place the wax needs to be removed. This can be done by plunging the fabric into boiling water or by ironing the fabric between layers of absorbent paper. Various starches and gums can be used as alternatives to wax. A simple flour and gum Arabic paste performs very successfully, if used with block or screen-printing techniques. Cassava paste is more glutinous and is traditionally hand-painted or stencilled onto the cloth, as it tends to be too sticky to be successfully printed by screen or by block. Japanese rice paste can be stencilled, applied with a fine wooden spatula or trailed across the fabric's surface with a tube. Cut stencils need to be stiff; oiled manila card or thin plastic are adequate. Paste can be applied using stiff paint brushes, pieces of card or thin strips of wood.

Where a cracked effect is desirable, dextrin makes a successful resist, and when used warm can be painted, block or screen printed onto most common fabric types. Once dyeing is completed it is necessary to remove any traces of starch by boiling the fabric in hot soapy water.

3. Ikat

The word "ikat" is derived from the Malay word *mengikat* meaning "to bind, knot or wind round" (Buhler, 1942). The ikat process is a resist patterning process, which involves the binding of sections of warp and/or weft threads with dye-resistant material (such as strips of palm leaf) prior to fabric construction. On immersion in a dye bath, the uncovered areas of the threads take up the dye. Further colours can be obtained by rearranging the resist-protected areas prior to further dye-bath treatment. On completion of dyeing, the resist material is removed and the threads are carefully arranged before weaving. According to whether the resist is applied to the warp, the weft, or both sets of threads, the resultant product is referred to as "warp ikat", "weft ikat" or "double ikat". A typical visual characteristic of an ikat-type cloth is a feather-like effect which is caused by the colour in the dye bath bleeding under the resisting material, and by the slight movement of threads caused by the strains imposed by the weaving process. In order to enhance the clarity of an ikat motif or pattern the decorated yarns should be allowed to dominate within the final woven cloth. Larsen observed:

"Whereas most ikats are plain woven, almost all warp ikats are cloths in which the warp yarn dominates the weft because it is either heavier or more densely crammed. The inverse is true of weft ikat. Double ikats tend to be woven in a balanced plain weave" [Larsen, p.29].

Most renowned of the resist-dyed cloths from India are the double ikat silks from Gujarat and Orissa. Known in Gujarat as *patola* and as *banha* in Orissa, these cloths were extensively traded throughout much of Southeast Asia, especially in the Malay Archipelago, where Portuguese, British, Dutch and other traders used them to barter for spices during the eighteenth and nineteenth centuries [Sreenivasam, pp.11&35]. Ikat production is

widespread throughout the Indonesian archipelago. The best known of Indonesian ikats is probably the cotton warp ikats of east Sumba. Double ikat-patterned cloths are made in Tenganan, a single village located in the south-east of the island of Bali. These cloths, which are known as *gringsing*, show a range of stylised floral and geometric motifs as well as various human figures. A range of weft ikats is also produced on Bali, and these show not only geometric and floral forms but also various figural compositions drawn from Hindu mythology.

Kasuri is a Japanese term used to denote ikat-type fabrics produced by one of a number of yarn resist-dyeing techniques, including clamp resist methods (briefly described in section 5 below). *Kasuri* fabrics were often used in the production of futons (i.e. thickly padded cotton quilts or mattresses). Various plant and animal motifs as well as a wide range of geometrical motifs were used [Langewis, pp. 33-37].

4. Tie and Dye

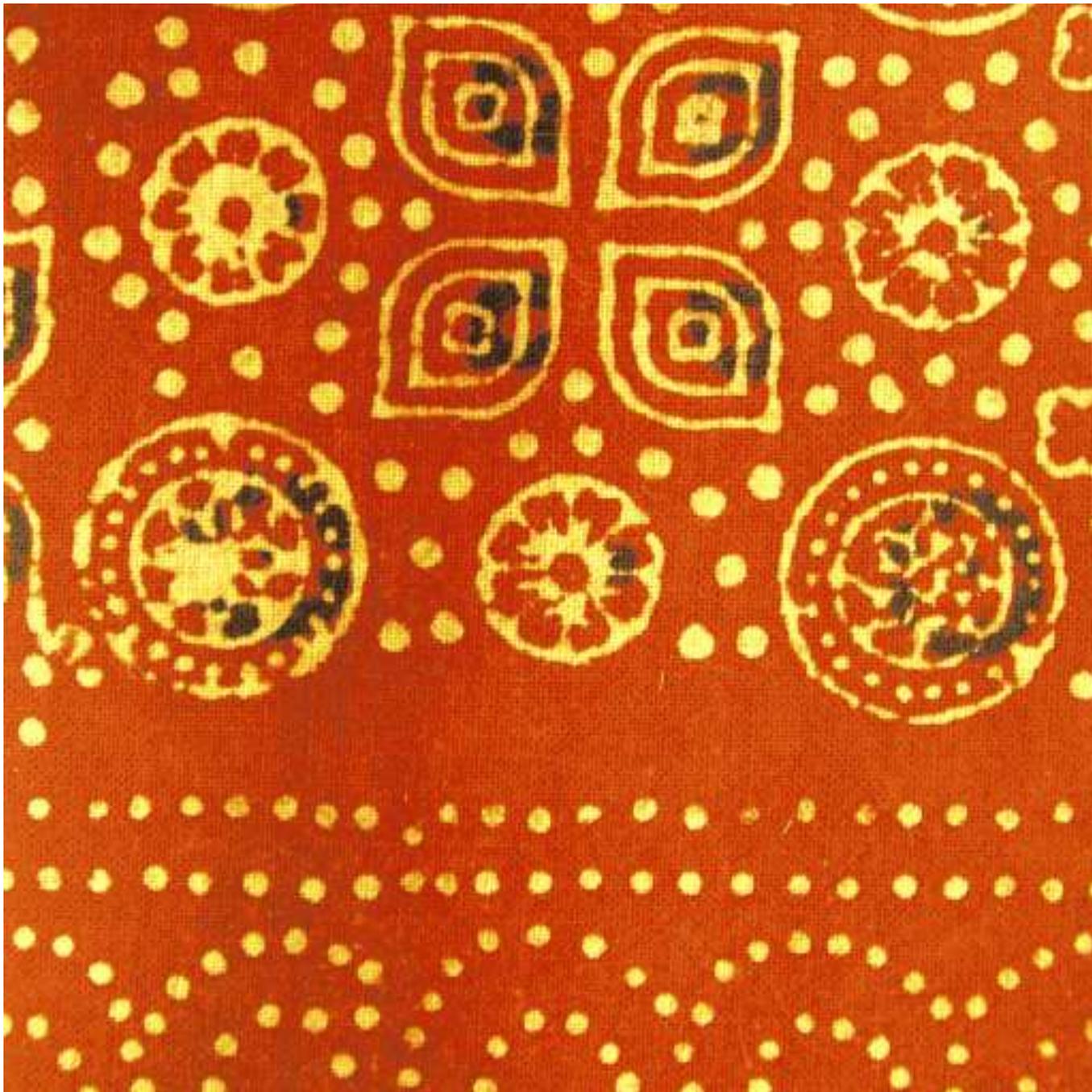
Tie-dyeing, when used in its basic form is a relatively straightforward means of decorating textiles. Pieces of cloth are wrapped and tied tightly with yarn or string so that dye will only penetrate to the unbound areas of the cloth. In Indonesia the technique is known as *plangi* (also spelt “pelangi”) and in the Indian sub-continent the terms *bandhana* (from *band* meaning “to bind”) and *chundri* (meaning “to gather into fine pleats”) are used. In Japan the term *shibori* (derived from *shiboru*, meaning “to wring, squeeze, or press”) refers to both the process and the product. Among the Yoruba people of Nigeria the technique is known as *adire*.

Probably the simplest form of decoration achieved using the technique is a light circle against a dyed background, as found on fabrics from the Indian sub-continent, parts of north and West Africa, Japan and parts of South-east Asia. These designs are produced by using the fingertips or nails to pull up small portions of the fabric and firmly tying these bunched areas with waxed yarn or similar material. After dyeing, these tied portions are untied to

reveal undyed areas of greater or lesser size. Alternatively the elevated areas may be tied at their bases with the upper parts left free; after dyeing, ring-shaped undyed areas will result. On occasions, small pebbles, glass beads, grains of rice, or other seeds, are tied in to the fabric bunches; such additions may enhance the regularity of design in the resultant dyed fabric.

A variant of the *plangi* technique, known as *tritik* (in Indonesia), relies on the use of stitch work. A length of strong thread is sewn into the fabric using a series of short stitches. The thread is subsequently drawn tight and close-packed folds form in the fabric. On immersion in the dye bath, the dye will be unable to penetrate to the tightest drawn portions of the fabric and will penetrate sparingly to the close packed folds. These stitched resists are occasionally combined with the more simple tying technique outlined above; examples include the so-called *kain-kembangan* cloths of central Java, which have *tritik*-patterned borders.

The more important areas of production in India include Rajasthan, Central India and Gujarat as well as a wide area around Bombay [Buhler, 1954, p.3738]. The technique is also in use in parts of Pakistan, especially in the Punjab. The simplest Indian or Pakistani *plangi* cloths show round or diamond-shaped patches of a few centimetres width distributed evenly over a dyed ground. Each region has its characteristic colours and designs. Writing in 1954, Buhler, a renowned authority on resist-dyeing techniques of various kinds, remarked that the finer categories of Indian *plangi* fabrics were referred to by different names depending on the nature of the process by which they were created [Buhler, 1954, p.3739]. Many of these terms are still in use today. In Gujarat, for example, red fabrics with scattered figures or patches of white, yellow and green were known as *chunri* or *chundri*, and cloths with a white undyed central area and red margins with tendril-like forms in white, yellow and green were known as *panetar* or *paneter* [Buhler, 1954, p.3739]. *Fulwadi* cloths were red and divided using yellow dots into lozenge-shaped panels filled with several large reserved areas of white and green,



and *gharchola* cloths were of the same colour scheme, and had oblong-shaped panels with figurative motifs showing humans or animals [Buhler, 1954, p.3739]. Typical of Rajasthan are tie-dyed fabrics with zigzag designs, wavy lines, leaf shapes, crosses and various other simple figures [Buhler, 1954, p.3739]. More complex resist-patterned fabrics are also produced in Rajasthan, and these depict minutely worked outlines of various leaf and floral motifs, and animals or human figures [Buhler, 1954, p.3739].

Throughout much of the Indian subcontinent, the technique is still widely used, particularly in rural areas. Saris, shawls and turbans are typical end uses. Buhler observed that exports from Rajasthan to other parts of the Indian subcontinent were, at one time, considerable. The resist materials were not normally removed prior to the sale of the resist-dyed fabric. This enabled prospective purchasers to distinguish between genuine hand-crafted items and factory-made imitations [Buhler, 1954 p.3739]. The *laharia* or “wrap-resist-dyed” cloths of Rajasthan are used for turban cloths and for saris. These cloths are prepared by rolling the fabric lengthways in rope form and twisting it with one or more strong cotton cords. After several rope forms are twisted and tied with cords they are immersed in a dye bath. Each successive colour requires the adjusting or removal of the cord resist [Sreenivasam, p.35].

The technique is widespread in many other parts of Asia, and its use has been noted in Cambodia, Myanmar, Thailand and Indonesia [Buhler, 1954, p.3739]. In Indonesia the principal producing regions are Sumatra (particularly the area in and around Palembang), Java, Lombok and Bali. Often silk, rather than cotton fabric, is used. In Sumatra and Java, the dominant back-ground colour to fabrics is generally red or reddish purple and the resisted areas take the form of circles, rings, lozenges, or more complex motifs [Buhler, 1954, p.3739]. In Indonesia *plangi* fabrics are used as shawls, sashes, and sarongs as well as wall hangings [Buhler, 1954, p.3740].

In China, the technique is generally associated with rural people in the south, particularly in Szechwan and Yunnan

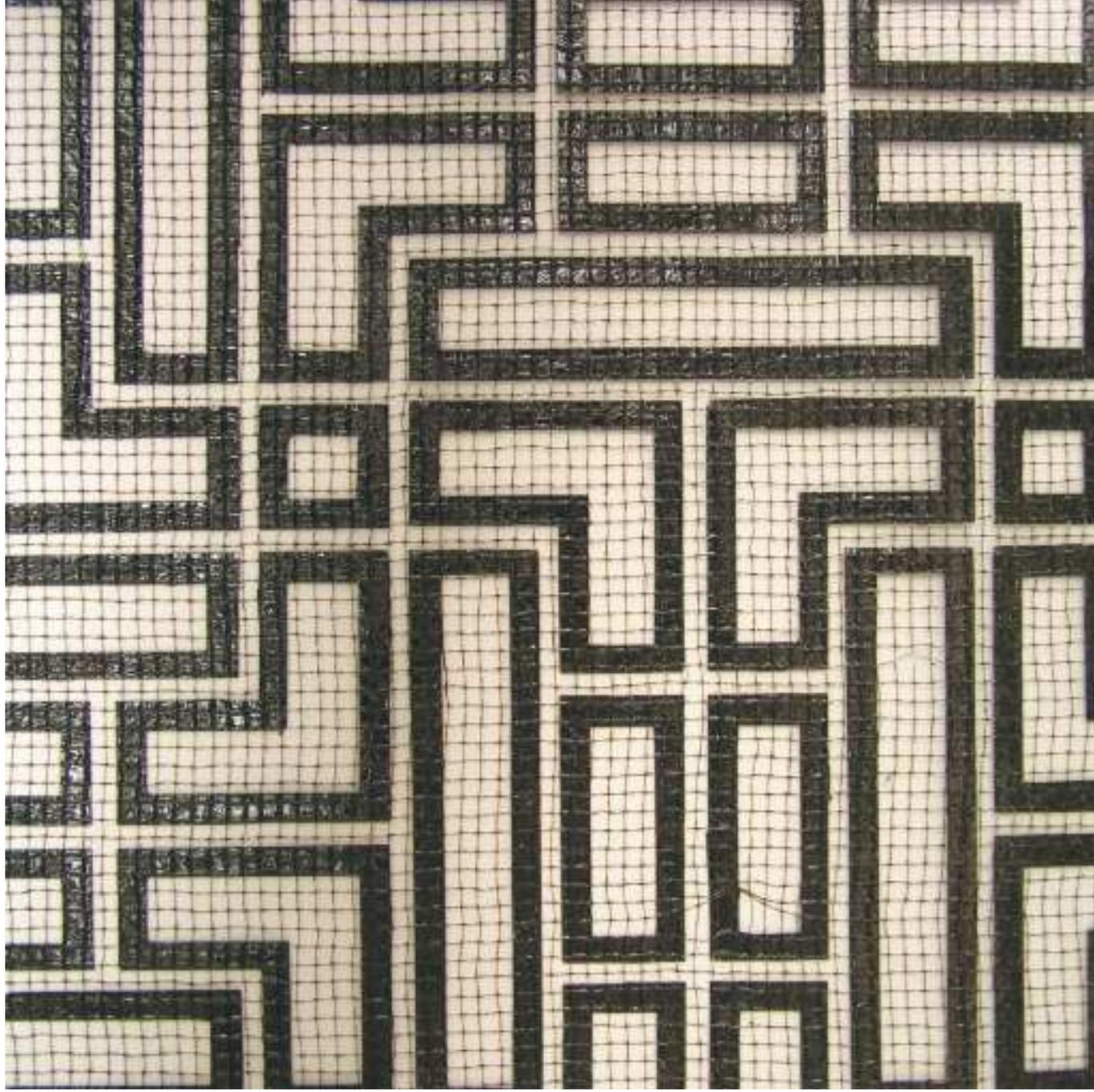
provinces, where it is used in association with intricate stitching and folding techniques to produce blue and white designs on cotton. Motifs include fish, flowers, birds and butterflies and lion-type animal motifs. Curtains, bedcovers, and clothing for children are the principal end uses [Buhler, 1954, p.3741].

In Japan the technique is known as *shibori* and was particularly popular during the eighteenth century. Combinations with other resist-dyeing techniques as well as embroidery were not uncommon. The technique was deemed to be best suited for use with soft pliable fabrics and was seemingly first used on silk and then, in the sixteenth century and onwards, for cotton [CIBA Review, 1967/4, p.22]. Certain regions or towns became associated with particularly varieties of *shibori* fabric. The *kyo shibori* from Kyoto are renowned as elegant designs on silk, and cotton *shibori* designs from Arimatsu and Narumi have been prized since the sixteenth century [CIBA Review, 1967/4, p.24]. The production of Japanese *shibori* fabrics was generally very labour intensive and, as a result, a whole kimono made from intricate *shibori* designs was very expensive and beyond the spending power of the majority of Japanese. Coverlets, wraps and men’s waistbands decorated using simple designs were common [CIBA Review, 1967/4, p.24].

Tie-and-dye-type fabrics are produced in many parts of Africa; the *adire oniko* cloths produced by the Yoruba of Nigeria are probable the most notable. These fabrics are produced by tying and stitching using raffia. Resist-dyed fabrics with designs comprised of large or small circles are found throughout much of West Africa, and production of these is particularly common among the Yoruba as well as the peoples of Senegal and Gambia [Pickton and Mack, p.148]. In Morocco, Algeria, Tunisia and Libya simple ring designs, using single colour resist-dyeing on woollen fabrics, are common [Buhler, 1954, p.3745].

From the viewpoint of the modern craft worker bound resists are probably the simplest forms of patterned textiles. Horizontal, vertical or diagonal stripes can be achieved

16. *Katagami* stencil. Made from mulberry paper and silk. Japan.



by pleating or rolling the fabric tightly and then binding sections to stop the penetration of the dye. A chequered effect can be produced if the fabric is rolled, tied and dyed in two directions each at ninety degrees to the other. The most common bound-resist is when the fabric is pulled into a central position and bound in sections down its length thus producing circles in the final design. Interesting additional patterning can be produced by further binding. The size of each circle can vary from one millimetre in diameter to one metre depending upon how much fabric is pulled up. With bound resists the choice of binding material is of great importance, as it is necessary to ensure that the ties are tight and that the dye will not penetrate underneath. After dyeing it is important to rinse and dry the fabric thoroughly before it is untied, otherwise excess dye will bleed into the design. Using different dyes and fabrics, while employing the same basic technique, can yield amazingly wide variations in final design.

Stitched resists require strong thread. Lengths of fabric are often folded into layers and then stitched to achieve mirrored images of motifs. Once the stitching has been completed the threads are pulled up tightly until the cloth forms closely-packed pleats. Thread in the corrugations of the folds of fabric is largely protected from the dye.

Pleating of cloth can be done by hand or by using a machine known as a 'princess pleater'. Hand-pleated cloth tends to be slightly irregular. Fabrics can be pleated in weft or warp directions and the pleats are often secured by a tacking thread. Crisper pleats can be achieved by using a domestic iron to press the edges of the fabric.

5. Clamped Resists

One of the rarest forms of resist dyeing is "clamped resist", known in Japan as *itajime*. The resultant soft ghostly images are found with no other resist or printing technique. Clamped resists do not require the use of pastes, waxes or bindings, but instead involve folding cloth in two or more directions and clamping it between boards or sticks. The clamped-resist technique seemingly fell into disuse in

Japan by the twelfth century CE but was revived during the nineteenth century when it was used in an adapted form for the resist-dyeing of warp and weft threads in the production of ikat-type designs [Leighton-White, 1994]. With this technique (known as the *itajimi-kasuri*) yarns were passed between two boards engraved in high relief and, when immersed in a dye bath, the dye was unable to penetrate to the areas under pressure [CIBA Review, 1967/4, pp16-21].

6. In Conclusion

Resist-dyeing techniques have been used worldwide and, in their simplest forms, were probably the first means of decorating textile fabrics. Although remote in historical origin, knowledge of such techniques should not be restricted to the anthropologist, archaeologist or historian, for such knowledge can form the basis on which to derive or develop a wide spectrum of aesthetic effects of great value to the modern designer. Many of the techniques described above are still practiced today and have spread beyond their traditional homelands to be used by crafts people in Europe and North America. Resist patterning techniques require high levels of skill and are exceedingly labour intensive. In terms of the mass-market production of the twenty-first century, these techniques offer no real potential as competitors for more technologically-advanced screen and digital printing techniques. However in more specialised niche, couture-type markets, there is always the demand for the unique, exclusive, one-off, designed item. Beyond this, there is still much of value to the modern designer. Experimentation with these techniques, within a modern studio environment, offers potential in the realms of design and product development, and as a complement to the numerous innovations in computer-aided design.

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