染色艺术：
日本的传统旗帜制作工艺

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摘要

数个世纪以来，日本在历史发展过程中形成了多种染色工艺。其中一种传统工艺名为“印染”，它通过模版将家纹图案和其他图案印制到织物上。尽管如今许多织物制造方法已实现机械自动化，但仍有上百家制造商保留着传统工艺。本文描述了作者在染色工匠指导下，亲身体验的应用于旗帜制作的“印染”工艺，以及该工艺的色彩还原精度。

Art of Dyeing: Traditional Flag Manufacturing in Japan

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Abstract

Various dyeing techniques have been developed over many centuries throughout Japanese history. One of these traditional techniques, known as *shirushi-zome*, is used to apply *kamon* family crest marks and other materials with patterns of stencils to fabrics. Although many fabric manufacturing methods have been automated by machinery, about a hundred manufacturers maintain their traditional techniques. This paper describes *shirushi-zome* as applied to flag manufacturing (which the author actually experienced under the guidance of a dyeing craftsman) and explores color reproduction accuracy.

印染工艺

日本传统手工染色工艺“印染”历史悠久，逾千年之久，被用于为各类织物上色。如包装布、门帘、和服（尤其是半缠和服）、手巾，当然还有旗帜（见图1）。“印染”由两个词组成：“印”意为“标记”，“染”意为“染色”。其字面意思就是“在织物上印制标记的染色工艺”。

印染工艺始于平安时代（9世纪）在中世纪（约公元1500年）前主要应用于亚麻织物。16世纪后期的安土桃山时代，棉花从亚洲大陆引入日本，此后便成为这种工艺的主要织物材料。染色生产体系于江户时代（17世纪至19世纪）确立，当时在德川幕府统治下的“德川和平”时期，民间文化在市民中盛行。自中世纪起用于代表家族纹章的“纹”或“家纹”体系，在这一工艺的发展过程中发挥了重要作用。1868年明治维新之后，日本文化迎来转折点。织物的西化导致对传统染色的需求降低，传统染色行业因此萎缩。如今，日本仅有约100家制造商保留着这一传统工艺。

印染工艺可细分为直接印花、脱色、涂料覆盖等类别，分类依据是所使用的工具。“筒引”和“型染”分别是通过用涂料和模版覆盖织物，将颜料限定在特定区域的工艺。“注染”和“引染”则是以其工具命名，它们也可被视为涂料覆盖印花或模版印花。

The *Shirushi-zome* Technique

The Japanese traditional hand-dyeing technique called *shirushi-zome* has a long history—over one thousand years—and has been used to apply color to various fabrics such as *furoshiki* wrapping cloths, *noren* curtains, *kimono* especially *hanten* (*happi)* clothes, *tenugui* towels, and needless to say, flags (fig. 1). *Shirushi-zome* is composed of two words: *shirushi* means “marks” and *zome* (“*some*” in its original form) means “dyeing”. It literally means “dyeing technique to print marks on fabrics”.

The *shirushi-zome* technique started during the Heian period (9th century) and it was applied to linen fabrics until the Medieval period (approximately 1500 AD). Cotton became the major fabric for this technique during the Azuchi-Momoyama period (late 16th century) when the plant was introduced from the Asian continent. The dyeing production system itself was established during Edo period (from the 17th to the 19th century), when civil cultures became popular among townspeople during the “Pax Tokugawa”, the warless centuries under the reign of Tokugawa Shogunate. The heraldic system known as *mon* or *kamon* that was used to represent family crests from Medieval times, played an important role in the development of this technique. The period following Meiji restoration in 1868 was the turning point of Japanese culture. Westernizing of fabrics caused lower demand for traditional dyeing and thus shrank the traditional dyeing business. Today only approximately 100 manufacturers in Japan maintain this traditional technique.

Sub-categories of *shirushi-zome*—such as direct printing, decoloration, and paste covering—are classified based on the tools used. *Tsutsu-biki* and *kata-zome* are techniques putting pigments in a limited area by covering the fabric with paste and stencils, respectively. *Chûsen* (vacuum printing) and *hiki-zome* (brush printing) are named after their tools—they also can be regarded as paste-covering or stencil printings.



图 1a. 日本旗章协会旗帜，图 1b. 滋贺县一家糖果店的窗帘，图 1c. 穿着浴衣的男孩。
（照片：1a由冈山拍摄，1b和1c由作者拍摄）

Figure 1a. Flag of JAVA, 1b. *Noren* curtains at a confectionery shop in Shiga prefecture, 1c. A boy in *yukata* cloth. (Photos: 1a by M. Okayama, 1b & 1c by Y. Katsurada)

型染：模版印花

在参观位于兵库县伊丹市的一家印染制造商-大路光染工厂时，我了解到了型染的基本流程。型染是印染工艺中使用模版的一种技术。以下展示这一工艺的一个示例。通过混合颜料可以调配出各种颜色（图2）。颜料的选择基于制造商的经验。不同颜色的配色配方细节有所不同，但可以用表1来描述，其中变量X和Y分别代表颜料和水。

模版是丝网筛上的图案。虽然多种颜色的图案可以放在一个模版中，但不同的染色区域需要用间隔物隔开，以防止颜色混合。这意味着，如果不同颜色相邻，就需要多个模版。

图 2. 为染色调配好的颜料。（照片由作者拍摄）

Figure 2. Colors prepared for dying. (Photo by Y. Katsurada)

Kata-zome, Printing with Stencils

On a visit to a *shirushi-zome* manufacturer, the Oji Mitsu-sen Factory in Itami, Hyogo prefecture, I learned the basic processes of *kata-zome*, a *shirushi-zome* technique using stencils. An example of the process is shown here. Various colors are made by mixing pigments (fig. 2). The selection of pigments is based on manufacturers' experiences. Details of color recipes vary by color but can be described in Table 1 with variables of X and Y for pigments and water, respectively.

The stencil is a pattern on a silkscreen mesh. While patterns for multiple colors can be placed in one stencil, the different coloring areas should be separated with spacers to prevent them from mixing. This means multiple stencils are needed if different colors are located next to each other.

成分及用量	数量
染料/颜料	X 克 （< 100 克）
水	Y g
尿素（NH2）2CO	30-50 克/升
碳酸氢钠（NaHCO3）	10-30 克/升
抗还原剂	10 克/升
总计	1,0 总计 g

表 1. 染色基本配方（调配1000克所需成分）。

Ingredients	Amount
Dye/pigment	X g (< 100 g)
Water	Y g
Urea $(NH_2)_2CO$	30-50 g/l
Sodium bicarbonate ($NaHCO_3$)	10-30 g/l
Anti-reducing agent	10 g/l
Total	1,000 g

Table 1. Basic recipe for coloring (ingredients for 1,000 g).

图3a展示了用于制作英国国旗的模版。图3b展示了其他需要多个模版的旗帜。制造商制作摩尔多瓦国旗的中心部分时，创纪录地使用了9个模版。

Fig. 3a shows stencils used for the flag of the United Kingdom. Fig. 3b shows other flags requiring multiple stencils. The manufacturer needed 9 stencils—a record—for the central part of the flag of Moldova.

图 3a. 英国国旗的模版。由于红色和蓝色区域用白色镶边（分隔颜色），所以一个模版就可以用于印染这两种颜色。

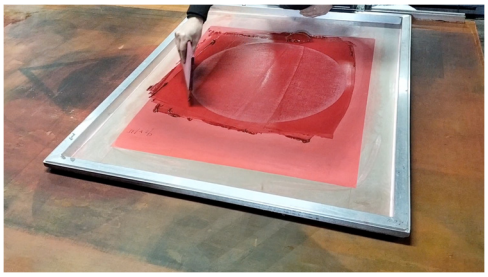
Figure 3a. Stencil for U.K. flag. Since the red and blue areas are fimbriated in white (separating the colors), one stencil works for dyeing both colors.

图 3b. 工厂中展示的其他需要多个模版的旗帜。摩尔多瓦国旗创纪录地需要九个模版。（照片由作者拍摄）

Figure 3b. Other flags displayed in the factory which required multiple stencils. The flag of Moldova required a record of nine stencils. (Photos by Y. Katsurada)

型染染色过程的一个独特之处是在织物的两面都涂抹颜料。如图4a、4b、4c和4d所示（这些图片取自为日本国旗染红色圆的视频），织物被夹在两层颜料之间。

A unique aspect of the *kata-zome* dyeing process is placing pigments on both sides of the fabric. As shown in figs. 4a, b, c, and d (images from a video of dyeing a red disc on Japanese national flag), the fabric is sandwiched between two layers of pigments.



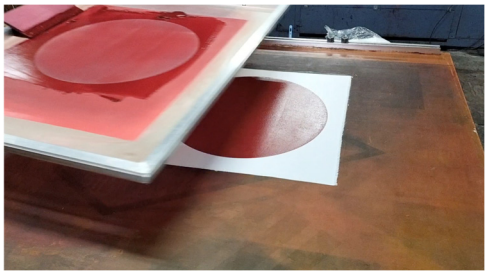


图 4a – 4b. 通过模版在织物背面涂抹颜料。

Figures 4a–4b. Placing pigments through the stencil for the back side.

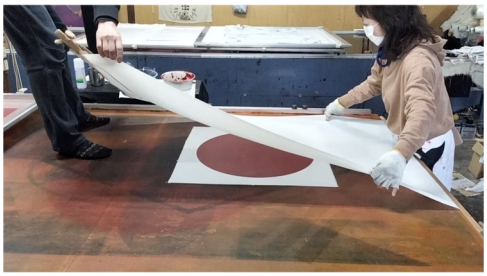


图 4c. 放置织物；图 4d：在织物正面涂抹颜料进行染色。（图片取自作者在制造工厂拍摄的视频）

Figures 4c. Setting a fabric; 4d. Placing pigments on the fabric for dyeing the front side.
(Images captured from a video taken by Y. Katsurada at the factory)

涂抹颜料后，织物会立即在户外晾干（图5）。因此，染色计划取决于天气条件。晾干后，下一步是在约100℃的温度下蒸8到15分钟（时间取决于颜色），以便在洗涤前使颜料固定（图6）。

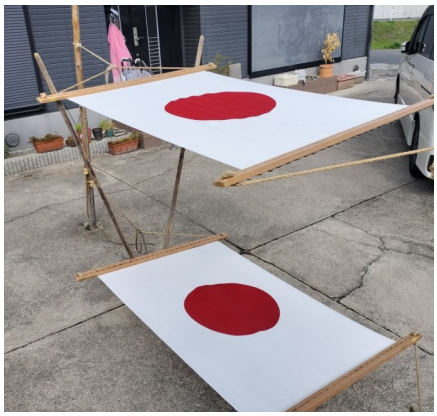


图 5. 在户外晾干织物，应避免雨天。（照片由作者拍摄）

Figure 5. Drying fabrics outside—rainy weather should be avoided. (Photo by Y. Katsurada)

Fabrics are dried outdoors immediately after applying pigments (fig. 5). The dyeing schedule therefore depends on weather conditions. After drying, the next step is steaming at approximately 100 °C for 8 to 15 minutes (depending on the color) to stabilize the pigments before washing (fig. 6).

图 6. 悬挂在蒸汽设备中的织物。温度和时长可以控制。（照片由作者拍摄）

Figure 6. Fabrics hung in the steaming facility. Temperature and duration can be controlled. (Photo by Y. Katsurada)

图 7a. 洗衣机中的织物。图 7b. 甩干机。（照片由作者拍摄）

Figures 7a. Fabrics in the washing machine. 7b. Spin dryer. (Photos by Y. Katsurada)

最后一道工序是洗涤和甩干，以去除颜料和粘合剂残留（图7a和7b）。

The final process is washing and spin-drying to wash the pigment and binder residues away (figs. 7a–7b).

印染的颜色

印染可以产生稳定的纯色，但能否成功取决于多种条件，如织物的底色（这与织物材料和质地有关）以及温度和湿度等自然条件。此外，这些因素还依赖于制造商的经验。1972年成立了全国青年印染经营研究会（简称“全染研”），以保护印染文化并培养下一代。该协会成员基本遵循为保持质量一致而制定的指导方针（“全染研标准”），其中包括一套80种标准颜色（图8）。

Colors of *Shirushi-zome*

Shirushi-zome can produce a stable solid color but success depends on various conditions such as the base color of the fabric (that is related to fabric materials and textures) and natural conditions such as temperature and humidity. Furthermore, these factors depend on the manufacturers' experience. The Zenkoku Seinen Shirushi-zome Keiei Kenkyukai (National Youth Dyeing Management Association) or "Zensenken" for short, was established in 1972 to preserve *shirushi-zome* culture and train future generations. Members of the association basically follow guidelines ("Zensenken standards") set to keep the quality consistent, they include at standard set of 80 colors (fig. 8).

图 8. 全染研的80种标准颜色。（2011年全染研色卡照片）

Figure 8. The Zensenken's 80 standard colors. (Photo of the color sheet in Zensenken, 2011)

全染研将色号301“金赤（金红色）”定义为孟塞尔颜色系统中的9R 5.5/14，该系统基于色调、明度（值）和饱和度（彩度）来描述颜色。日本国旗使用的就是这种金赤红色。

测量织物的精确颜色并不容易，但如今借助智能手机应用程序可以获取初步的颜色信息。我尝试使用一款名为（颜色分析器）的智能手机应用程序进行测量，它由Kamusoft开发，有适用于iOS和安卓系统的英文和日文版本。这款软件以多种格式显示测量到的颜色信息，包括孟塞尔颜色系统。

The Zensenken defines the color #301, “*Kin-Aka* (golden red)”, as 9R 5.5/14 in Munsell Color System, whose color description is based on hue, tone (value), and saturation (chroma). This *Kin-Aka* red is used in the Japanese national flag.

It is not easy to measure the precise color of fabrics but nowadays it is possible to obtain preliminary color information with smartphone apps. I tried to measure the color using one such smartphone app—Color Analyzer (*Iro Shirabe*) by Kamusoft (available in English and Japanese for iOS and Android OS). This software shows the measured color information in many formats, including the Munsell Color System.

我用这款软件分析了大路光染工厂制作的日本国旗的红色。遗憾的是，我没有其他日本国旗，所以从个人收藏中挑选了其他带有红色部分的旗帜进行比较——一面棉质的美国历史旗帜（即本宁顿旗），以及一面尼龙材质的加利福尼亚州旗。这些颜色是在日光条件下同时测量的。

印染日本国旗的红色为8R 5.2/20.7，本宁顿旗的红色为7R 4.9/17.7，加利福尼亚州旗的红色为5R 6.0/18（图9）。与定义的金赤红色孟塞尔规格9R 5.5/14相比，日本国旗在色调和明度上最为接近，尽管饱和度极高。另外两面旗帜则呈现出更偏紫红色调。虽然需要更系统、校准后的测量来进行更精确的比较和讨论，但这一初步测量表明，传统印染技术所产生的红色是对正确颜色的理想再现。

I analyzed the red color of the Japanese flag produced by Oji Mitsu-sen Factory with this software. Unfortunately I did not own other Japanese national flags, so I selected from my personal collection other flags with red parts for comparison—a cotton historic American flag (known as the Bennington Flag), and a nylon California state flag. The colors were measured at the same time under daylight conditions.

The red in the *shirushi-zome* Japanese flag was 8R 5.2/20.7, in the Bennington Flag was 7R 4.9/17.7, and in the California flag was 5R 6.0/18 (fig. 9). Compared with 9R 5.5/14, the defined *Kin-Aka* red Munsell specification, the Japanese flag was closest in hue and tone although the saturation was extremely high. The other two flags showed more purplish red hues. Although more systematic and calibrated measurement is needed for more precise comparison and discussions, this preliminary measurement indicated the red produced by the traditional *shirushi-zome* technique was an ideal reproduction of the correct color.

图 9. 测量到的红色在孟塞尔颜色系统中的数值：图 9a. 传统印染制作的日本国旗：8R 5.2/20.7；图 9b. 被称为本宁顿旗的美国历史旗帜：7R 4.9/17.7；图 9c. 尼龙材质的加利福尼亚州旗：5R 6.0/18。（照片由作者拍摄）

Figure 9. Measured Munsell colors of the red in: 9a. Japanese flag produced by traditional shirushi-zome: 8R 5.2/20.7, 9b. Historic American flag known as Bennington Flag: 7R 4.9/17.7, 9c. Nylon California flag: 5R 6.0/18. (Photos by Y. Katsurada)

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