

Colors of the Floating World

Recent analysis of the color materials used in ukiyo-e prints by the artist Torii Kiyonaga has confirmed the remarkable skills of the printmakers involved in realizing Kiyonaga's vision. Professor **Susumu Shimoyama**, who played a leading role in the study, reports.

Ukiyo-e pictures are one of the leading representations of Japanese culture. Ukiyo-e are basically polychrome woodblock prints of *nikuhitsu-ga* or *nishiki-e* (original drawings) on the themes of the daily life and customs of common people, kabuki actors and sumo wrestlers from the mid-seventeenth century to the start of the twentieth century. Whereas *nikuhitsu-ga* are paintings by a single artist, ukiyo-e prints are the product of a collaborative process involving a painter or drawer, woodblock craftsman, print puller and publisher. In this process, first, the drawer makes a preliminary sketch. The woodblock craftsman then carves multiple blocks in preparation for polychrome printing of the design, cutting away the area of each block that is *not* to be printed. The print puller then applies in turn each of the differently carved and colored blocks to a single sheet of paper, to complete the picture. It is believed that in the early days of ukiyo-e, a publisher would oversee a run of only 200 prints for each set of blocks.

Analysis of the colorants used in traditional Japanese woodblock printing throws light on some of the specific techniques used by the parties involved in this collaborative artistic effort, as a recent study of four works by the printmaker Torii Kiyonaga (active 1767–1815) reveals.

Together with Utamaro, Kiyonaga is considered one of the twin masters of pictures of beautiful women. Against a backdrop of realistic depictions of famous places in Edo, Kiyonaga drew the graceful figures of groups of beautiful and well-proportioned women in the large (approx. 39 x 26.5 cm) diptych and triptych formats, introducing the “series of

pictures” scheme of representation that allows appreciation of each panel independently of the others, and breaking ground for the golden age of ukiyo-e prints. However, his influence on the history of art in Japan has been little studied since almost all his main works are held in art galleries overseas.

Using a radioisotopic radiation source and 3-D spectral fluorescence, we performed a nondestructive analytical survey on four works by Kiyonaga in the possession of the Chiba City Museum of Art. They are *Nakamura Riko no Honzo Nyobo to Nase* (1776, **Fig. 1**) on the theme of the revenge of the forty-seven *ronin* (a samurai legend), thought to be an early work by Kiyonaga; *Summer at Shinagawa*, from the series “Twelve Months in the South” (around 1784), a woodblock print in the large diptych format that is

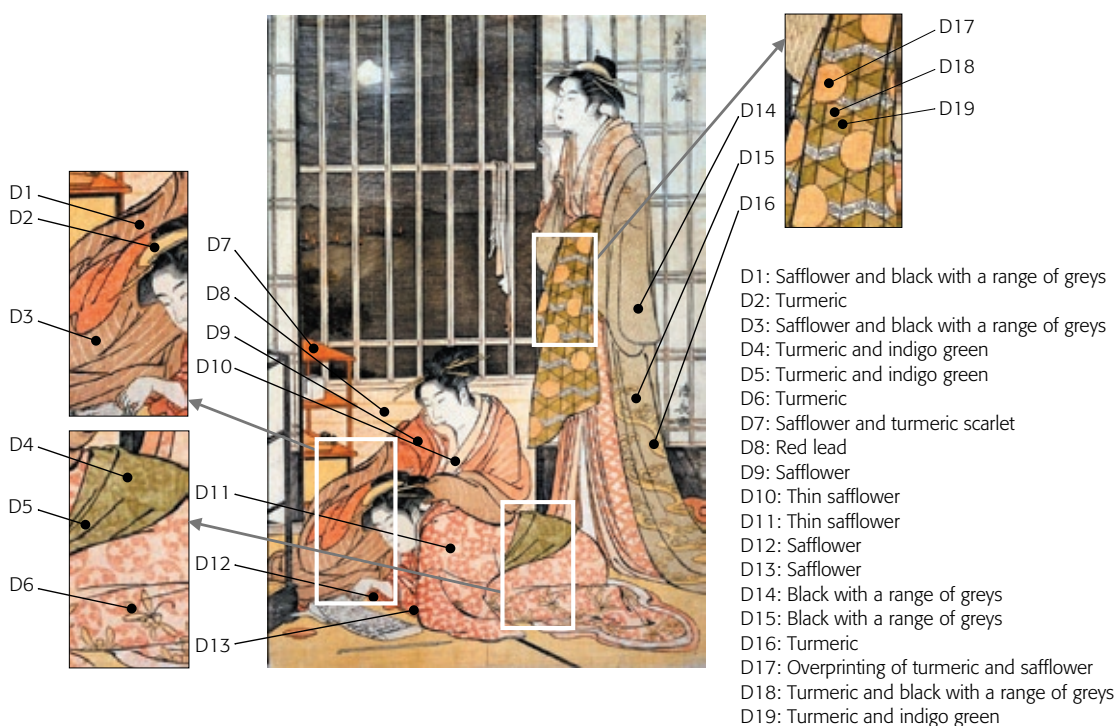
well-known as an outstanding work by Kiyonaga with an extremely small number of prints still remaining; *The Moon in the Ninth Month*, from the same series “Twelve Months in the South” (around 1784, **Fig. 2**), which is thought to have been published on a single sheet instead of a diptych; and a single sheet in the “Degatari-zu” (No. 33) series of theatrical prints that is representative of Kiyonaga: *The Actors Ichikawa Yaozo III as the ex-soldier Hachirobei, Nakamura Riko as the Geisha Otsuma of Tanbaya, the Lead Joruri Chanter Tomimoto Itsuki-dayu and the Famous Shamisen Player Namisaki Tokuji* (1785).

Characteristics of the Artificial Colors

The blue coloring used in the multi-colored ukiyo-e woodblock prints includes a plant-based pigment derived from the dayflower (*aigami*), indigo (*ai*), and the manmade *bero-ai* pigment, or Prussian blue. The dayflower was used in the early days, with indigo emerging later, and subsequently,

Figure 1: Nakamura Riko no Honzo Nyobo to Nase



Figure 2: *The Moon in the Ninth Month*

Prussian blue came into wide use from the latter half of the 1830s.

For example, in *Nakamura Riko no Honzo Nyobo to Nase*, dayflower was used for the blue pigment while indigo and Prussian blue were not used. For example, the blue in the kimono (measurement point A4 in Fig. 1) is printed using dayflower. The faded bamboo trunk in the background (A1) and the blue area of the fence (A7) are also dayflower. The red area in the layers of kimono (A3, A6) is crimson while turmeric has been used for the yellow area in the layered kimono (A2, A5) and the yellow area of the fence (A8).

As for the special characteristics of the dye compound, the dayflower fades quickly while indigo is less subject to fading. Dayflower was used in the early days of *ukiyo-e* prints with indigo. For example, the dayflower is one option for gradated printing (*bokashi*) when depicting gradation in the sky while the color material in indigo is not suitable as it tends to cause blemishes in the coloring. Though its color can fade easily, the most suitable dye for the gradation is an artificial colorant, the *bero-ai* pigment.

One special characteristic established by this survey is that there are

two types of purple. One is the purple made by mixing crimson with dayflower, and the other one is a purple thought to be made by applying layers of crimson over dayflower. This color is used to depict colors in the kimono and the woven design of the obi. The pattern is printed in dayflower with layers of crimson applied to represent the woven design in the obi. In terms of other pigments, it is thought that red lead oxite (*tan*, Pb_3O_4), the main element of which is lead, was used since elements of lead were detected.

Moon in the Ninth Month

The special characteristics of the artificial color in *Moon in the Ninth Month*, from the series “Twelve Months in the South” (around 1784, Fig. 2) are, to start with, the skillful use of diluted ink to control the luminosity and represent a large range of colors. Take, for example, the striped fabric (D2 and D3 in Fig. 2) of the kimono worn by the woman who is leaning against the back of the woman reading a book on the tatami floor. This area looks purple. However, only red crimson was confirmed in both areas and the blue coloring that is used to create purple was not detected. This indicates that by mixing a

small amount of diluted ink in the red color, a dark red (red with low luminosity) that looks like purple was produced.

Then, there is the pattern on the obi of the woman viewing the evening scene through the lattice window. The only coloring detected in the dark yellow area in the pattern of triangles (D18) is turmeric. If it is only turmeric, the coloring should be a bright yellow like the ornamental comb in the hair of one of the women in this picture (D2), or in the kimono pattern (D6 and D16). However, the pattern of triangles

(D18) is a dark yellow. That is, in order to depict the colorful pattern of the obi worn by the woman, diluted ink was probably mixed with bright turmeric to depict a darker yellow with a different luminosity.

Also, as a special characteristic of this work, compound colors are skillfully used to vary the coloring. One example is the area that is printed green by mixing yellow turmeric with blue indigo. This compounded green was confirmed in the obi of the woman reading a book on the tatami floor (D4, D5) and in part of the triangle pattern in the obi (D19) worn by the woman looking out at the evening scene.

Another representation of the masterly use of compound color are the areas printed a deep scarlet by mixing crimson red with yellow pigment. This compound scarlet was confirmed in the ornamental shelf (D7).

The pattern of circles in the obi (D17) worn by the woman who is looking out at the evening scene is presumed to be a light crimson applied in layers over turmeric.

A pigment presumed to be red lead was confirmed in this work. It is in the area of the wallboard below the lattice window (D8). This is where we detected elements of the lead which is

the main ingredient in red lead.

In ukiyo-e prints, deep crimson and light crimson are used in distinct ways, and in this work we detected both dark crimson (D9, D12, D13) and light crimson (D10, D11). Moreover, no coloring or pigments were detected in the apparently delicate grey in the diamond pattern in the kimono of the woman who is looking at the evening scene (D14), or the

on the raised platform, and the ground color in the kimono (E16) worn by the shamisen player to the right. This indicates that the yellow color of orpiment was used in each of these areas.

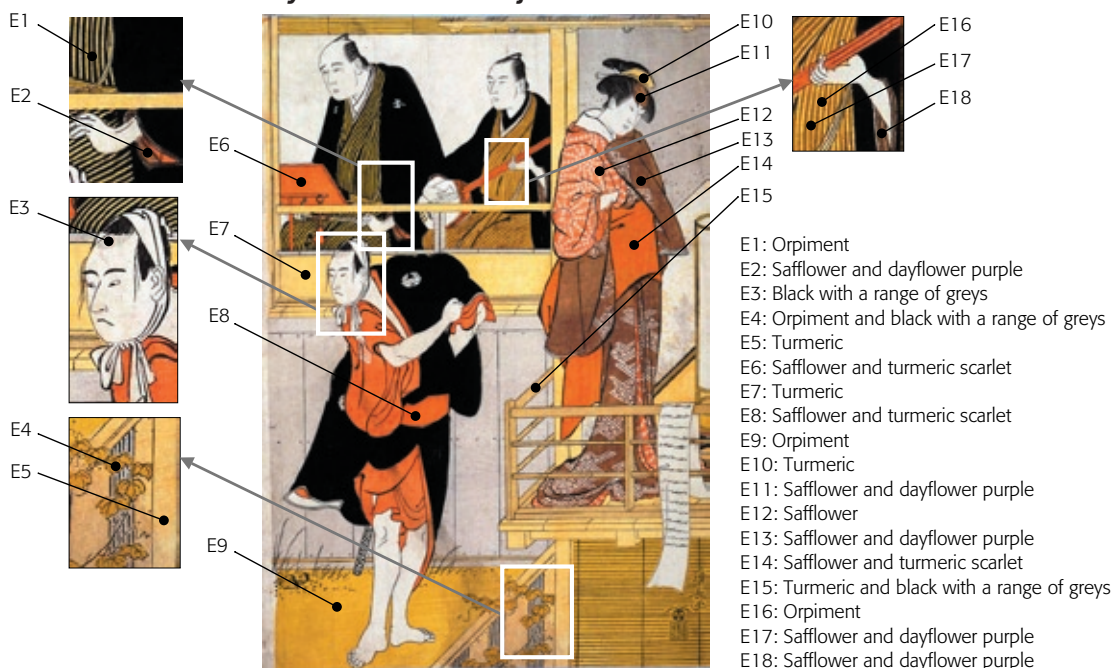
The leaves of the creeping vine entwined in the wooden fence is printed a dark yellow (E4), but we detected elements of arsenic in this area as well, so it is presumed that orpiment mixed with diluted ink was used to

namental comb (E10), but the railing on the stage where Otsuma of Tanbaya is standing (E15) is printed in turmeric mixed with diluted ink.

There are also areas in this work that have been printed scarlet by mixing yellow turmeric with red crimson. They are the obi worn by the soldier Hachirobei (E8) and the obi worn by Otsuma (E14). Furthermore, blue coloring is frequently used for the area where the hair on the forehead is shaven off to form a half-moon shape, but in this work, the shaved part of the forehead of the soldier Hachirobei (E3) is printed in diluted ink.

The colors used for these works by Kiyonaga are dayflower blue and indigo, red crimson and red lead, yellow turmeric and orpiment. Even if we add in black ink, there are only seven hues and four colors. The woodcrafter would have made as many blocks for a polychrome print as the drawer used color. However, the number of blocks used was not necessarily affected by

Figure 3: The Actors Ichikawa Yaozo III as the ex-soldier Hachirobei, Nakamura Riko as the Geisha Otsuma of Tanbaya, the Lead Joruri Chanter Tomimoto Itsuki-dayu and the Famous Shamisen Player Namisaki Tokuji



ground color in the kimono (D15). It is presumed that the depiction of the pattern and the ground color has been done in diluted ink.

The Actors Ichikawa Yaozo III as the ex-soldier Hachirobei, Nakamura Riko as the Geisha Otsuma of Tanbaya, the Lead Joruri Chanter Tomimoto Saigu and the Famous Sangen Player Namisaki Tokuji

The special characteristics of this work are, to start with, the heavy use of orpiment (arsenic sulfide). Elements of arsenic were detected in the yellow area of the ground (E9) where the soldier Hachirobei is standing as he assumes the *mie* pose with his hand gripping the hilt of the sword, the ground color of the kimono (E1) worn by the lead chanter seated to the left

print the leaves.

There is also heavy use of purple made by mixing dayflower with crimson. Purple made by mixing crimson with dayflower has been used in finely textured areas such as the hair ornament of Otsuma of Tanbaya (E11), the purple area of her kimono (E13), the sleeve cuffs of the lead chanter and the shamisen player seated on the raised platform (E2 and E18), and the striped pattern on the kimono worn by the shamisen player (E17).

In addition, by mixing some of the turmeric with diluted ink, a distinction has been made between the luminosity of the yellows in the print. Only turmeric has been used for the dais on the raised platform (E7), the pillar holding up the stage where Otsuma of Tanbaya is standing (E5), and the or-

the creation of various colors with limited options. The print puller would use each of the four kinds of artificial colors and mix them with thin ink, creating for example purple by a combination of dayflower and crimson, green by mixing indigo and turmeric, and scarlet by mixing crimson and turmeric. When studying the coloring of ukiyo-e prints, I am always impressed and astonished by the skills of the carvers and printmakers who, in response to the artist's sense of color, drew out such ingenious color representation by using so few color materials, mixing light and dark shades, and printing them in layers. ■

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