

The Pursuit of Perceived Density Found in Colors Favored by Japan

Sungmi Oh^{a*}, Hyunjung Kim^b

^a*Joshibi University of Art and Design, JAPAN*

^b*Yonsei University, SOUTH KOREA*

**sungmi021@yahoo.com*

ABSTRACT

An Edo expression ‘48 Teas and 100 Mice’ refers to the many variations of brownish and grayish colors adopted by the public when vivid colors were forbidden. Subdued colors with presence of base tones remain common in today’s Japan. Muddy colors with white or gray undertones are often used in the designs of commodities. Deep colors are also frequent, together forming distinct groupings of color unique to Japan. We attempt to explain this Japanese preference through a notion of “pursuit of density”. Colors have perceptual attributes such as hue, value, and saturation, but also have further phenomenological qualities such as perceived heaviness or density. ‘Perceived density’ refers to how dense and filled a color appears. Muddy and deep colors favored in Japan are of high perceived density and appear thick or having a mass. Perceived density is unique in that it does not increase monotonically with a single attribute, such as value or saturation. We postulate that apparent density is related to the composition of the color, that is, to the nature and ratio of the achromatic component. Possible factors contributing to this aspect of Japanese color preference are briefly considered: the humidity of the natural climate, and the indirectness in communication.

KEYWORDS: Perceived Density, Muddy/Deep Color, Achromatic Component

48 TEAS AND 100 MICE

In the Edo Period (1603-1868) in Japan, there was an expression ‘48 Teas and 100 Mice (shijyūhatcha hyakunozumi 四十八茶百鼠)’. The term referred to the many subtle variations of brownish and grayish colors that were adopted by townspeople (chōnin 町人) during the period when vivid colors were forbidden to them by sumptuary regulations. The Edo Period was a time of peace, economic prosperity, and urban expansion. A rapid growth of internal commerce and consumption brought affluence to chōnin, the commoner merchant class. But this changing economic condition was viewed as a challenge to the ruling samurai class, and the shogunate issued sumptuary laws in attempts to maintain the existing socio-political order (Shively 1964). As for color, the laws prohibited chōnins from wearing purple or deep-red. Gold and silver yarns were also prohibited. Black, dark blue, brown, and gray were allowed (Nagasaki 1976, Yoshioka 2000, Jō 2017a). Faced with these constraints, chōnins expressed themselves through variations of brownish and grayish colors, giving birth to the general term ‘48 Teas and 100 Mice’.

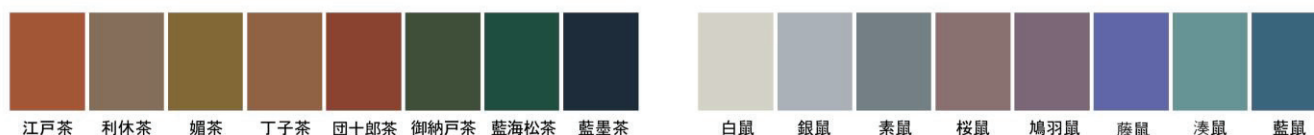


Figure 1: Examples of ‘48 Teas and 100 Mice’ colors

What is interesting is that the ‘tea (cha 茶)’ and ‘mouse (nezumi 鼠)’ colors of the Edo Period are not all ‘brown’ and ‘gray’ in terms of modern color categories. Some ‘tea’ colors would be categorically Green or Blue

instead of Brown (Fukuda 2005, Lee 2016), and some ‘mouse’ colors, with stronger nuance of hue, would fall in the categories of Pink, Purple, Green, or Blue-Green, and not Gray. Jō (2017b) speculates that in that period, off-gray or off-black colors of warm hues were called ‘cha’ and those of cool hues were called ‘nezumi’. ‘Cha’ and ‘nezumi’ appear to represent the common undertone that the colors assume, rather than the color categories of the resultant colors. These subdued colors with the presence of base tones are said to embody the Edo sense of beauty called ‘iki (粋; chic, coolness)’. The Edo chic in tea colors are often explained through philosopher Kuki Shūzō (1930)’s words: “The reason why tea colors are chic (iki) is that, the showy nature of the color (hue) on the one hand, and the decrease in degree of saturation on the other hand, reveal the coquetry of knowing resignation and the spirit of refinement.” While the origin of such color usage remains to be settled, the muted colors of Edo have found their ways into contemporary Japan.

MUDDY COLORS AND DEEP COLORS

In the commodity designs of today’s Japan, one will often find subdued colors with white or gray undertone. Subdued whitish or grayish colors look moderate and understated but also look rich and dense owing to the preserved characteristics of pure hues and the turbidity and muddiness created by the undertones. Muddy – we may call them ‘pelochromic’ – colors that depart from white or various values of gray and take on some nuances of hue (e.g., Munsell 1.5Y 8.5/4 or 1.5YR 6/2), are often used as dominant colors in Japanese designs (Fig. 2). Light pelochromic colors are often found in packaging designs for food or small goods, and in small Japanese electronic appliances such as hair dryers and digital cameras. Medium to dark pelochromic colors are frequently adopted for residential and office buildings. Both light and dark pelochromic colors are used in cars and in electronic appliances such as rice cookers and refrigerators. Of course, vivid and clear colors also play roles in Japanese designs, but the routine use of pelochromic colors is unique to the Japanese market.

Along with these muddy colors, deep colors with a hint of black undertone are also frequent. Deep colors with strong hue contents and blackish shades (e.g., Munsell 10G 3/2) – we may call them fuliginous colors – are often adopted as main colors or are combined with pelochromic colors in various sectors of Japanese design (Fig. 2). The combination of muddy colors and deep colors creates a rich and filled impression in the given design, especially when the colors are synthetically reproduced in mass-produced design.

Muddy, turbid colors are used in other cultures, too, but Shigenobu Kobayashi (1977) notes that even when turbid colors are used, they are warm turbid colors, and cool turbid colors are not found much outside Japan. The prevalence or preference could be of a different nature.

In this study, we attempt to explain the Japanese preference for the muddy and deep color groups through a notion of “pursuit of density”.



Figure 2: Examples of muddy and deep colors

THE PERCEIVED DENSITY

Colors can be defined by three perceptual attributes: hue, value, and saturation. But colors can also be defined by further phenomenological qualities (John Mollon, e-mail message to author, February 25, 2017) such as perceived heaviness or warmth (Bullough 1907, Payne 1958, Pinkerton and Humphrey 1974). The perceived density of color is a phenomenological quality that represents how dense and filled or thin and airy a color appears. Colors with white or gray undertones look muddy and dense. Colors with black undertones look clear and not turbid, but they also assume the quality of being dense or thick, or having a mass.

The apparent density of color is unique in that it does not have a monotonic relationship with a single perceptual attribute. That is, unlike perceived heaviness, which decreases with value and increases with saturation (Monroe 1925, Alexander and Shansky 1976), perceived density does not increase or decrease continuously with value or

saturation. High apparent density is observed in non-apex regions of an equi-hue plane where no single attribute of color is at peak strength (Fig. 3): a region off the achromatic axis and a region intermediate to white and pure color apices (where muddy colors are located), and a region intermediate to black and pure color apices (where deep colors are located). A recent report (Kawai and Ohtani 2014) reveals that perceived clarity of color is high in the achromatic region and decreases rapidly as chromatic information is added to achromatic information. The finding agrees with the high perceived density in the off-gray region.

We postulate that apparent density is related to the layering or composition of the color, that is, to the nature of the achromatic component (white, gray, black) and its ratio to the chromatic component. While colors with a gray undertone appear dense when the ratio of chromatic component to gray component is small, colors with a white or black undertone will require a larger ratio of chromatic component to look dense (Fig. 3). The nature of the hue component, that is, the compositeness of hue, also may influence perceived density, but more investigation is needed.

In design, relative density may matter: In Japanese design, relatively dense colors within the intended color category are frequently used.

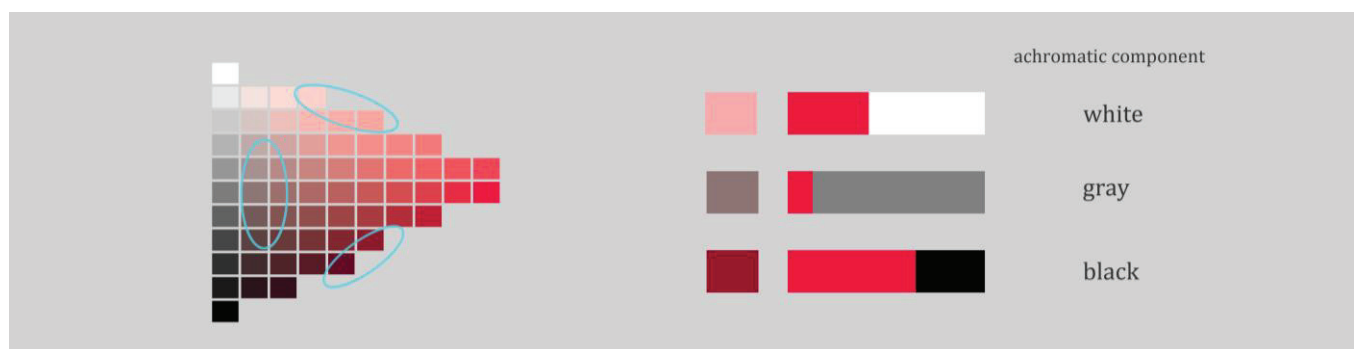


Figure 3: High density region and achromatic component ratio

DISCUSSION

Finally, we briefly consider factors that may have contributed to the quest for perceived density in Japanese color usage. Apart from the cultural heritage of past eras, the humidity of the natural climate and the indirectness of Japanese communication may have served as a congruent backdrop to the quest for dense colors.

While the prevalence of dense colors in Japan has not been explained much, the high humidity of the Japanese climate has been connected to the use of turbid colors. Satō (1999) argues that the vaporous air of Japan arising from colliding ocean currents (especially on the non-Pacific side) will cast a veil over outdoor scenes and reduce the luminance range, and thus will induce a familiarity for huge amount of turbid intermediate colors. Also, color contrast adaptation will occur and subtle variations of colors will be better discriminated and appreciated in a humid environment of this kind. While the long-term effect of humidity on color perception needs to be explored, it has been shown that contrast adaptation changes the gain of the human contrast response (Webster and Mollon 1995). Yamauchi (2011) speculates that among countries that modernized early, a country with Japan's humidity is unusual. In this dampness, a blurring of distant landscapes was common and a sensitivity for subtle color changes was able to mature. It should also be noted that the four primordial Japanese color terms were bright (*mei* 明), dark (*an* 暗), clear (*ken* 顕), and opaque (*baku* 漠) (Stanlaw 2010, Jō 2017a).

The dense colors favored in Japan are not pure colors and have added achromatic layer. Colors have inherent assertiveness, and subdued colors with an achromatic layer are weak in assertiveness (Komachiya 2011). This unassertiveness may be congruent with the indirectness or ambiguity found in Japanese communication. Ambiguity in Japanese communication is often explained with the notion of *amae* (甘え) and *enryo-sasshi* (遠慮-察し) (Miike 2003). Doi (1973) states that all interpersonal communications in Japanese society have the emotional undertone of *amae*. *Amae*, longing for dependency or belonging, has the duality of the dependency need and the attempt to control such need, and is based on mutuality of non-verbal emphatic nature. When mutuality and agreement is respected, self-expression becomes ambiguous and hesitant, as in subdued colors. *Enryo-sasshi*, precaution and conjecture, is also crucial in Japanese communication to maintain interpersonal and situational harmony. *Enryo-sasshi* requires a

mutual adjustment: The sender must economize in constructing the message and the receiver must be ready to expand the message (Ishii, 1984). The sensitivity expressed in the term *enryo-sasshi* enables the indirect messages of subdued and dense colors to be understood as richness and meaningful ambiguity.

Perceived density, revealed in the colors favored in Japan, is a critical attribute of color.

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