

A Study on the Visual Presentation of Smells Based on the Proust Effect

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Abstract

This paper focuses on the visual presentation of smells under the Proust Effect, delving into the intrinsic connections between smell, memory, emotion, and culture, as well as their innovative practices and development trends in the field of design. By exploring the symbolic meanings of smells in literary works, it provides metaphorical resources for visual design and explains the cross-sensory design basis of smell visualization through the principles of neuroaesthetics. From the perspectives of semiotics and narratology, it discusses the metaphorical transformation of smell visualization and the ways to evoke resonance. The paper also analyzes the role of technological development in promoting smell visualization. The study shows that smell visualization expands the boundaries of graphic design but faces challenges such as technological precision and cultural differences. In the future, interdisciplinary cooperation will help its development, becoming an important bridge connecting senses, emotions, and culture.

Keywords: Proust Effect, smell visualization, neuroaesthetics, semiotics, interdisciplinary

1. Introduction: The Interweaving of Olfaction and Vision — Poetic Origins and New Design Explorations of Smell Visualization

In the diverse human perceptual system, smell, with its unique intangible characteristics, traverses the hidden corners of memory and emotion, becoming a mysterious bond connecting the past and the present, individuals and collectives. Proust, in *In Search of Lost Time*, awakened his long-dormant childhood memories through the smell of a Madeleine cake, revealing the profound and subtle connection between smell and memory. This phenomenon has been called the “Proust Effect” (Proust, 1913-1927). This effect has not only inspired in-depth exploration of the neural mechanisms of memory and emotion in neuroscience but also opened up a new creative horizon in the fields of art and design, making smell visualization a fascinating and promising research direction.

In the realm of graphic design, smell visualization is a bold attempt to transcend sensory boundaries, aiming to transform the elusive olfactory experience into an intuitive and perceptible visual language to construct a unique aesthetic narrative. It is not merely a simple translation of sensory experiences but a deep exploration of memory, precise evocation of emotions, and vivid interpretation of cultural connotations. By skillfully employing visual elements such as color, shape, and texture, abstract smells are concretized into meaningful symbols, thereby evoking strong emotional resonance in the viewer’s heart.

From the poetic expression of literature, the innovative practice of art to the application exploration of design, smell visualization holds rich possibilities. In-depth exploration of this field is of great significance for expanding the boundaries of graphic design and promoting the development of interdisciplinary research. Next, this paper will analyze the internal logic, forms of expression, and future directions of smell visualization from multiple dimensions, providing new ideas and references for research and practice in this field.

2. Memory of Smell: Insights from Proust to Neuroaesthetics

The close connection between smell and memory revealed by the Proust Effect lays an important foundation for smell visualization. It is precisely because of the unique power of smell to evoke memories that transforming it into a visual language becomes extraordinarily meaningful.

2.1 *The Poetics of Smell: The Gateway of Memory Through Time and Space*

The Proust Effect fully demonstrates the unique power of smell as a carrier of memory. Smell is not a mere physical stimulus; it is more like a container bearing time and emotion, storing precious memories from an individual's growth process and the profound cultural heritage passed down through generations. In literary creation, smell is often endowed with rich symbolic meanings, becoming a powerful tool for writers to convey emotions, create atmospheres, and deepen themes.

Baudelaire, in *The Flowers of Evil*, uses the "stench of decay" to metaphorically represent the corruption of modern civilization (Baudelaire, 1857), making readers almost able to truly smell the decaying air of that era and profoundly experience the distortion and struggle of human nature in the face of material desires. In *Snow Country*, Kawabata Yasunari uses the "crisp scent of snow" to create an ethereal, lonely, and pure atmosphere (Kawabata, 1935-1948), delicately conveying the characters' deep longing for beauty and purity and their helplessness and loneliness in the face of reality. These descriptions of smell in literary works provide rich metaphorical material for graphic design.

In real life, the connection between smell, emotion, and cultural memory is also very close. For example, the aroma of cured meat that fills homes during the Spring Festival is, for many Chinese people, the strong flavor of the New Year, carrying the emotions of family reunion and happiness, and behind it is the Spring Festival culture that has been passed down for thousands of years. Overseas wanderers, when they smell the mixture of the scent of the homeland's soil, grass, and crops, will involuntarily evoke deep longing for their hometown's mountains and rivers, relatives, and friends, and this smell becomes a symbol of their cultural identity and emotional attachment to their homeland.

From a design perspective, the visualization of smell is a poetic reconstruction of memory. Designers can use the principles of color psychology to choose warm colors such as orange-red, combined with smooth curves, to represent the warm and festive smell in childhood memories, evoking people's deep-seated beautiful memories. Using the principles of constructivism, they can present the smell of industrial waste in urban areas through sharp geometric shapes and cool colors, prompting people to reflect on modern social development.

Moreover, narrative design techniques provide an effective way to build scenes of smell memories. According to the theory of narratology, designers can arrange a series of coherent images according to the process of the smell's generation, development, change, and dissipation, guiding viewers to associate their own related memory fragments in the visual flow. For example, a series of illustrations can depict the process of walking on an ancient town street, smelling the aroma of baking bread from a distance, gradually approaching the bakery where the smell becomes stronger, and finally leaving with the smell gradually dissipating. This allows viewers to immerse themselves in a specific memory atmosphere, enhancing visual Infectivity and deepening emotional experience.

2.2 *Insights from Neuroaesthetics: The Sensory Symphony of Smell*

The ability of smell to evoke memories and create emotional resonance has a basis in neuroscience. From the scientific perspective of neuroaesthetics, the visualization of smell is an artistic feast that transcends multiple senses. Research shows that smell is closely connected to the limbic system of the brain through the olfactory cortex (Zelano et al., 2016). This special neural connection allows smell to directly trigger the switch of emotion and memory, creating a strong resonance. This neural mechanism provides designers with a solid scientific basis to guide them in their creative process, ensuring that visual symbols are highly compatible with the emotional attributes contained in the smell, thereby achieving a synergistic effect between different senses.

Take common smells as examples. The scent of lavender is usually closely related to feelings of tranquility and relaxation. Based on color theory, low-saturation purple often conveys a sense of stability and calmness; spiral textures visually give a feeling of smoothness and fluidity, similar to the relaxing experience brought by the scent of lavender. Therefore, in the visual design of lavender scent, combining low-saturation purple with spiral textures can vividly simulate its soothing characteristics. For example, the scent of citrus fruits is full of vitality and freshness. Bright yellow, which represents energy and sunshine in color emotional expression, combined with dynamic geometric shapes such as rotating circles or jumping triangles, can perfectly showcase the lively characteristics of citrus scents.



Figure 1. Lavender Visualization Design

Sources: Drawn by the author.



Figure 2. Citrus Visualization Design

Sources: Drawn by the author.

In addition, multisensory collaborative design can further enhance sensory immersion. According to Gestalt psychology theory, the human perceptual system tends to integrate various sensory information into a unified whole. Designers can fully utilize this principle to cleverly combine visual symbols of smell with other sensory elements such as sound and touch. For example, in designing a forest-themed smell visualization work, the visual presentation of lush trees and dappled light, combined with the gentle chirping of birds and the rustling of leaves in the wind, and the choice of rough-textured paper to simulate the feel of tree bark, allows viewers to experience the atmosphere of the forest from multiple sensory dimensions, enriching the visual language and providing them with a more profound, real, and immersive sensory experience.

3. Visualization of Smell: Artistic Transformation from Symbols to Narratives

The memory characteristics of smell provide rich materials and emotional basis for its visualization, while neuroaesthetics offers scientific guidance for this transformation. Next, we will further explore the specific manifestations of smell visualization in terms of symbols and narratives.

3.1 Semiotics of Smell: Metaphors from Sensory to Visual

In the professional context of design, the visualization of smell is a complex and exquisite process of symbolic transformation. Designers use basic visual elements such as color, shape, and texture to construct visual metaphors that represent various smells. From the theoretical framework of semiotics, these visual symbols are not only intuitive representations of olfactory sensory experiences but also carriers of specific cultural connotations, bearing rich cultural meanings (Roland Barthes, 1964).

Different cultural backgrounds endow the same smell with completely different symbolic meanings, which brings diverse and rich possibilities for the design of smell visualization. In Eastern culture, sandalwood is closely related to religious ceremonies, symbolizing sanctity, solemnity, and tranquility. When designing the visualization of sandalwood smell, designers often choose gold, which represents nobility and sanctity in Eastern culture, combined with the mandala pattern. The mandala, in Buddhist culture, signifies completeness, harmony, and the order of the universe, and the combination of the two can accurately convey the sacred and tranquil atmosphere contained in sandalwood. In Western culture, the scent of roses is a symbol of love and romance. Designers usually use red, which represents passion and love, combined with soft and winding curves, to showcase the romantic characteristics of rose scent. For example, in Valentine's Day-related designs, patterns composed of red rose petals and curved elements are often seen to strengthen the connection between rose scent and romantic emotions.

In addition, by interpreting visual symbols in multiple ways, the richer connotations of smell can be explored. Designers can use abstract shapes and complex textures to express the layers and variability of smell. For example, using irregular geometric shapes intertwined with gradient colors to show the changes of the top, middle, and base notes of a complex perfume allows viewers to explore the rich sensory experiences behind the smell while interpreting these symbols, enhancing their aesthetic level.

In the field of brand design, the visualization of smell has become an important bridge for brands to establish emotional connections with consumers. The perfume brand Diptyque has successfully transformed its classic scents into story-filled visual scenes through hand-drawn illustrations and vintage tones, evoking consumers' identification with the brand's history and culture (Lux & Millot, 2022). When consumers appreciate these visual designs, they seem to be able to smell the unique fragrance through the pictures, and then associate it with the

lifestyle and values conveyed by the brand, enhancing their loyalty and emotional dependence on the brand. For example, Diptyque collaborated with Chinese calligraphy artist Hei Ao to release a limited-edition paper eau de toilette for the New Year (as shown in Figure 3). Using paper and ink as media, the free brushstrokes write the New Year, integrating vision, touch, and smell into a three-dimensional landscape. The character “paper” is strong and wild, presented on the limited packaging design of the paper eau de toilette. The packaging is based on red, decorated with gold foil, echoing the use of paper in traditional Chinese New Year rituals. The bright and pleasant mimosa scent complements the soft smell of paper, and the addition of musk depicts the delicacy and subtlety of ink touching paper. The different postures of ink spreading on paper are like the changing performances of paper eau de toilette on different skin and over time, painting a thousand-person thousand-face personality portrait.



Figure 3. Diptyque Paper Eau de Toilette

Source: <https://post.smzdm.com/talk/p/aeqgx0wz/>

3.2 Narrativity of Smell: From Individual Memory to Collective Resonance

The visualization of smell not only conveys information through symbols but also evokes emotional resonance through narratives. Designers can build a bridge of communication between individual and collective memories through carefully designed visual symbols, allowing people to find emotional resonance points in shared smell memories.

The “Olfactory Memory Bank” project by the University of the Arts London is an exemplary innovative practice in this regard. The project scans individuals’ brain activities to transform each person’s unique smell memory into customized visual symbols. For example, a participant’s memory of the cinnamon scent in their grandmother’s kitchen was transformed into interwoven orange curves and gray grids, forming a unique “smell portrait” (Dade-Robertson, 2024). This personalized visual storytelling approach respects the uniqueness of individual memories, allowing each person to find their own emotional attachment in the visual symbols and also opens up new creative ideas for the design field.

In brand design, the narrativity of smell visualization also has great value. Brands can tell stories related to smell, integrating the brand’s history, culture, and values into them, enabling consumers to deeply connect emotionally with the brand. The Diptyque brand precisely tells the stories behind its classic scents through story-rich hand-drawn illustrations and vintage tones, allowing consumers to deeply understand the brand’s connotations while experiencing the fragrance, thereby enhancing their sense of identification and belonging to the brand.

In addition, constructing memory scenes through narrative design techniques can further enhance the effect of smell visualization. Designers can present a series of continuous images according to a certain narrative logic, showing the process of smelling from the initial perception to dissipation, guiding viewers to associate specific memories related to it. For example, in a series of illustrations depicting a beach vacation, the first picture shows waves hitting the beach, and the sea breeze carries a faint smell of seawater, with blue and white as the main colors and relatively simple lines. In the second picture, the protagonist walks into a beach snack stall, and the smell of grilled fish spreads, with the addition of orange flames and food patterns in the picture, and the colors become richer. In the last picture, the protagonist leaves the snack stall, and the smell gradually dissipates, with the picture’s colors becoming more subdued and the lines becoming smoother. This narrative design allows viewers to feel as if they have personally experienced the beach vacation, and their memories of the related smells are more profound.

The symbolization and narrativity of smell design make smell visualization more vivid and meaningful. With the development of technology, smell visualization has also ushered in new changes.

4. The Future of Smell: Cross-Boundary Exploration from Art to Technology

Driven by modern technology, smell visualization continues to break through tradition, presenting more diverse forms and bringing new sensory experiences to people.

4.1 Artistry of Smell: Dynamic Visual Expression from Static to Dynamic

With the rapid development of technology, the visual presentation of smell has undergone a significant transformation from static to dynamic. Dynamic design, with its unique advantages, can more vividly simulate the diffusion and change of smell, providing viewers with a stronger sensory immersion and elevating the artistic expression of smell visualization to a new level.

The “Shylight” installation by Dutch Studio Drift is an outstanding representative in this field (as shown in Figure 4). The installation uses the folding movement of mechanical silk to accurately simulate the fleeting nature of the night-blooming cereus scent (Van Herpen, 2019). In this work, the dynamic changes of silk are not only a visual representation of the physical characteristics of the night-blooming cereus scent but also contain philosophical reflections on the brevity and beauty of time and life. It breaks through the limitations of traditional static design, allowing viewers to more profoundly feel the subtle connections between smell, time, and life in the dynamic visual experience.



Figure 4. Shylight device

Source: <https://zhuanlan.zhihu.com/p/27513316>

In the field of graphic design, dynamic graphics provide rich possibilities for expressing the layers and temporality of smell. Designers use animation principles, through color gradients, flowing lines, and shape transformations, to vividly and graphically show the process of perfume changing from the top note to the base note.

In addition, dynamic interactive design offers viewers unprecedented opportunities to participate in the experience of smell visualization. Designers use sensors to capture viewers' behaviors, such as movements, positions, and expressions, and adjust the changes in visual patterns in real time. This interactive design reflects the user-centered design philosophy, emphasizing the interactivity between users and design works. Viewers can more actively participate in the experience of smell visualization, enhancing sensory immersion while obtaining more personalized and unique experiences, and establishing a closer and deeper connection between the design work and the viewers.

4.2 Technological Nature of Smell: Sensory Integration from Virtual to Reality

Continuous technological advancements have brought many innovative opportunities to smell visualization, especially the rise of augmented reality (AR) and virtual reality (VR) technologies, making it possible to combine visual symbols of smell with virtual environments and creating richer and more diverse multidimensional sensory experiences for people. The Japanese team “Scantee Machina” has achieved a clever integration of visual symbols of smell with virtual scenes through AR technology. Users simply need to scan specific visual patterns with their smartphones to trigger the release of virtual smells (Nakamoto & Ota, 2023). For example, in an AR tour application for a historical and cultural site, when users scan the site's buildings, their smartphone screens not only display virtual information about the buildings' historical changes and internal structures but also release smells related to the buildings at the same time, such as the aroma of old wood or the scent of spices from a particular period, allowing users to feel as if they have traveled through time and are immersed in the atmosphere of history. This technology breaks the boundaries between reality and virtuality, greatly enriching users' sensory experiences and bringing new development ideas to fields such as cultural tourism and education.

Blockchain technology has also been applied in the field of smell visualization, providing strong support for the standardization and copyright protection of smells. The digital smell database jointly built by Smell Kingdom and Hangzhou Internet Notary Office generates a unique hash value for each digital smell, ensuring the

copyright of creators. The application of this technology not only promotes the standardization process of smell visualization, allowing different creators' works to be managed and traded under unified norms, but also lays a solid foundation for its commercial application.

Smell visualization can also create unprecedented sensory experiences through the cross-border integration of multiple technologies. As a cutting-edge technology, brain-computer interface technology brings new possibilities to smell visualization. Designers can use brain-computer interface devices to capture viewers' EEG signals, analyze their emotional and attention states, and adjust the changes in visual patterns in real time.

5. Conclusion: Outlook and Challenges of Smell Visualization

In summary, inspired by the Proust Effect, smell visualization has integrated the power of literature, art, design, and technology to achieve a leap from theoretical basis to practical application. From the exploration of smell memories to the scientific guidance of neuroaesthetics; from metaphorical expression through symbols to emotional resonance through narratives; and to the innovative changes achieved with the help of modern technology, smell visualization continues to expand its boundaries.

In the future, smell visualization has a broad development prospect. In artistic creation, it will promote the innovation of artistic forms and create more works that integrate multiple sensory experiences, enriching people's aesthetic experiences. In the commercial field, it can enhance the emotional connection between brands and consumers and improve the competitiveness of products. In cultural dissemination, it helps people better understand and inherit smell memories from different cultures.

However, the development of smell visualization also faces some challenges at present. In terms of technology, the precise simulation of smell and its perfect matching with visual effects still need to be improved, and the equipment costs are high and difficult to popularize. In terms of culture, there are significant differences in the perception and understanding of smell across different cultural backgrounds. How to overcome cultural barriers and ensure that smell visualization works are widely accepted is a problem that needs to be solved.

At the same time, it is also necessary to establish and improve relevant laws, regulations, and industry standards to regulate the creation, dissemination, and application of smell visualization works and protect the rights and interests of creators and consumers. Through the joint efforts of all parties, smell visualization is expected to become an important bridge connecting senses, emotions, and culture, opening a door for people to a new world of perception and promoting the continuous development of human perception and cultural cognition.

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