
An Initial Exploration of the Relationship Between Plant Biomimetic Forms in Public Art and Crowd Psychology

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To cite this article:

Qiao Qian, Yang Huiyu, Li Weijia, Pei Wen. An Initial Exploration of the Relationship Between Plant Biomimetic Forms in Public Art and Crowd Psychology. *Urban and Regional Planning*. Vol. 8, No. 2, 2023, pp. 26-30. doi: 10.11648/j.urp.20230802.12

Received: April 27, 2023; **Accepted:** May 30, 2023; **Published:** June 9, 2023

Abstract: Urban public space and crowd activity in urban public space is the precondition of public art design, and the crowd psychology is the factor that the public art design must consider. The plant bionic form of public art is a new art form that brings fresh blood to art design. It has the characteristics of interdisciplinary and interdisciplinary, it is also becoming more and more important to the urban public space. In the specific area of urban public space, public art works in the form of plant bionics have different effects on the psychology of the people in the space through different ways of influence and expression, to meet different needs. In order to redefine the relationship between public art of plant bionic form and crowd psychology from, this paper explores the relationship between public art of plant bionic form and crowd psychology from the way that public art of plant bionic form influences crowd psychology, using inductive, comparative and analytical methods. Based on existing bionic form of public art and extension, this paper ultimately concludes that there are three types of relationships between biomimicry public art and crowd psychology: Service-Oriented Relationship, Guidance-Oriented Relationship, and Collaborative-Oriented Relationship, and elaborates on the significance and value of bionic form of public art on crowd psychology, in order to provide more guidance for the future development of biomimicry public art.

Keywords: Plant Biomimetic Design, Public Art, Urban Public Space, Crowd Psychology, Plant Morphology

1. Introduction

Urban public space and crowd activity in urban public space is the precondition of public art design, and the crowd psychology is the factor that the public art design must consider. Plant biomimicry as a new form of art has entered public art design, bringing a new breath of life to public art design works in urban public spaces. Excellent design works from both domestic and foreign sources are refreshing. Within a specific range of urban public spaces, plant biomimetic forms in public art works have different effects on crowd psychology through different ways of influence and expression, to meet different needs. At the same time, the analysis and definition of the relationship between public art in plant bionic form and crowd psychology can not only extract the current situation of public art in plant bionic form, but also start from the current situation, to provide more direction and guidance for the public art of plant bionic form, to promote the development and prosperity of the future, so as to propose the value and significance of public art works of

plant bionic form to the crowd psychology.

2. A Brief Summary of Public Art in the Form of Plant Biomimicry in Urban Public Spaces

2.1. Urban Public Spaces and the Activities of People Within Them

“Urban public space is an external space relative to indoor building structures [1]” and is an important part of urban construction. Urban public space generally includes parks, green areas, squares, etc., characterized by “diversity of functions, openness of form, and sharing of relationships [2]”. It has a public service function that satisfies the public space activities such as communication, leisure, and travel for urban residents [3], and is an important venue for public activities in the city. “It can not only provide convenience for the basic material life of urban residents but also provide a certain

guarantee for their spiritual and cultural needs [4]."

The activities of people within urban public spaces are mainly divided into three types: necessary activities, spontaneous activities, and social activities [5]. Necessary activities are closely related to the daily lives of urban people and are less affected by the environment. Spontaneous activities are related to the subjective wishes of urban people, are selective, and are easily influenced by environmental conditions. Social activities are activities generated by groups with the participation of others. Most of the public activities within urban public spaces belong to spontaneous activities.

2.2. Plant Biomimicry Design and Plant Biomimicry Public Art

Plant biomimicry design, which emerged with the birth of bionics, is a design method that takes plants as the mimicking object and simulates their characteristics in terms of morphology, structure, function, internal cells, and texture to create works that meet people's functional and aesthetic needs. Its feature lies in adhering to the concepts of "people-oriented" and "harmonious symbiosis," returning to nature, and possessing natural beauty, enhancing the artistic, ecological, and sustainable attributes of design works, and increasing people's environmental awareness [6].

Plant biomimetic public art is a design form that uses the method of mimicking plant characteristics in public spaces such as city squares for artistic creation. This design form makes plants, which represent nature, a link between the public, public environments, and public art works, thereby making the relationship between people and nature closer. Its characteristic lies in its ecological properties. By closely resembling the appearance of plants, combined with the functions of the plants being mimicked, it returns to nature visually while also emphasizing ecology, creating a pleasant atmosphere, and providing services and convenience for the public.

3. The Ways in Which Biomimetic Forms of Public Art Influence the Psychology of the Crowd

3.1. Visual Approaches

The visual approaches through which biomimetic forms of public art based on plant biology impact the psychology of the crowd mainly include color and form. Color is the first visual characteristic and refers to the image produced by light acting on an object. "Different plant species present different colors, and the same plant develops different colors depending on the stage of growth [7]." With the continuous development of color theory, the analysis of plant colors has also begun. There are certain rules and systems regarding the selection and application of colors in biomimetic public art based on plants.

"Green is the most common color associated with plants in public perception, and it is also considered the most calming color by psychologists, making people feel relaxed and easing

fatigue; white can also make people feel calm and comfortable; red, orange, and champagne can stimulate feelings of tension, fatigue, and joy [8]." Among all the characteristics of plants, vision directly influences people's senses, thereby affecting their physiological and psychological states [9]. Therefore, biomimetic forms of public art based on plants can evoke different associations, emotions, and psychological effects through the use and combination of different colors, leading to the desired function and effect.

The expressed form of biomimetic public art based on plants can also affect the psychology of the crowd. For example, the common leaf shapes of plants differ, so different processing methods for different works and environments can have different effects on the psychology of the crowd. The simplified leaf shape combined with the effect of blowing leaves can create a lively and agile feeling, thereby evoking the emotions of happiness and freedom among the crowd. The curves of most plant flowers are used to create softness and make people feel comfortable and relaxed. "The vertical and winding shapes of plant roots represent different symbols. Vertical shapes symbolize vigorous vitality and can make people feel positive and upward. The winding shape represents connection and dependency, making people feel emotions of support and care [10]."

3.2. Material Approaches

There is a wide range of materials and techniques that can be used for biomimetic forms of public art based on plants. Artists often make different choices based on their concept, subject matter, connotation, artistic needs, etc., which can result in different effects on the psychology of the crowd [11].



Figure 1. "Greenough Barrier" a.

The expression of material in public art is closely related to human perception. People have inherent cognition of the characteristics of materials, and artists choose different materials based on this inherent cognition, their intended expression, and the object of biomimetic simulation. Through stimulating the human perceptual system, artists can awaken people's emotions and affect the psychology of the crowd. The "Greenough Barrier" designed and produced by the Australian LUMP sculpture studio is a form of weather-resistant steel

plate that has corroded after being exposed to wind and sun, forming a vein-like shape. The special color, texture, and quality created by the cracked steel plate can give people a sense of the passage of time and a feeling of melancholy, even a sense of historical tragedy, prompting deeper reflection.



Figure 2. "Greenough Barrier" b.

3.3. Environmental Approaches

Urban public spaces have different characteristics due to differences in function, location, and other aspects. Biomimetic forms of public art based on plants adapt to these differences in urban public spaces by matching the theme, connotation, and artistic techniques to the characteristics of the specific space. This creates a harmonious effect with the environment and enables people in the surrounding area to resonate with the artwork, thereby affecting the psychology of the crowd [12].

Biomimetic forms of public art based on plants affect the psychology of the crowd in urban public spaces through the environmental factors of geographical and cultural environments. The geographical environment refers to the geographical features of the city space, including water, plants, climate, architecture, space structure, and other factors [13]. The cultural environment is related to the cultural connotation and historical factors of the urban area.

Since the form of biomimetic public art based on plants is based on plants and natural objects, it fits better into urban public spaces dominated by natural elements and can resonate with the emotions of the public. In contrast, in urban public spaces dominated by non-natural elements, artists might use materials and expression techniques that more closely match the local environment to convey the information that affects people's psychology.

Each city has its own history, cultural background, and folk customs. In this context, incorporating local cultural characteristics into biomimetic forms of public art based on plants can awaken the cultural memory of local people. When appreciating the artwork, people can also resonate with the cultural connotation, resulting in psychological changes [14].

4. The Relationship Between the Form of Public Art Inspired by Plant Biomimicry and Crowd Psychology

4.1. Service-Oriented Relationship

The essence of a service-oriented relationship lies in serving others. In the context of public art inspired by plant biomimicry, it mainly refers to how the artwork considers the psychological states and behavioral patterns of the crowd within the environment, and serves the public and their psychological needs through its function, form, color, etc.

Many existing works of public art inspired by plant biomimicry are in a service-oriented relationship with the crowd's psychology. Most of these artworks mimic the shape of plants through materials or techniques to achieve a satisfactory visual effect, which influences people's psychology from a visual perspective and fulfills the need to serve their visual requirements. For example, the outdoor public art installation "Big Flower" by German artist Isa Genzken adopts a realistic style and fully displays the shape of the flower. It stands tall and slim on the square, achieving excellent visual effects while not occupying too much space. When people look up to admire it, it also maintains a certain distance, meeting not only their viewing needs, but also their psychological needs for distance and atmosphere.



Figure 3. "Big Flower" by Isa Genzken.

In addition to fulfilling visual needs, some public artworks inspired by plant biomimicry in a service-oriented relationship also serve functional needs while satisfying the psychological needs of the crowd.

The street installation "Shadow Play" transforms triangular areas in traffic into public spaces, improving the lives of pedestrians and the streetscape of Roosevelt Row. This artwork mimics the shape of plants through geometric

modules and uses steel plate materials to create thin but structurally rigid units. By clustering individual modules together, an angular, open-tree canopy structure is formed, which filters strong sunlight and creates shade. Due to the special structure and material of the tree canopy, the geometric shape could maximize the formation of shade while also causing slight wind movement and air circulation, creating a microclimate.

Since the installation is located in a desert area with strong sunlight, it uses metallic materials and cool silver-white tones. The geometric installation and ground elements visually separate from the natural land and trees outside, reducing the heat and irritation caused by exposure while calming the emotions of the crowd, thus truly serving the physiological and psychological needs of people in the current urban public space.

In a service-oriented relationship, humans are the recipients of service and are passive. The psychological needs of people are being taken care of, while public art inspired by plant biomimicry not only creates a suitable environment for people through form and function, but also satisfies emotional needs [15].



Figure 4. "Shadow Play" by Roosevelt Row.



Figure 5. "Shadow Play" by Roosevelt Row.

4.2. Guidance-Oriented Relationship

A guidance-oriented relationship refers to how public art inspired by plant biomimicry guides the direction of urban public environment planning, while also guiding the crowd to

engage in interactive behaviors, change their activities, and transform their psychological states.

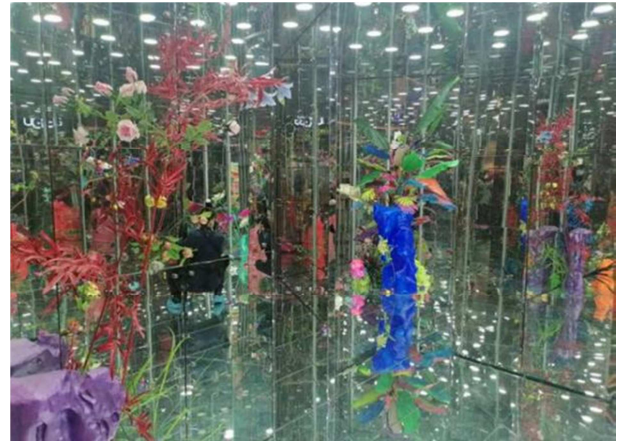


Figure 6. Main installation of "Noah's Garden 2021".

In a guidance-oriented relationship, people become the protagonists, and their behavior and psychology become a part of the content. The focus is on meeting people's needs and how to guide the public to interact. In K11 Select in Wuhan, a public art project themed "Nature and Self, Plants and the City, Ecology and Geopolitics" was held, with Deng Guoyuan's public art installation "Noah's Garden" as the core. The project involved several artists and used multiple combinations of images and installations to guide the audience's interactions, allowing viewers to seek and explore in reality and illusion and feel the beauty of nature through meditation. This project encouraged people to rethink the relationship between urbanization and self-survival, and to reach an ideal world and spiritual garden through the mirror of nature and the self.

4.3. Collaborative-Oriented Relationship

A collaborative-oriented relationship refers to how the crowd is more willing to participate in the construction of public art and express their feelings and ideas in the process of completing public art works.

In this process, some social problems can be solved, and some people can even gain a certain social status. In a collaborative-oriented relationship, public art inspired by plant biomimicry is often combined with regional culture and rejuvenated, allowing the environment to have new changes. It satisfies people's higher-level psychological needs while endowing the environment and art with higher cultural connotations, allowing public art works to radiate new vitality.

The collaborative-oriented relationship is more like an ideal state. Although it is currently limited by geography, technology, public aesthetic standards, etc., there are almost no public art works inspired by plant biomimicry that can achieve a collaborative-oriented relationship. However, some artists are researching art works that can reach a collaborative-oriented relationship with crowd psychology and even exploring other forms of relationships. These efforts can bring new vitality and new development to public art inspired by plant biomimicry.

5. The Value and Significance of Plant Bionic Public Art Works to Crowd Psychology

In today's society, material civilization has developed far more than spiritual civilization. People's material needs are guaranteed, and their spiritual needs have steadily increased. Public art works using plant-inspired biomimicry forms can strengthen the connection between humans and nature, convey information to the human perceptual system through their unique artistic form, and trigger emotional and psychological changes, thus satisfying specific spiritual needs of people.

Plants have long existed in the natural environment, and are closely related to humans. People can feel relaxed and comfortable in the natural environment. Through public art works using plant-inspired biomimicry forms, the affinity of the natural environment for humans can be magnified, thereby relaxing and adjusting one's psychological state, and achieving psychological pleasure and stability. The expression techniques, materials, and color choices of public art works using plant-inspired biomimicry forms are very diverse, and the themes and connotations are also influenced by the needs of different cities and spaces. Therefore, it can produce rich artistic effects in artistic expression, thus satisfying and affecting people's aesthetic appreciation in various aspects.

Furthermore, through the appreciation and understanding of public art works using plant-inspired biomimicry forms, people's sense of nature can be enhanced, making people more psychologically close to nature, enhancing their concept of respecting, caring for, and awe-inspiring nature, and having the significance of propaganda and education.

6. Conclusion

The creation of public art forms inspired by biomimicry of plants is still in a vigorous developmental phase. While the imitated objects and expressive techniques have become more stable, many more innovative designs continue to emerge. These may involve emerging technological methods, novel materials, or considerations of new psychological needs among audiences. In the future, public art forms inspired by biomimicry of plants will take a more humane approach by fully considering the characteristics and needs of the public. Through more interactive guidance, people will be able to participate more in the creation of public art, thus imbuing these works with even deeper meaning.

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