Study on the Characteristics and the Causes of Urban Color Evolution Based on New Contextualism

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Abstract: As the urban renewal enters a new round of peak period, the problems of urban color fragmentation and collage become more and more serious. This paper used the urban color contextualism to investigate the color of Shenzhen Nantou Ancient City, conducted inductive analysis of survey sample data, and interpreted the evolution characteristics and causes of the traditional architecture and modern architecture colors, providing a reference for creating a distinctive urban color style and thus promoting the organic renewal of urban colors.

1. Introduction
Urban color is of great significance for the continuation of the historical context of the city. First, color is the basic visual stimuli that influences people's perception of urban context (Embrechts JJ, 1988), which is important for spatial perception of urban artificial environments (Tosca TF, 2002). In the process of urban accumulation, color carries regional memories, aesthetic value, society, history, and human logic. At the same time, the architectural color is diachronic, not only rooting in the historical base of the past tense but also extending to the urban space of the present tense, as the city epitome of the past tense and the present tense. With the emergence of globalization, unification has continuously replaced diversification, and urban color can better preserve the identification characteristics of the local environment, enhance the value of historical and cultural heritage, and condense the sense of national collective identity (Collette JP, 2006). Therefore, urban color is an important part of the urban characteristics and features, and interpretation of the characteristics and causes of urban color evolution is an important link to create characteristic urban color features.

2. Interpretation of urban color contextualism
2.1 Concept of urban color contextualism
“Color contextualism” was first proposed by the famous domestic color expert Yu Ximan, including the color of the geographical environment and the human environment, especially referring to the color of the soil and the landscape, as a research method in city planning to investigate the color genes in the natural, social, and historical contexts. Dr. Wang Wei from Southeast University further developed the meaning of “color contextualism” and summarized it as the sum of the color expressions and logical relationships of the elements in the existing urban environment. It should be the background and starting point of urban color planning (2011). Through induction and integration, He innovated the urban color research results, combined with new contextualism, ecological genetics, self-organization and other theories, and regarded “color contextualism” as a dynamic and developing life-like body...
with metabolic functions, which was an open and complex system with hidden powerful force. Thus, the concept of “color contextualism” with epoch-making significance was proposed: It included not only the color genes, color expression and color logic relationship of the existing geographical environment and human environment, but also a system with connotation, life, inheritance and development which was formed on the basis of the vertical axis of time and the horizontal axis of space. The urban color contextualism that blends in more organic, systematic and factors, have a newer connotation and deeper extension than the previous meanings, with diachronic, holistic, dynamic, spontaneous and cultural attributes, and interprets the inner structure and evolution mechanism of urban color from a new perspective. Urban color contextualism is the core strength of urban color, containing the inner evolution mechanism of urban color, and subtly influencing the development trend of urban color.

2.2 Tissue of urban color contextualism
Firstly, by introducing the concept of "gene" in biology, the urban color contextualism system was simulated and analysed. The urban color genes were divided into three types of traditional color genes, modern color genes and heterogeneous color genes, in favour of analysing the internal organization evolution process of urban color contextualism; Secondly, the urban color genes in the urban color organization, underwent the continuous replacement, reconstruction, miscellaneous, juxtaposition and co-constructed urban color contextualism organization. By the concepts of dominant gene and recessive gene, the urban color contextualism tissue was divided into two parts of dominant factor expression and recessive factor expression, in which the natural geographical environment is dominant, including climate, hydrology, vegetation, etc. The recessive expression includes social culture, collective consciousness behaviors, color aesthetic psychology, folk custom life, and color selection concepts, etc.

2.3 Influence factors of urban color contextualism
The factors that influenced the evolution of urban color contextualism mainly included natural environment, social environment, process technology and ideology. The region, climate, soil, hydrology, vegetation, and landform of the natural environment were all dominant factors which were visible and visually perceptible. Although the natural environment did not determine the final urban color configuration, it was the base color that determined the color of the city; Traditional culture, national cohesion, religious beliefs, political systems, and social collective ideology invisibly existed in the social environment, imperceptibly affecting the urban color. In addition, with the continuous development of society, the productivity technology was gradually improved, with constant influx of emerging materials, and the diversification of building materials was of great significance to the evolution of urban color contextualism.

![Fig. 1 Slicing model of urban color contextualism, drawn by the author](image-url)
3. Example of Shenzhen Nantou Ancient City

3.1 Current situation of the ancient city color
Shenzhen Nantou Ancient City is located in Shekou peninsula, north of Yangtai mountain, west to the Pearl River estuary, south to the Lingdingyang bay, with good natural environment. In the sixth year of the Eastern Jin dynasty (331 years), Dongguan County and Bao'an County were established. In the Hongwu year (1984) of the Ming dynasty, “Dongguan defending Qianhu city” was built up, also as the local military institution at that time. Since then, the town had been gradually formed. During the Wanli Period of the Ming Dynasty (1573), “Xin’an County” was set up and became the local administrative centre (Shu Maoguan, Wang Chongxi), which is the historical origin of Shenzhen city. In addition, Nantou Ancient City is also a historic urban village in Nanshan District. It was once a low-income community and a settlement for new immigrants in Shenzhen, forming a highly mixed state of foreign tenants living and small businesses. According to the statutory plan of Shenzhen City, the development orientation of Nantou Ancient City was an important historical and cultural protection area in the Nanshan District. First, in accordance with the main operational steps of the color study by the French chromatist Jean-Philippe lenclos (Zhao Chunshui), the Chinese architectural color card based on the "China Color System" (GB/T15608-2006) was used as the basic tool to record and analyze the color data. The research object was mainly focused on the building facade color in the ancient city area for classified researches. Depending on the time dimension, it was mainly divided into historical protection buildings and modern buildings, and from the functional perspective, it was divided into residential type, public type and industrial type. At present, the existing traditional architectural styles in the ancient city are composed of historically protected buildings and antique buildings, including: the City Gate, Dongguan Guild Hall, Wentianxiang Temple, Guandi Temple, Nantou Infant Care Tang, Pailou, Xianyu, Xin’an Prison, Coastal Defence agency, Opium Museum, Juxiu Building, etc. Secondly, the architectural color samples were tested and extracted along Zhongshan South-north Street and East-west Street of the Nantou Ancient City, regarding the historical protection buildings and modern typical buildings as key color measurement objects. In order to avoid the interference of the daylight color temperature on the test color of the building, a cloudy or sunny day with good visibility was chosen. The tests were conducted at 9:00-11:00 am and 13:00-15:00 pm, visually comparing the "Chinese Architectural Color Card National Standards". In a building facade without direct sunlight and shadow, the color of building main body, auxiliary color, building materials, age information, building stories, color code, and so on, were photographed, measured, drawn, and recorded. For the protected historical buildings, it was necessary to combine the literature materials to supplement the color information of different historical periods, and to combine the questionnaires on Nantou Ancient City color to interview and comb the historical evolution context of the Nantou Ancient City color.

According to the surveyed sample data, the current situation of Nantou Ancient City color was analysed. First of all, from a macroscopic point of view, in the color space distribution map of Nantou Ancient City (Fig. 2), the gray tone of the traditional brick shows scattered and fragmented distribution in the city and is surrounded by the high-value and high-purity warm yellow, reddish-brown, and orange-red of the surrounding modern buildings, forming abrupt color collages. The color features of traditional architectures have also been severely eroded and islanded; Secondly, the color features of
partial buildings around south and east city gate present a certain continuity under the planning protection, with more gray and white bricks. The hue is relatively stable, with relatively low purity. In the north and east of the ancient city, due to the existence of many industrial buildings, there are many color-noise buildings. The urban color relationship and color pattern are lack of organizational structure and order and clear tone orientation, resulting in difficulty of highlighting the color features of the ancient city characteristics.

3.2 Influence factors of Nantou Ancient City color evolution

The urban color contextualism was used to interpret the color evolution of Nantou Ancient City, and through the dominant genes and recessive genes, the evolution of the color of Nantou Ancient City was analyzed. First of all, the ancient city was east to Shenzhen Bay, and there were many ports and islands in the surrounding area. Among the perceptible dominant factors, the water system and vegetation affected the accumulation of the ancient city main color and the aesthetic concept of color selection and made the color of the ancient city tend to be gray; The soil was dominated by the camel granite weathered soil layer of middle and high Munsell values, supplemented by a colorless gray tone; Besides, due to the factors of climate, sunshine, and soil, the ancient city was warm in all seasons, conducive to plant growth. Therefore, there was no strong seasonal variation in vegetation color, and it was green and yellow green all year round, with a certain stability; Then the recessive genes of the ancient city color contextualism referred to cultural forms, political systems, process technology, economic factors, social activities, etc.

Cultural forms

Due to its special geographical location, foreign trade, multi-ethnic integration and population movement, Nantou Ancient City had accumulated Confucian culture, Guangfu culture, Hakka culture, fishermen culture and immigration culture, and constructed a diverse and inclusive north-south cultural form and generated different cultural spaces, which was an important factor affecting the diversified development of the color of Nantou Ancient City.

Political systems

Although the Nantou Ancient City was located in a remote area, thanks to the rise of the salt industry, the state administration had emerged during the Three Kingdoms period. During the Ming Dynasty, due to military factors such as maritime traffic, the defensive system construction of the ancient city was continuously strengthened, at that moment a large number of related administrative facilities, religions, rituals and other spaces were built. The administrative facilities were basically accomplished
in the Qing Dynasty. The reform and opening policy had also promoted foreign trade and economic
development, prompting major changes in the color styles and features of the ancient city.

Economic factors
Owe to the rise of the salt industry in the early period of Nantou Ancient City, the convenience of
shipping promoted frequent population movements and drove the development of industry and commerce and the financial industry. The reform and opening policy had further promoted the prosperity and development of the coastal economy and incorporated more modern urban color genes and western heterogeneous color genes, not only driving the modernization of the ancient city color, but also bringing great impact to the development of traditional urban colors.

Process technology
Process technology was an important factor that influenced the evolution of urban color contextual-
ism. Because of traditional building techniques and traditional local materials such as bricks, granite
stone, rammed earth and wood, and construction technology restrictions, the color of Nantou Ancient
City tended to be warm, camel-gray and brick-gray of natural materials. The integral color was more
uniform. With the continuous improvement of the technological level, bricks, coatings, metals, glass
and organic synthetic materials were gradually used in modern buildings. The color of the ancient city
was diversified step by step, reshaping the urban color characters and quality.

3.3 Characteristics and Causes of Nantou Ancient City color evolution
Due to the large number of urban village buildings in the ancient city currently, the buildings are
mainly residential type, more with repeated materials and color. Consequently, 12 sample data of each
representatively and typically traditional buildings and modern buildings were selected for compara-
tive analysis, coded by the age of the building (1-24). The basic attributes of color samples: hue (H),
value (V), and chroma (C) were classified, summarized, and collated (Fig. 3). Combined with litera-
ture, questionnaires, and interviews, the characteristics and causes of urban color evolution were inter-
preted.

During the Ming and Qing Dynasties, the color of the ancient city was in the accumulation period.
Because of the relatively stable political, administrative, military factors, and the restriction of con-
struction technology and construction materials, the living environment of the closed and traditional
urban color was formed. The main color of the architectural presented middle-high values and stable
fluctuation, keeping good continuity, and the main color purity of the building was also stable and
low-purity; From the end of the Qing Dynasty to modern times, the building auxiliary color was more
flexibly used, in a continuously jumping and fluctuation state of middle and high value, with the purity
of lower value. From the end of the Qing Dynasty to the beginning of the People's Republic of China,
due to the influence of the modernization of society, the value and purity of the architectural main col-
ors had great oscillation, showing a trend of high value and high purity. With the rapid development of
the urban economy, after the reform and opening, the color of the modern city in the ancient city had
qualitative changes, and the color organization of the city has mutated. In the late 1990s, with the
traceability and return of the traditional local culture by the society, the antique buildings continued to
rise in the ancient city, which made the color value and purity of the ancient city main color slightly
reduced and those of the auxiliary color fell back, forming a slight oscillation. With the continuous
strengthening of cultural factors and the implantation of emerging architectural color experiments, the
value and purity of urban color continued to increase. It could be seen that the color of Nantou ancient
city from the accumulation period, the fluctuation period, then the transition period and finally to the
adjustment period, the urban color value and purity were continuously improved, and the color tended
to be diversified modern color tones such as warm yellow, red-orange and pink-green from the tradi-
tional tones of single brick gray and camel gray. With the arrival of modernization and the continuous
improvement of productivity technology, the influence of natural environmental factors on urban color
had gradually decreased. Economic development, technological process and cultural heritage progress-
ively became the dominant factors affecting the color evolution of cities.
4. Conclusions
At present, the problem of urban color in China is becoming more and more serious, and the urban color current situation of fragmentation, collage and islanding seriously affects the quality of urban features. Therefore, with the utilization of the urban color contextualism, based on the inner color of the city, the exploration of the urban color evolution mechanism had become the core link to solve the urban color problem, which was conducive to improving the pertinence and effectiveness of urban color planning; The development predictability and perspectiveness of the urban color were enhanced to promote the organic renewal of urban color and create characteristic urban color features.

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Fig. 3 Color evolution of Shenzhen Nantou Ancient City, drawn by the author