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Analysis of the public art value of Huizhou three carvings from the perspectives of biomechanics and biology: Digitization, inheritance, and their impact on the development of museum city

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CITATION

Wang LM, Su L. Analysis of the public art value of Huizhou three carvings from the perspectives of biomechanics and biology: Digitization, inheritance, and their impact on the development of museum city. *Molecular & Cellular Biomechanics*. 2025; 22(2): 878. <https://doi.org/10.62617/mcb878>

ARTICLE INFO

Received: 23 November 2024
Accepted: 11 December 2024
Available online: 22 January 2025

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Abstract: This paper explores the three carvings in Huizhou from a novel perspective integrating cell molecular biomechanics. Taking the stone carving, wood carving, and pottery carving of the Ming Dynasty as examples, after gathering relevant literature via the network and classification, microscopic and scanning techniques were employed. The granite used in stone carving, at a cell molecular level, consists of silicate minerals with strong covalent bonds. These bonds endow the stone with hardness and resistance to deformation. The cells and molecules within the granite are arranged in a crystalline lattice, which dictates its mechanical properties. Mahogany in wood carving has cellulose and lignin molecules. The lignin provides rigidity and hydrophobicity, protecting the wood cells from moisture and external mechanical stresses. In pottery carving, the clay particles are sintered together during firing, creating a new molecular structure. The formation of a grease protective film and oxide on the brick carving is a result of molecular interactions at the surface. This layer can be seen as a self-assembled molecular barrier, similar to how cell membranes protect cells. The axisymmetric modeling and downward center of gravity influence the stress distribution at a molecular scale. A streamlined shape may reduce air or fluid resistance, minimizing mechanical forces acting on the carving's surface molecules. The delicate material with small particles implies a specific microstructure that affects its mechanical behavior. Understanding these cell molecular biomechanical aspects not only reveals the hidden scientific secrets of Huizhou carvings but also aids in their conservation and restoration. It enriches our comprehension of their durability and aesthetic qualities from a microscopic and molecular vantage point, further enhancing their cultural and digital significance in the context of the museum city's development.

Keywords: Huizhou three sculptures; public art value; digitization; museum city; cell molecular biomechanics; covalent bonds

1. Introduction

As the Ming Dynasty (1368–1644 AC) craft, the stone carving, wood carving and pottery carving of Huizhou Sandiao can be collectively referred to as the “Sandiao”, and Huizhou, as the birthplace of these three crafts, has left a significant mark in the city. Therefore, “Huizhou three sculptures” has also become a kind of symbol of the city. Huizhou Three Carvings is the Ming Dynasty cultural classic art carrier, but also represents the roots in the local folk customs, the long history and cultural heritage, is the ancient Huizhou Shang culture of the performance of the multiplication, its exquisite and ingenious craftsmanship is very representative—delicate and nuanced, unique. In addition, it integrates the essence of the Ming Dynasty craft aesthetics and is full of the unique aesthetic pursuit of the Ming Dynasty culture [1]. Whether from an aesthetic point of view, or from the perspective of historical emotions and

humanistic feelings, the value of the three carvings of Huizhou is immeasurable. At the same time, it is also of great significance to the reproduction and inheritance, exploration and development of Huizhou culture. All in all, from the perspective of historical, humanistic and aesthetic pursuits, and public art, the three carvings of Huizhou have the role of inheritance and development. As a traditional craft inherited from Huizhou culture, it has high humanistic and historical values. Whether it is pottery carving, stone carving, or wood carving, are very distinctive, exquisite and extraordinary, they are not only the inheritance of ancient Huizhou merchant culture, the embodiment of profound and ingenious craftsmanship, but also the embodiment of the essence of craft aesthetics in the Ming Dynasty [2], so, based on the humanistic point of view, Huizhou three carvings on the history and culture, and the promotion of folk customs archaeological significance. The three carvings of Huizhou are an important heritage in the cultural history of the Ming Dynasty, and at the same time, it is also one of the important artistic elements in the Huizhou culture, which has profound historical and cultural connotations and high artistic value, and is one of the treasures in the traditional Chinese cultural heritage. However, with society's continuous development and digital technology and other technologies, the protection and inheritance of Huizhou Sandiao have been challenged. In this context, it is necessary better to understand the public art value of Huizhou Sandiao and integrate it with digital technology to better show the charm of traditional Chinese culture and Huizhou Sandiao craftsmanship. Based on this, this paper first analyzes the public value of Huizhou Sandiao in detail, and further elaborates on its digital development and inheritance [3]. This paper focuses on analyzing the specific influence of Huizhou three carving culture on the museum city, and discusses how to show the elements of Huizhou three carvings in the museum city to enrich the local history and cultural connotation better. Through the specific research of the three carvings in Huizhou, the digitization of the cultural heritage of the Ming Dynasty will be realized, to better protect and inherit the culture of the three carvings in Huizhou.

2. Research methods and results

2.1. Research methodology

This paper takes the Ming Dynasty (1368–1644 AC) and Huizhou Sandiao as an example for analysis, with the help of high-definition scanner (4 mm–8.5 mm, electronic imaging, produced in Guangdong), infrared scanner (infrared wave, 1 Hz, thermal 45°–200°, produced in Guangdong), 3D scanner (accuracy 2 cm–3 cm, scanning frequency 30 times/min, produced in the United States), to observe the surface composition, structure, mechanical balance, particulate matter, and color of the three carvings. The samples are all public materials and do not involve issues such as confidentiality and infringement.

Artec Leo is a wireless AI-powered 3D scanner designed to simplify the scanning process, making it easy and efficient. This device integrates AI computing, a 5-inch HD built-in display, and a battery, providing a comprehensive solution for fast, accurate, and high-quality 3D data capture. Equipped with an NVIDIA Jetson TX2 processor and advanced algorithms, its cutting-edge technology can capture rich textures, adapt to different lighting conditions, and perform precise texture-to-

geometry mapping. Leo features a dual optical system, an integrated supercomputer module, a 9-degrees-of-freedom position sensor, and VCSEL light technology with variable flash intensity. Through integration with Artec Studio and Artec Cloud, Leo offers a fully autonomous scanning experience, supporting direct scanning to the cloud, remote control of the scanner, and allowing users to build their own functionalities through dedicated APIs and SDKs. Artec Leo 3D scanner specifications are shown in **Table 1**.

Table 1. Artec Leo 3D Scanner Specifications.

Category	Description
Operating System Support	Scanning: No computer required; Data processing: Windows 7, 8, 10 × 64
Output Formats	3D Mesh: OBJ, PLY, WRL, STL, AOP, ASC, PTX, E57, XYZRGB Measurement: CSV, DXF, XML
Dimensions	Height × Width × Depth: 231 mm × 162 mm × 230 mm
Weight	2.6 kg/5.7 lb
3D Point Accuracy	Up to 0.1 mm
3D Resolution	Up to 0.2 mm
3D Accuracy Over Distance	Up to 0.1 mm + 0.3 mm/m
Working Distance	0.35 m–1.2 m
Volume Capture Zone	160,000 cm ³
Linear Field of View	Closest Range: 244 mm × 142 mm; Farthest Range: 838 mm × 488 mm
Texture View Angle	Horizontal × Vertical: 38.5° × 23°
Texture Resolution	2.3 megapixels
Color	24 bpp
Real-time Fusion 3D Reconstruction Rate	22 fps
Data Acquisition Speed	Up to 35 million points/second
3D Exposure Time	0.0002 s
2D Exposure Time	0.0002 s
3D Light Source	VCSEL
2D Light Source	White 12 LED array

The steps for performing a 3D scan with the Artec Leo are as follows: First, using the built-in 5-inch high-definition display, users can select the appropriate scanning mode. The Artec Leo supports a target-free tracking system, meaning scans can be conducted without additional markers or targets. Users simply align the scanner with the object to be scanned and press the start button, and the Leo will automatically handle the entire scanning process. Second, during the scanning process, the Artec Leo leverages its powerful AI computing capabilities and advanced algorithms to capture the object's texture and perform precise texture-to-geometry mapping. Its dual optical system and 9-degree-of-freedom position sensor ensure high accuracy and rich detail in the scans. Third, after completing the scan, users can choose to transfer the data directly to the cloud or transmit the video stream to external devices via WiFi or Ethernet, and process the data using Artec Studio software, including 3D reconstruction and editing. Artec Studio offers a robust set of tools to help users

optimize and refine the scanning results.

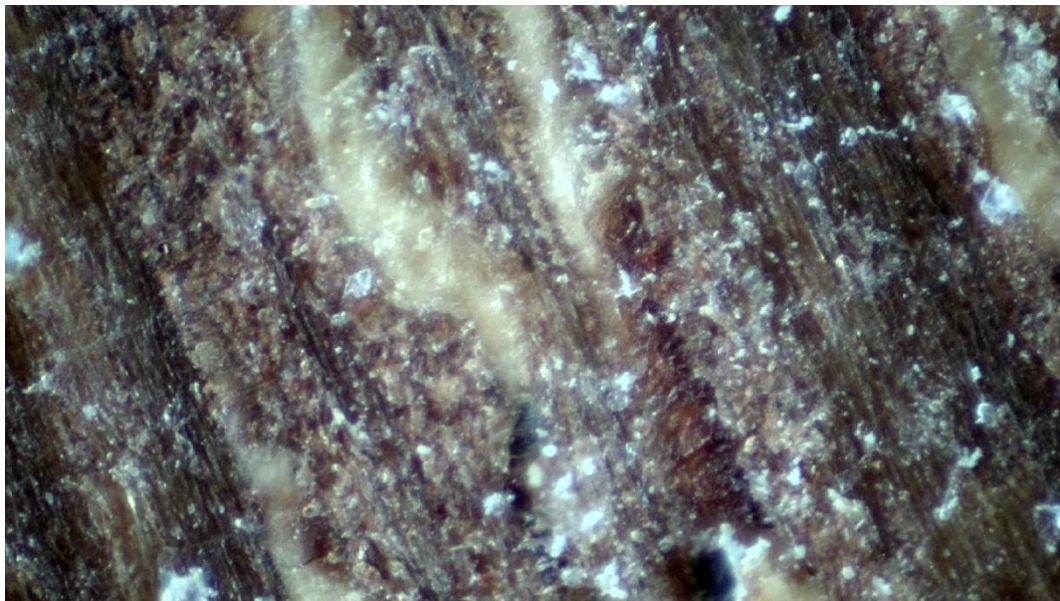
2.2. The material of the three carvings

Taking the samples of Huizhou three carvings in the Ming Dynasty as an example, the material of the three carvings was analyzed, and the results are shown in **Table 2**.

Table 2. The material of the three carvings in Huizhou.

content	ingredient	strength	Depth of seal engraving
woodcarving	Mahogany, elm	1 Hb–2 Hb	2 cm–5 cm
stone carving	Granite, bluestone, white marble	5 Hb–10 Hb	5 cm–10 cm
Pottery carving	Clay, kaolin, quartz, feldspar powder, porcelain white powder, dolomite	3 Hb–4 Hb	2 cm–6 cm

From the material of the three carvings in **Table 2**, it can be found that the material of the wood carving is relatively ordinary, mainly elm, the stone carving is mainly bluestone, the pottery carving is mainly clay, and the depth of the seal carving is 2 cm–10 cm, and the strength is 1 Hb–10 Hb, indicating that the three carvings of Huizhou will choose different patterns, depths and seal carving forms according to different materials. As a treasure in the craftsmanship of the Ming Dynasty, Huizhou's three carvings carry the local historical and cultural connotations. It originated from ancient Huizhou, has been continuously developed here, and has long been integrated with Huizhou's folk life and cultural development [4,5]. After generations of development and inheritance, in the Hongwu period, Huizhou three carvings embody the essence of seal carving culture, exude the unique charm of Huizhou history, produce many carvings, such as, lions, bats and other auspicious animals, as well as tangled branch flowers, lotus flowers and other plant patterns. Huizhou three carvings can inherit and develop the Ming Dynasty seal carving technology, according to different materials, seal carving, at the same time, also according to the pattern to choose different materials, in-depth analysis of the carving of the material, can understand Huizhou three carvings, and its culture, and inherit and carry forward the Ming Dynasty aesthetic technology. The observation of the Huizhou Sandiao sample showed that a large amount of oxide was present on its surface, as shown in **Figure 1**.



(a)



(b)

Figure 1. Oxides on the surface of stone and wood carvings, (a) stone carving; (b) woodcarving.

It can be seen from **Figure 1** that a certain amount of oxide is precipitated on the surface of the stone carving, and there is a certain amount of grease on the surface of the wood carving, indicating that the three carvings of Huizhou attach great importance to corrosion resistance to prolong their preservation time. As a traditional craft with strong humanistic feelings and profound folk connotation, the three carvings of Huizhou in the Ming Dynasty occupy an extremely important position in history. Each of the three carvings of Huizhou can reflect the local folk customs and customs, and have relevant legends and religious beliefs, etc., and choose different shapes and characters for design. The elements of the three carvings in Huizhou are very diverse, and the core is extremely rich, so the cultural symbolism it embodies [6,7]. The shape of the three carvings in Huizhou can often reflect the inner desire and reflect the

unremitting pursuit of happiness, so it is necessary to keep the carvings longer. Therefore, after the completion of the three carvings in Huizhou, great attention is paid to the anti-oxidation and anti-corrosion treatment of the surface. Generally speaking, the anti-corrosion treatment of Huizhou Sandiao mainly involves the use of rosin, tung oil, zinc oil, etc., to form a surface oxide. For ceramic carving, high-temperature firing is mainly carried out, and the observation results are shown in **Figure 2**.



Figure 2. Side treatment of pottery carving.

During the Ming Dynasty (1368–1644 AC), the three carvings of Huizhou were fired at high temperatures, which could form glazed material on the surface and improve the corrosion resistance of the carvings, and the firing temperature was between 200°–400°. The pottery carving of Huizhou Sandiao has the skills of the Ming Dynasty, as well as the essence of history and humanities, especially the firing method and firing skills. Through the study of Huizhou pottery carving technology, you can feel the display of Huizhou's folk customs and religious beliefs, understand the connotation of Ming Dynasty pottery carving, and learn exquisite skills. In this way, the three carvings of Huizhou have become the business card of the city [8,9], to understand and taste the urban culture and customs of ancient Huizhou, as if they are in a museum, so as to enhance the archaeological value of the three carvings of Huizhou.

2.3. The shape of the three carvings in Huizhou

Comparing the material of the three carvings in Huizhou and observing its shape, it can be found that its material is relatively delicate, as shown in **Figure 3**.

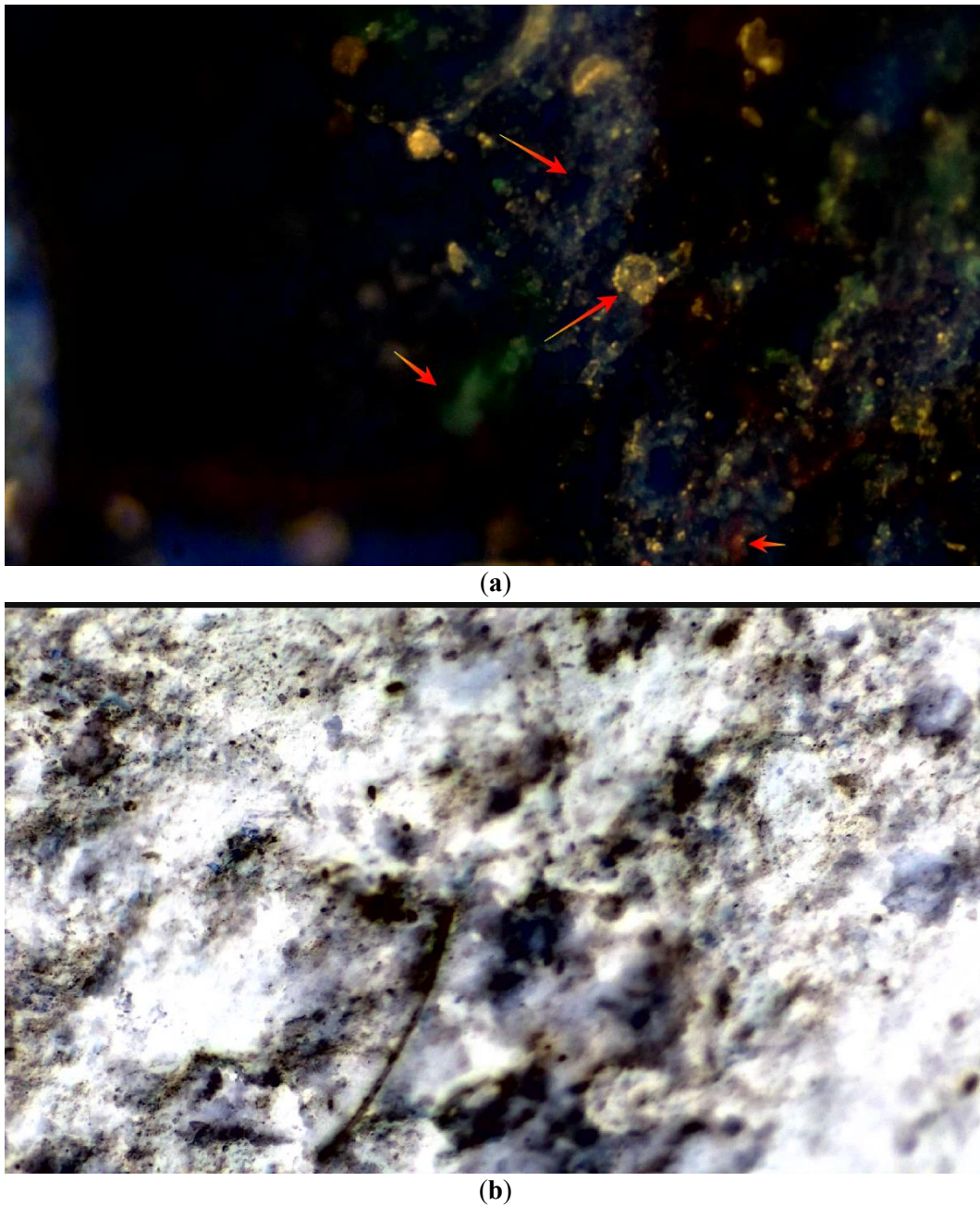
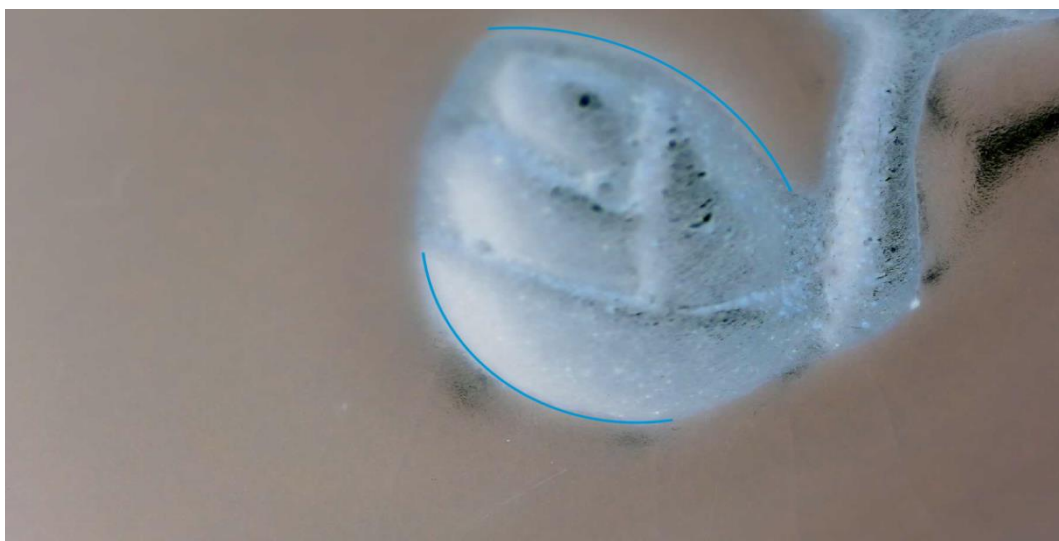


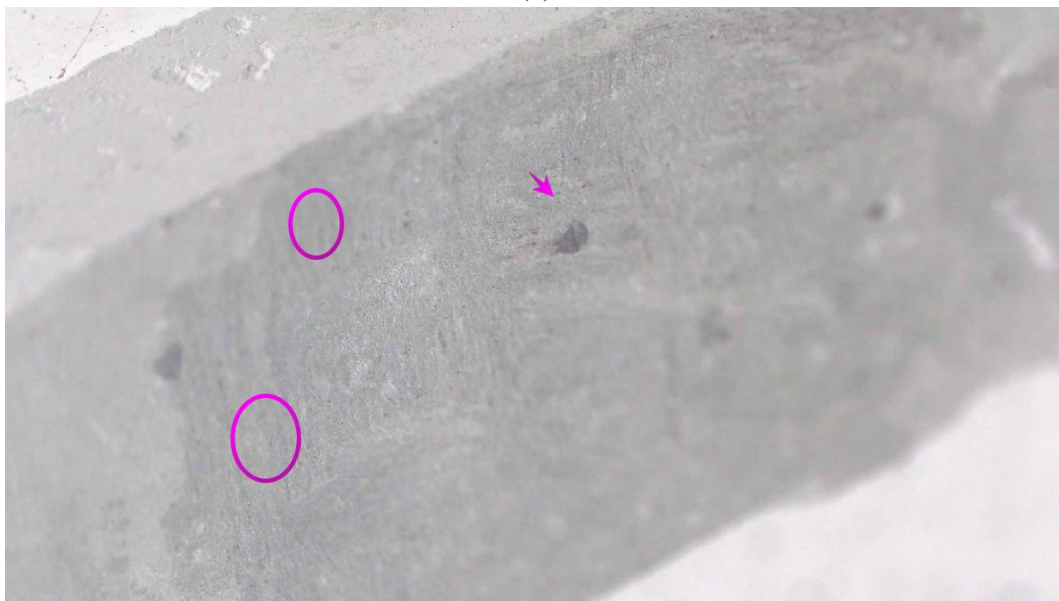
Figure 3. The material of the three carvings in Huizhou, (a) Pottery carving; (b) stone carving.

As can be seen from **Figure 3**, during the Ming Dynasty (1368–1644 AC), the particles of pottery carvings were relatively fine, and there were a small number of crystals, but the overall diameter was small. Moreover, the pottery carving contains a small amount of dyes, indicating that the pottery carving is colored before firing, so as to improve the carving effect. Huizhou pottery carving also pays attention to the flexible application of firing and baking techniques and glaze, which can give a more unique artistic style, exquisite and profound, so that people can watch it, as if they are savoring a poem with deep philosophy, and completely immerse themselves in it. The skills of wood carving in Huizhou are different. The conception of Huizhou wood carving is often very bizarre [10–12], and the technique is meticulous and often praised. The materials used in wood carving are mostly various types of wood with

different types and textures, and generally speaking, craftsmen will carve the original wood without destroying the texture and color of the wood city, so as to carve it. For example, in the process of designing ornaments, windows, porches, furniture, etc., craftsmen often use different techniques such as relief carving and openwork to present intricate and delicate situations or patterns. Among them, there are many auspicious totems in the culture of the Ming Dynasty, such as a hundred birds and a phoenix, and at the same time, there are some patterns that will depict the folk cultural customs and vast, vast and beautiful natural scenery. It can be deeply rooted in the hearts of the people and make people linger and appreciate, because it can not only reflect the craftsmen's superb skills, but also show the long-term aesthetic realm of the Ming Dynasty culture. Stone carving is mainly based on the texture and texture of the stone for seal carving, forming a natural and seal carving fusion, as shown in **Figure 4**.



(a)



(b)

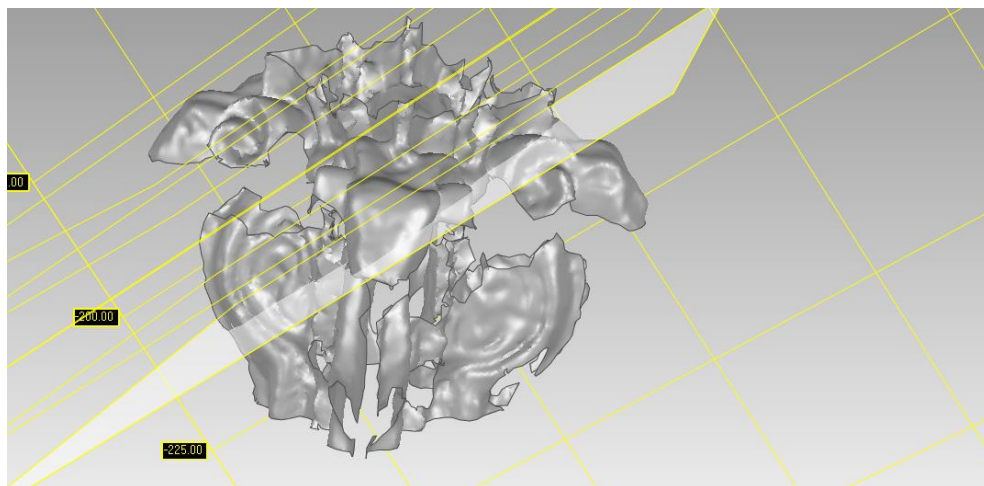
Figure 4. Pattern of brick carving, (a) pattern; (b) back.

As can be seen from **Figure 4**, the brick carving is carved before firing, forming

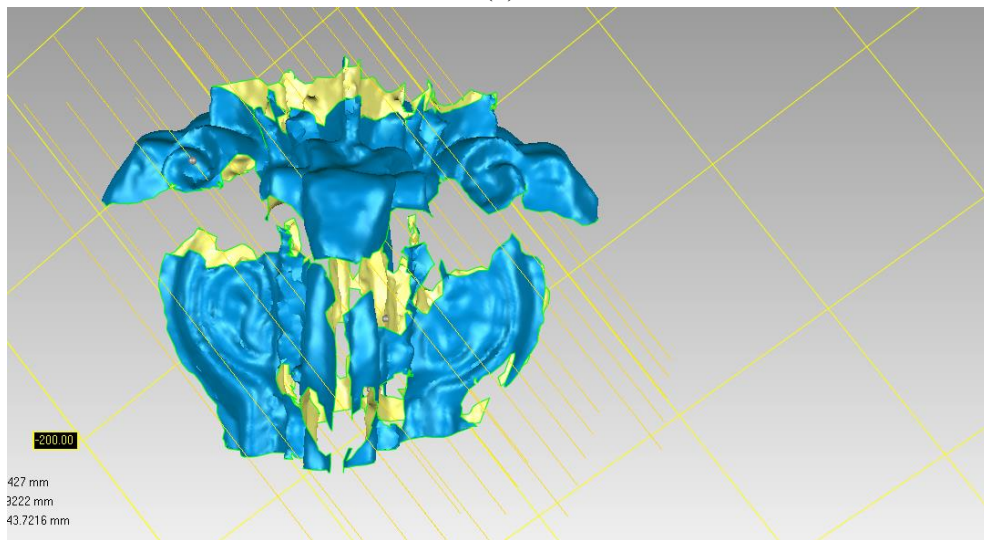
a more vivid pattern and improving the preservation time of the brick carving. The techniques of Huizhou three carvings are exquisite. Whether it is stone carving, pottery carving, or wood carving, its production techniques and carving techniques are different, and have a unique charm. Stone carving pays attention to knife skills, and the technique is dexterous and skillful; wood carving focuses on details, delicate and meticulous; pottery carving pays attention to vividness, and the shape is smart and lifelike. In the process of starting from scratch, the craftsman will embody meticulousness and delicacy through his meticulous carving of every line and detail. Moreover, each structure has been treated with extreme subtlety, which shows that during the Ming Dynasty (1368–1644 AC), the techniques of the three carvings in Huizhou were outstanding and wonderful, which can arouse amazement [13,14]. During the Ming Dynasty (1368–1644 AC), Huizhou Sandiao also paid great attention to the flexible application of materials, and improved the overall texture through textured materials. Based on this, the wonderful Huizhou three carvings were able to meet the public and won countless praises. Huizhou's three carvings come from the ancient Huizhou culture, with a long and profound folk heritage, coupled with its integration with the aesthetics of the Ming Dynasty, therefore, it also has an antique and simple and elegant style. Take Huizhou stone carving as an example. It has always been known for its sleek lines, vivid and diverse layers, and vivid images. In terms of its craftsmanship, it is particularly praised for the exquisite use of the two techniques of “yang carving” and “yin carving”. Combined with the technique of “line carving”, the stone carving process is more delicate and exquisite. For example, dragon pillars, stone railings, etc., are more well-known in Huizhou stone carvings. In the process of its production, the flexible use of yang and yin carving techniques will make the stone carving more free and easier, and the elegant and flexible patterns will become more vivid. From the perspective of artistic elements, the pattern will combine many natural elements, such as water ripples, moire, etc., which can be described as excellence, delicate and vivid coexistence, texture and delicacy. The fine treatment makes the Huizhou stone carvings more agile and lifelike, showing the elegance and simplicity and magnificence to the fullest, compared to the Huizhou pottery carvings. Huizhou pottery carving has always been more natural and simple, and some people call it “elegant and delicate” a lot. The basic pottery carving technique is using high-quality local clay as a material, which is carefully processed and then carved on the surface. For example, in the process of painting some animals and flowers, craftsmen are trying their best to depict the vitality of animals and plants while skillfully depicting their forms [15].

2.4. Mechanical balance of brick carving

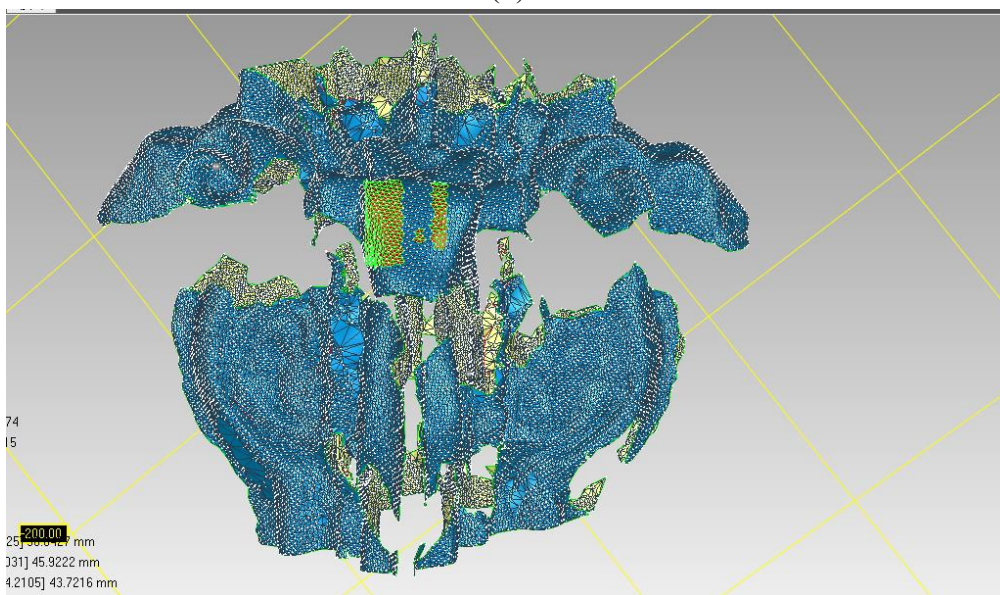
Using three-dimensional scanning technology, the three carvings of Huizhou are digitally scanned to obtain the corresponding simulation drawing, as shown in **Figure 5**.



(a)



(b)



(c)

Figure 5. Digital collection of three carvings in Huizhou, (a) planar autopsies; (b) normals are determined; (c) digitization.

According to the data of the Ming Dynasty (1368–1644 AC), the data of the three carvings in Huizhou were collected to determine the plane and normal, and finally the three-dimensional samples of the brick carvings were formed to complete the digital collection. The intricate scenery, carved figures, and various totems all have distinct layers and three-dimensional effects. This meticulous craftsmanship makes each piece of Huizhou wood carving glow with a different artistic brilliance and unique artistic vitality. In the production of wood carving, craftsmen also frequently use the opening technique to make the whole piece more light and have shadow ingenuity and perspective beauty. The part and entity processed by the opening technique are so exquisitely integrated into one, which makes the sense of hierarchy more distinct, and at the same time, it can also enhance the visual experience, so that in the solemn and elegant, there is a touch of agility and ingenuity, so that the audience can get spiritual nutrients from the process of watching, and improve the aesthetic taste; For example, each Huizhou pottery carving has its natural and beautiful characteristics, and is endowed with a far-reaching historical and humanistic core and beautiful meaning, which can show the ancient Huizhou people's continuous pursuit of a better life, simple folk feelings, traditional values and natural beauty [16]. It contains many traditional folk signs and symbols that can be seen everywhere, such as peacocks, lotuses, dragons and phoenixes, etc. Folk humanities signs and symbols, generally rich in auspiciousness, are the embodiment of a beautiful yearning for auspiciousness and the embodiment of the beautiful spiritual connotation in Chinese history and traditional humanities, reflecting the people's continuous pursuit of a happy life. In the middle of the Ming Dynasty ((1468–1544 AC)), Huizhou folk life that frequently appeared in Huizhou pottery carvings also included some festivals, farming and local folk customs, etc., whether it was related customs and habits, or unique landscape patterns, etc., which could be displayed in front of the audience through flexible and ingenious techniques, which was fascinating. Therefore, the profound meaning of Huizhou pottery carving is also reflected in its ability to produce real historical emotions and resonance of humanistic spirit to realize the inheritance of wisdom and connotation in Chinese history and humanities.

In the process of digital collection, it was found that the mechanical balance of the three carvings in Huizhou during the Ming Dynasty was reasonable, and the test results are shown in **Table 3**.

Table 3. Mechanical balance of the three eagles in Huizhou.

substance	center of gravity	Left-right balance ratio	Upper and lower balance ratio	Front-to-back balance ratio
woodcarving	2/3	0.92 ± 0.01	0.85 ± 0.03	0.88 ± 0.01
stone carving	2/3	0.99 ± 0.02	0.95 ± 0.02	0.91 ± 0.01
Pottery carving	2/3	0.95 ± 0.01	0.89 ± 0.02	0.92 ± 0.03

It can be seen from **Table 3** that during the Ming Dynasty (1368–1644 AC), the mechanical balance of the three carvings in Huizhou was better, and the overall center of gravity deviation was small, only between 0.1–0.2. The three carvings of Huizhou have far-reaching cultural heritage and historical color, and have a unique aesthetic charm. Through viewing, you can intuitively feel the profound beauty of traditional

crafts and understand the historical and cultural heritage contained in them to resonate. Taking stone carving as an example, it has a profound historical and cultural heritage, classical and elegant temperament, and gorgeous and simple artistic style, which is impressive. In the process of appreciating the stone carving, the viewer can find that the craftsmen's techniques and craftsmanship are profound and delicate, and the application of stone is full of ingenious thinking, and shows many historical allusions, humanistic customs, and folk feelings. When the audience sees the dragon and phoenix totems full of vitality on the stone carvings, they can feel the pursuit of wonderful skills in the Chinese historical and cultural tradition. This aesthetic charm, like fine wine, becomes more mellow the more you taste it, and it will become more historical and charming with the passage of time. To this day, it is still touching and inspiring. In short, Huizhou stone carving has now become a part of Chinese history and culture, adding new blood to the culture of the Ming Dynasty; In addition, the techniques used by craftsmen in making wood carvings are extremely exquisite and ingenious, so it makes wood carvings more aesthetically attractive.

3. The public art value of the three carvings in Huizhou and its influence on the museum city

3.1. Improve the digital level of Huizhou Sandiao

With the rise of digital technology, Huizhou Sandiao culture has also begun to use digital technology and has been profoundly affected by digitalization. The integration of advanced technology has injected new vitality into Huizhou Sandiao, and expanded its development space, which is conducive to the protection and inheritance of Huizhou Sandiao culture. Through digital communication, traditional culture can be displayed and promoted, for example, through various breakthroughs such as cultural protection and digital restoration, digital innovation, interactive experience, etc., the spread of Huizhou Sandiao has become broader, and at the same time, its influence has also increased. It is necessary to build a digital platform, create a mobile app unique to the platform, and a specific website to carry out a large-scale exhibition of Huizhou three carving art through the medium. It is used to present it. In its exclusive application and website pages, pictures or videos are used to show the craftsmanship of Huizhou three carvings, and with analysis, etc., so that the platform can comprehensively display the three carvings of Huizhou and understand their cultural and historical background, so as to better appreciate them. It focuses on the development history of Huizhou Sandiao and its background, craftsmanship and artistic style, and brings together some relevant resources for the audience to learn. Based on this, we can deepen our understanding of Huizhou's three carving crafts and their culture. Let the platform's audience independently choose their favorite Huizhou Sandiao and buy it, to realize the marketization of Huizhou Sandiao, so as to expand its dissemination. In the digitalization of the cultural protection and innovation of Huizhou Sandiao, it has certain application value. The dissemination and display of the traditional culture of Huizhou Sandiao has important cultural protection and inheritance significance. In this regard, digital technology can play an effective role as a publicity medium and promote the development of museum cities. Through the

continuous improvement of the digital display platform and the virtual museum, the three sculptures of Huizhou can be displayed in the public eye, so that the public can appreciate and observe online, without being limited by time and space, as if they are in a museum. Through VR technology (virtual reality technology), you can feel the artistic conception and aesthetic charm of Huizhou Sandiao as if you were there, and have an in-depth understanding of the simple charm and profound philosophy contained in Huizhou Sandiao. At the same time, the use of social media and online art market and other media can also broaden the market space for Huizhou Sandiao and enhance its influence. In restoring and preserving Huizhou's three carvings, digital technology has an important importance that cannot be ignored. 3D scanning technology can realize real-time modeling and recording of Huizhou three carvings, and digitization almost enables accurate digital proofreading of Huizhou three carvings and restore them. In addition, digital virtual reconstruction and simulation technology can also restore the original appearance of the ancient, so that the damaged places can be effectively restored and maintained. In this way, the chances of damage to antiquities are reduced and they can be preserved for a long time. In terms of innovation, digital technology has strong expressiveness, which can inject fresh blood into the innovative application of Huizhou Sandiao. Digital technology is based on big data analysis and integrates artificial intelligence technology, that is, the use of AI technology, so that the engraver can obtain rich inspiration and design ideas in the production process, and give a more unique and modern craftsmanship. At the same time, the existence of reality augmentation technology and interactive display platform can experience the culture of Huizhou Sandiao more closely, for example, the interactive installation and virtual space are applied to the creation, the drawing is personalized and unique, and the participation and interaction are generated, so as to get a better sense of experience. Virtual reality technology is used to establish a unique virtual display area so that users can feel the charm of the three Huizhou carvings and appreciate them. Specifically, it includes the following: First, the virtual exhibition area; that is to say, the platform should establish a strong degree of restoration, with multi-party interactive functions of the virtual display area, in order to exhibit the Huizhou three carvings, at the same time, set up a guide tasting function, enhance the user's interactive experience; the full 360-degree demonstration of Huizhou Sandiao enables users to use some specific facilities and equipment and electronic browsing media to complete the all-round refinement. After that, some sound interaction, gesture reading and other functions are used to deepen the user's interactive experience effect, so that they can experience a variety of different tasting operations in this virtual space, such as shrinking or enlargement, visual rotation and other operations, so as to achieve multi-faceted interactive effects, allowing users to immerse themselves in the artistic charm of Huizhou three carvings and form a museum city.

3.2. Enhance the public art value of Huizhou three sculptures

As one of the crafts of the Ming Dynasty, the inheritance of the three carvings in Huizhou has a high public art value. The continuation of the three carvings of Huizhou is also the continuation of the culture of the Chinese nation, which has an important role in enriching the culture of the Chinese nation and promoting the development of

the city, and can improve the level of public services in the city. The survival of the three carvings in Huizhou also allows future generations to still be able to witness and share, protect and inherit the construction skills of Jingmiao. It is worth mentioning that the marketization of Huizhou three carvings has also brought considerable benefits to the local economy, so that craftsmen can make a living with techniques, and the inheritance of Huizhou three carvings has also made the traditional craft gain a broader development space and greater influence, which will help strengthen the national pride and improve social stability and harmony. It can be seen that the protection and inheritance of the three carvings of Huizhou is far more than the continuation of its art form, but also the inheritance of the long, profound and unique historical and cultural heritage of the Chinese nation. The inheritance of the three carvings in Huizhou is first of all the inheritance of its exquisite techniques. Huizhou Sandiao is the previous generation of craftsmen who passed on the city's experience and techniques to the next generation of young people, so it will continue to play a role in public art and the development of the city. In the development of Huizhou three carvings, the previous generation of craftsmen to Huizhou three carving techniques and craftsmanship of persistence and enthusiasm can infect the younger generation, so that the younger generation can learn to understand the essence of Huizhou three carving skills, and pay more attention to the quality and details of Huizhou three carvings, and synchronize with the development of the city. In this way, young craftsmen will cherish and protect the national humanistic traditions and better build the city of Huizhou. Public art will guide more young people to understand and understand the craftsmanship of Huizhou Sandiao, so as to achieve the integration of modern teaching methods and traditional crafts. Through the establishment of the Huizhou Sandiao Workshop, the relevant parties can also use the teaching of professional training courses and other means to carry out systematic technical training and teaching for contemporary young people, and use advanced teaching concepts and technologies to make their learning efficiency and practical ability, technical level, etc., greatly improved. In this way, more and more young people can be interested in Huizhou three carving crafts, and give them more space for communication to provide them with enough learning resources; third, the use of digital technology, so that the characteristics of the traditional craft techniques of Huizhou three carvings and the whole process of production can be recorded and retained, for future generations to taste, learn. At the same time, advanced science and technology can be used to acquire and protect national cultural heritage. To this end, the relevant parties can establish a special database, the use of digital technology, to record the production process of the Huizhou three carvings, so as to pass on the Huizhou three carving skills and methods for a long time, and protect China's historical and cultural heritage. In short, the use of digital technology to protect and inherit the craftsmanship techniques of Huizhou three carvings and their related cultural content is conducive to its development and inheritance in modern society. Huizhou three carvings are one of the important crafts in the culture of the Ming Dynasty, with unique historical and humanistic colors, and have great artistic charm. In the development of modern society, due to the influence of urbanization, Huizhou Sandiao is facing problems of protection and inheritance, innovation, and development. Based on this, studying its public art value, digitization, inheritance, and impact on the museum city is of great practical significance. Through

the study of this paper, it is concluded that the three carvings of Huizhou have a long history and profound cultural heritage, and as an important public art element, they have important artistic value and social significance. The three carvings of Huizhou may become the cultural calling card of the museum city, which in turn will promote the local cultural tourism industry. Huizhou traditional crafts and modern tourism industry can be effectively combined, and the development of cultural tourism products, related handicrafts and cultural output, so as to improve the core competitiveness of the local cultural tourism industry, so that the local culture has a stronger cultural atmosphere and historical heritage. In this way, while boosting the local tourism economy and cultural industry, it can also build a unique image of the city, expand the city's popularity, and gradually make the local economy prosperous. It can be seen that Huizhou Sandiao culture can play a certain role in promoting the tourism and cultural development of the museum city, the innovation and development of cultural products, and the promotion of the local economy, and help the museum city establish a good image and inject new blood into it.

3.3. Create a comprehensive image of the museum city

As we all know, Huizhou three carvings have a unique, full of historical and cultural artistic charm, so, in the museum, Huizhou three carving culture has always had a certain status. The three carvings of Huizhou make the museum culture richer, make the content of its display more humanistic and historical significance, and also play a positive role in the local cultural inheritance and the subsequent development of tourism. The exhibition of Huizhou three sculptures in the museum city can show the unique historical and humanistic atmosphere of Huizhou three sculptures, and effectively publicize its historical and cultural connotation to enhance the influence of Huizhou three sculptures. At the same time, it also strengthens the cultural soft power of the museum city. It is mainly embodied in the exhibition of various traditional Huizhou crafts, including three carvings. Entering the museum's exhibition hall allows the audience to understand the difference between the materials up close and the characteristics and highlights of each. In this way, it can enhance the museum city's cultural inheritance and protection capacity, and lay a solid foundation for its subsequent development. Moreover, the display of the three carvings in Huizhou also brings a richer style and theme to the museum culture. For example, the three sculptures of Huizhou will be brought to the museum city for many exhibitions, including folk classics and classical totems, modern abstraction, religious beliefs and other different styles and themes, so that the subtlety and difference of artistic expression can be seen at a glance. In this way, it can show the cultural inclusiveness, acceptance, and taste of the museum city, so as to improve the historical and cultural heritage of the museum city. In addition, the relevant parties can also present the unique skills and techniques of Huizhou three carvings and related production processes in the exhibition of the museum city, and through illustrations, model demonstrations, video explanations, etc., to the public, so as to publicize the ancient inheritance skills of Huizhou to the public. At the same time, some interactive devices can also be set up to allow the audience to immerse themselves in the production process of the craft, deepen their knowledge and understanding of the Huizhou three

carving crafts, and improve their tasting ability. In short, the display of different Huizhou three sculptures can greatly improve the humanistic experience strength of the museum city. At the same time, it also contributes to the enhancement of the cultural soft power of the museum city and promotes the further development of its cultural industry. Huizhou Sandiao is rich in profound local history and cultural customs, is a part of the Chinese national culture, and has unique significance for the inheritance and continuation of the Chinese national culture. Presenting it comprehensively in the museum city can show the world its unique historical and cultural charm and its exquisite craftsmanship to attract more and more tourists to come here for better appreciation. Moreover, in this way, the flow of people visiting the museum city will be greatly increased, thereby promoting the local tourism economy and increasing the income of local tourism consumption. The exhibition of the three carvings of Huizhou in the museum city will surely greatly increase the income of local tourism consumption. Tourists who travel to the local area often begin to collect some related artworks, classics, and souvenirs after visiting relevant exhibitions and tasting related items, and they collect or appreciate them for a long time. In addition, when tourists arrive, they need to dine, shop, and stay nearby, which can contribute to the increase in the tourism industry of the museum city. On this basis, the economy of the museum city will also be steadily improved, and thirdly, the development of cultural tourism will be promoted. Combined with the exhibition of the three sculptures of Huizhou, the museum city will present a side full of historical and cultural heritage and atmosphere.

4. Conclusion

As an important traditional culture, Huizhou three carvings originated in the Tang Dynasty and prevailed in the Ming Dynasty, so this paper studies the three carvings in Huizhou in the Ming Dynasty, and the results show that the material of the Huizhou three carvings in the Ming Dynasty is delicate, mainly granite, white marble, clay, quartz, and kaolin. The color is single, mainly red, black, etc., and there are oxides and grease on the surface of the engraving, so it has strong corrosion resistance. Huizhou's three carvings choose materials according to the content to achieve a good integration of content and materials. The style of Huizhou three carvings is complex, the center of gravity is located at $2/3$, the mechanical balance is reasonable, and the deviation is between 0.1–0.2. Through data acquisition and 3D scanning, more accurate 3D images can be obtained, which can better record and analyze Huizhou's three carvings, laying the foundation for the development of the museum city. As a city card, the three sculptures of Huizhou have public art value, so their digitization can lay the foundation for the development of the museum city. This study also has some shortcomings, mainly in the selection of representative samples and the composition analysis of samples. In the later stage, the analysis of samples will be intensified, the scope of analysis will be expanded, and the research level will be improved.

To address issues in representative sample selection and composition analysis, future research will expand the sample size of Huizhou Three Carvings, covering different historical periods, craft types, and regions, and collaborate with museums, private collections, and heritage institutions to obtain diverse samples. Advanced

techniques such as Raman spectroscopy, X-ray fluorescence (XRF), and scanning electron microscopy (SEM) will be employed for precise material analysis. Future directions include deepening digital preservation and display using high-precision 3D scanning, virtual reality (VR), and augmented reality (AR) to enhance interactive experiences. Additionally, the study will focus on craft transmission mechanisms to ensure sustainable development, and conduct field research to evaluate the impact of digital methods on public art value and museum city construction, exploring their application potential in other traditional crafts.

To comprehensively understand the artistic and cultural significance of Huizhou Three Carvings, it is essential to analyze their morphology, materials, and mechanical properties from biological and biomechanical perspectives. This interdisciplinary approach reveals the profound connections between the carvings and nature, offering new insights for the innovation and development of traditional crafts. By examining common motifs such as dragons, phoenixes, lotus flowers, and vines, and comparing sculptural materials with biological ones, the study explores symmetry, proportion, and material performance. Additionally, leveraging digital technologies like 3D modeling and virtual reality can transform the biomimetic features of the sculptures into inspirations for modern bioengineering designs.

Author contributions: Conceptualization, LW and LS; methodology, LW; software, LW; validation, LS; formal analysis, LS; investigation, LS; resources, LS; data curation, LW; writing—original draft preparation, LW; writing—review and editing, LW; visualization, LS; supervision, LS; project administration, LW and LS; funding acquisition, LW and LS. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by 2023 University Research Project of Anhui Provincial Department of Education: Innovative Application Research of Urban Public Art with Intangible Heritage Empowerment (Project No. 2023AH052911). This work was supported by 2022 Anhui Institute of Information Technology Established a school-level key research team: “Intangible Cultural Heritage Inheritance Research Team” (Project No. 23kytdzd003, Anhui Institute of Information Technology).

Ethical approval: Not applicable.

Conflict of interest: The authors declare no conflict of interest.

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