

# Inspiration from Biology: Exploration of the Application of Bionic Design Elements in the Design of Cultural Creative Products

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**Abstract:** With the development of the times, people's life concepts, lifestyles and thoughts are also constantly changing, and the demand for cultural products is paying more and more attention to creativity and innovation. Since ancient times, nature has been the source of human enlightenment. As a design method, bionic design not only has a unique sense of beauty, but also makes product design more vital and appealing. The research focus of this topic is to take the inspiration brought by biology as the starting point, with the help of the form elements, color elements, structural elements, functional elements and symbolic meanings in the bionic design, to find new ideas in the design and development of cultural and creative products. Inspiration, the application and exploration of the utilization, processing and re-creation of the external morphological characteristics and internal functional structure of living beings, and giving products a new way of spreading while presenting cultural connotations. The aim is to summarize the innovative thinking methods that transform natural biological characteristics into product design applications, and provide reference and new ideas for promoting the development and design of cultural creative products.


## 1 INTRODUCTION

Bionic design is to extract a large number of novel bionic creative thinking and harmonious and continuous design methods by simulating nature to design more and better products to meet the growing material and spiritual needs of consumers. Visual design constantly proposes new bionic design concepts, and actively seeks design methods and methods that combine design with nature. The design product visually reflects the visual characteristics of human beings and the natural environment in harmony. Designers can use the creatures and natural existences in nature as the basis to extract elements with bionic meaning, and combine advanced science and technology to apply visual symbols with bionic meaning to the creative performance of products, which can satisfy consumers. Improved aesthetic requirements promote the application of bionic elements in product visual design. With the progress of science and technology, the level of productivity and the continuous improvement of economy, the bionic elements in nature will be continuously extracted

and applied in the visual design of products, which will directly promote the continuous improvement of the design level of the entire society and the level of social economy.

In the research on the elements of bionic design, many scholars have studied them and achieved many results. For example, Brandl summarized some methods of bionic design in design applications, and summarized exaggeration, simplification, deformation, decomposition and combination, etc. The application of design techniques in the bionic design of product form points out that these design techniques are not encouraged by each, but are interconnected (Brandl 2017). No matter what kind of design technique is used, the needs of product form and structure must be combined in the process of refining the form, rather than simply refining the form. In related research, Alekberli T classified bionic design into intentional bionic design and fun bionic design, and classified the characteristics and concepts of different bionic designs (Alekberli 2021). Kozlobaeva E A constructed a theoretical model from biological prototypes to bionic design procedures and a theoretical model from product problems to bionic design procedures, and created procedures and methods for morphological bionic

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optimization (Kozlobaeva 2018). These scholars have done a lot of research on bionic design, which provides a good theoretical and research foundation for this article.

This article has studied various design methods in bionic design; such as partial method, overall method, metaphor method, etc., and explained the methods, and carried out actual practice in terms of the ownership of bionic cultural and creative products and the purchase type intention of bionic cultural and creative products. Questionnaire survey, a total of 650 questionnaires, 644 valid questionnaires, the effective questionnaire rate is 98%, including 388 male questionnaires and 256 female questionnaires.

In this way, we can better understand the needs of consumers and strive for the usefulness, detail and reliability of the questionnaire.

## 2 THE DESIGN METHOD OF BIONIC DESIGN ELEMENTS IN THE DESIGN OF CULTURAL AND CREATIVE PRODUCTS

In the process of product design, bionic design extracts elements from organisms, establishes a connection with the structure of the product, and then converts this connection into the unique functions or ornamental features of the product. The most commonly used design methods when the bionic design is applied in the product design process include the partial method, the overall method, and the metaphorical abstraction method (Liu 2020).

### 2.1 Local Method

The local method is a design principle that extracts the most representative feature of the biological form, abstracts, refines and transforms it into the product design form. In nature, certain local features of some creatures are distinctive, impressive, and often have unique aesthetics. For example, the colorful colors and delicate patterns in butterfly wings often provide creativity for color matching and application in graphic design. The eyes of the fly, the pliers of the praying mantis, the wings of the birds, etc., because of their unique structure and function, have helped people obtain inspiration in the design of many products, and have formed many product design schemes that have changed our

traditional lives. Partially extract design elements and transform them into product features related to product function or structure. It has a wide range of applications in product design. The design feature of local method is to extract and strengthen. In the process of design, grasp biological The most distinctive personality characteristics, through the imitation and reinforcement of the form, derive these characteristics with the corresponding more distinctive structure, color or function (Zhang 2020). The first step in the application of the local method is the relationship between the biological structure and the product structure, which itself is based on the designer's full understanding of the product and biological characteristics, combined with its own association to create a unique connection point, and thus form a product idea. The local bionic design is simple to operate and directly applied, and it is also the most widely used in bionic design (Chen 2020, Wang 2021).

### 2.2 Holistic Method

The holistic method is to extract the features that best summarize the shape from the entire structure of the organism after a comprehensive observation and analysis of the biological shape, and then use concise colors or lines to generalize, and use the design method to coordinate deformation and reorganization to transform it. Transform into a product form with this biological aesthetic or behavioral characteristics. The holistic method also has a lot of applications in the field of product design. For example, when the aircraft was first invented, its shape characteristics fully absorbed the shape characteristics of birds and the dynamic characteristics of bird flight, even if the development is achieved today, The shape of the airplane has undergone great changes, but it still has a very similar appearance to birds (Alekbberli 2020). There are also lightings that are widely used in modern homes. Many lightings have been designed to absorb some morphological features of lotus, chrysanthemum and other plants. After extracting them with simple lines, they are completely transformed into the appearance of lighting, so In the process of providing people with lighting, lamps and lanterns also bring people a certain natural experience (Laszlo 2017, Berg 2017). For example, a lotus-like chandelier can bring a different kind of vivid emotion that belongs to the lotus in the room.

### 2.3 Metaphorical Abstraction

Although partial extraction and overall generalization design have certain applications in bionic design, in modern times, in order to meet the needs of industrial production, the application of bionic elements to most products is not so direct, but after sufficient metaphorical abstraction. Summarize some of the characteristics of biology into unique colors, lines, and structures, and transform into products with a higher degree of integration with products, form, color and structure (Gardan 2017). Metaphorical abstraction itself is a step that must be implemented in bionic design. The metaphorical abstraction mentioned here is more used to express a deep and highly abstract form of bionic design.

### 2.4 Observation Method

Observation method is the purposeful and planned observation and observation of the existing products and the behavior of consumers in the process of using the products by the designer, so as to obtain true and reliable information, find the shortcomings of the product, and then carry out the improvement design, and put the product on the market. Observing in the environment is the most true and reliable source of information (Kahn 2017).

## 3 EXPERIMENTAL RESEARCH ON THE APPLICATION OF BIONIC DESIGN ELEMENTS IN THE DESIGN OF CULTURAL AND CREATIVE PRODUCTS

### 3.1 Investigation Direction

With the development of economy and the progress of society, the current bionic cultural and creative products are gradually attracting the attention of consumers. The interesting, aesthetic, and comfortable room bionic cultural and creative products are increasingly interested by consumers and willing to spend money on cultural and creative products. key point. Cultural creative products are no longer just ordinary commemorative products, but also a product that attracts consumers' attention and meets consumers' needs for culture and creativity. Based on the survey of consumers' needs,

this paper uses questionnaires to conduct detailed questionnaire surveys, and examine consumers' demand for bionic cultural products by analyzing consumers' possession of bionic cultural and creative products and consumer expectations of bionic cultural and creative products. Trend, in order to bring certain reference materials for the bionic cultural and creative product market.

### 3.2 Sources of Experimental Data

Different ages, genders, and personalities have different requirements for color, shape, function, texture, and texture of bionic cultural creative products. This survey analyzes people in the 20-30 age group, and analyzes men and women in this age group. The demand for bionic cultural and creative products, the reference value of purchasing power and the opinions of young people, the expected value of bionic creative cultural products; the analysis of the degree of application of bionic content such as the shape, function, color, texture and texture of natural objects in indoor textiles is To study the key points of the market practice of bionic design and application, in this survey, a total of 650 questionnaires were distributed in a coastal city, with 644 valid questionnaires, and the effective questionnaire rate reached 98%. Among them, 388 were male questionnaires and 256 were female questionnaires. In this way, we can better understand the needs of consumers and strive for the usefulness, detail and reliability of the questionnaire.

### 3.3 Reliability Analysis

Reliability analysis is an important process of content analysis. Only through strict reliability analysis can the content analysis results be reliable. The reliability formula of content analysis used in this study is:

$$R = \frac{n \times k}{1 + (N - 1) \times k} \quad (1)$$

In the formula, R stands for reliability, K refers to the degree of mutual agreement between two judges, and refers to the average of the degree of mutual agreement between the judges. The formula for calculating the K value is:

$$K = \frac{2M}{N_1 + N_2} \quad (2)$$

M is the column that both agree completely, N1 is the number of columns analyzed by the first

judge, and N2 is the number of columns analyzed by the second judge.

#### 4 ANALYSIS OF THE EXPERIMENTAL RESULTS OF THE APPLICATION OF BIONIC DESIGN ELEMENTS IN THE DESIGN OF CULTURAL CREATIVE PRODUCTS

##### 4.1 Analysis of Ownership Rate of Bionic Cultural and Creative Products

With the development of the economy, my country's cultural and creative products have developed rapidly. In particular, bionic cultural creativity has been paid more and more attention. The light industry in coastal areas is relatively developed, which can be used for reference to the design of bionic cultural and creative products in the country. The results of the questionnaire are as follows Table 1 shows:

Table 1: Analysis table of experimental results.

Subject's attitude	male	female
Have	39	25
No	122	118
a bit less	156	78
More	45	21
Very much	26	14

It can be seen from the figure 1 that there are 240 people without bionic cultural and creative products, accounting for 37% of the total, ranking first in proportion.

The number of people who have relatively few bionic cultural and creative products is 234, accounting for 36% of the total number of people, ranking second, and the number of people who have a relatively large number of bionic creative cultural products is 66, accounting for 10% of the total number of people, ranking third. From this analysis, it is concluded that most people have few or no bionic cultural and creative products, and that bionic cultural and creative products have considerable

market prospects in the entire cultural and creative product market.

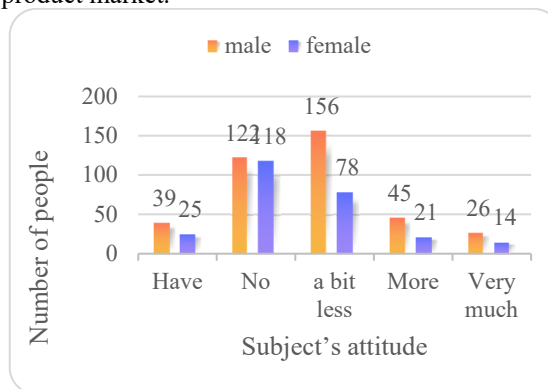


Figure 1: Analysis diagram of experimental results.

##### 4.2 Analysis of Expected Value of Bionic Cultural and Creative Products

In response to a questionnaire survey of 644 bionic cultural and creative products, this article also analyzed the intention of purchasing types of bionic cultural and creative products. Interviewed 644 experimental subjects to confirm their types of bionic cultural and creative products. The results are shown in Table 2:

Table 2: Questionnaire for purchase types.

Type of purchase	male	female
Decorations	63	98
Utility	156	108
Stationery	48	50
apparel	30	32
food	20	16
other	10	13

It can be seen from Figure 2 that 161 people choose decorations, accounting for 25% of the total, and 264 people choosing practical products account for 41% of the total. The others are 98 for stationery, 62 for clothing, 36 for food, and 23 for the other, corresponding to the experiment. The subject's investigation of the types of bionic cultural and creative products' purchase intentions found that tourists' purchase of cultural and creative products is mainly based on practicality, so bionic cultural and creative products should be based on practical product development.

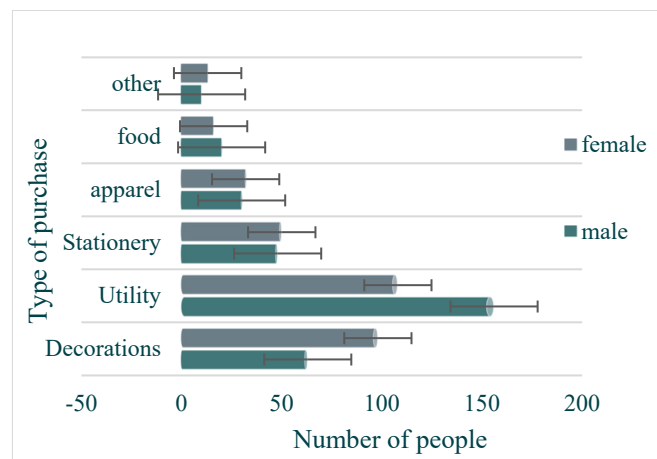


Figure 2: Survey chart of purchase types

## 5 CONCLUSIONS

Design comes from life and nature. This article takes this as the starting point, and uses the questionnaire method to conduct detailed interviews with consumers, gain insights into consumers' demand for bionic cultural and creative products, and visit cultural creativity. Product prospects and bionic design bring fashion, interest and vividness to the product. Personalized bionic cultural and creative products have become an inevitable trend. However, there are still some shortcomings in this experiment. For example, the age of the experimental subjects tends to be younger and cannot represent consumers as a whole, and the experiment is actually carried out in a relatively relaxed environment. The actual environment may be very different from the experimental environment, and the environment may also be It is one of the factors that affect the purchase demand. These are not considered. We hope that further improvements will be made in subsequent experiments to make the experiment more universal.

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