

## Research on Fashion Design Based on Biological Perspective -- “Taking Cell as an Example”

Yuanxin Liu<sup>1,a,\*</sup> and Dan Zhang<sup>1,b</sup>

Fashion College in Wuhan Textile University, Hongshan District, Wuhan, Hubei, China

547548906@qq.com

\*corresponding author

**Keywords:** Fashion Design; Biology; Cell Pattern; Aesthetics.

**Abstract:** Obtaining design inspiration from all things in nature is an important method of fashion design. This paper attempts to study the acquisition of new design ideas and modeling materials from biological cells. The aesthetic research based on biological cell patterns is an extension of current clothing fabrics and styles. Exploring, by drawing on the pattern of the cell itself, using biological cell staining and then performing microscopic observations, the cell pattern is incorporated into the design of clothing dyeing, clothing fabrics, clothing silhouettes, and clothing accessories, thereby bringing more variety and richness to clothing design material.

### 1. Introduction

#### 1.1. Background

In the era of rapid development, the economy is prosperous and cultural life is rich and diversified. Fashion consumers are seeking innovation and change, and the demand for personalized clothing is becoming stronger. Fashion practitioners and researchers are constantly exploring new ideas and methods of design. Fashion design is a discipline based on innovation and practicality that has undergone a long period of development and change. Under the background of the rapid development of individual needs today, new ideas in design are explored, and the cross-discipline will graft more diverse and rich results. The organic combination of biotechnology and apparel fabrics and the continuous development of biotechnology have provided new ideas for the transformation and innovation of apparel fabrics. Over time, the mature development of biofabric technology will bring innovation in the field of textile fabrics come to new life.

#### 1.2. Significance

Using the special state of microbial cells in a special environment and the special form of its performance, the clothing textile is used as a medium to present a different "modern beauty". Research on the aesthetic form of biological cells and apply them to clothing style design and fabric pattern design, bringing new inspiration for the diversification of today's fashion design ideas. Incorporate cell patterns into the design of clothing dyeing, clothing fabrics, clothing silhouettes, and clothing accessories, thereby bringing more diverse and rich materials to fashion design.

### 1.3. Research Status

#### 1.3.1. Cell Staining

At present, a large amount of dye sewage was emitted by dyeing and weaving industry and cause a serious threat to ecoenvironment and human health. This problem has attracted attention from home and abroad, and many factories are studying how to alleviate this problem. In the UK, represented by Faber Futures, a new type of dyeing method was first discovered through biotechnology extraction in textile dyeing. The principle of this dyeing is to use streptomyces and other related bacteria for biological fermentation dyeing. This dyeing method will greatly reduce the water consumption compared to the past traditional dyeing process, and saving about 500 times the

water consumption, and biological dyeing does not have any chemicals, which can reduce the pollution of chemical products to the environment. The resident designer of the Department of Biochemical Engineering of University College London once said, "When you put a designer in a biological and scientific environment, you have a new way of thinking, you can catalyze this innovation". She has also been using streptomyces to study biological dyes.



**Figure 1.1.** Fabric dyeing by biotechnology

### 1.3.2. Cell Material



**Figure 1.2.** Clothing made of bacillus subtilis natto

Biologic, the team in the Massachusetts Institute of Technology (MIT) Media Lab, used experiments as a medium and through many of practical discoveries, they finally identified and discovered bacillus subtilis natto. The excellent properties of bacillus subtilis natto are used to study the performance of the bacteria on clothing fabrics. During the research process, it was found that the cells of bacillus subtilis natto are very sensitive to the humidity in the air, and it will change with the humidity in the air change. When the humidity in the air reaches a certain level, the clothing fabric will expand with the change of its humidity. The lower the humidity, the smaller it will be. Used this principle, the designer team used the characteristics of bacillus subtilis natto as the main element of the clothing fabric, and finally developed a clothing called "Second Skin". The characteristics of the clothing is can be changed according to the wearer's body temperature and the humidity environment, so that the breath ability of the clothing becomes better.

Bacillus subtilis natto is a common food material in Japanese cuisine. But the BioLogic team made it into a biofilm suitable for making clothing and put it into spandex fabric. In the special environment of microorganisms, different biofilms have different patterns and shapes, and their performance will also show different postures and performances as the environment changes. Moreover, one of the characteristics of biofilms is that the air permeability effect is directly proportional to the humidity. Under special circumstances, when the humidity of the biofilm reaches 100%, the respiratory system of the biofilm will be fully opened, and the degree of air

permeability will be maximized as the respiratory system is opened.

## **2. Cell Experiment-Take the Observation of Plant Rhizome Cells as an Example**

### **2.1. Instrument Materials**

#### **2.1.1. Instrument**

High power microscope, glass slide, cover glass, petri dish, absorbent paper, dissecting needle, tweezers, etc.

#### **2.1.2. Materials**

Horizontal slices of young apple stems, spinach leaf slices, boxwood leaf buds longitudinal slices, peach branches slices, corn slices, linden stem slices, etc. Meilan dye, gentian purple dye, sudan red dye, etc.

### **2.2. Experimental**

#### **2.2.1. Cell Culture**

Put the plant tissue in saline and stand still. (This step is only needed for a few specimen preparations)

#### **2.2.2. Production**

Wipe the cover glass and the glass slide clean, put a drop of water in the middle of the cover glass, cut the plant tissue with a blade, immerse it in water and flatten it, and cover it with the cover glass to avoid air bubbles under the cover glass.

#### **2.2.3. Staining**

Put a drop of dye solution on one side of the cover glass on the glass slide, suck it with absorbent paper from the other side, and repeat until the specimen is completely infiltrated by the dye solution.

### **2.3. Observation Results**

Place the specimen under a high-power microscope, adjust the appropriate magnification, observe and take photos for recording.

## **3. Cells Constitute Beauty**

### **3.1. The Emergence of Biological Aesthetics**

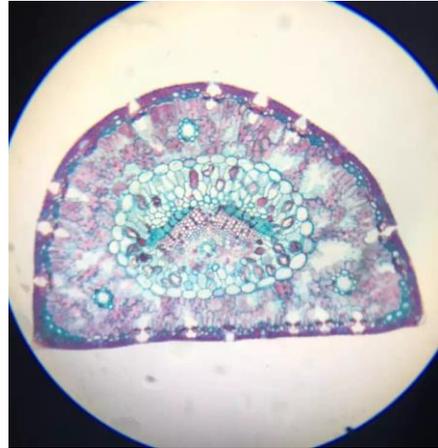
In the early years, people have always excluded aesthetic activities in the material world from the door of aesthetics, and aesthetics is limited to activities in the field of art. The German enlightenment advocate Mengjaton advocated aesthetics as a discipline since the eighteenth century and people began to pay attention to the beauty in the material world. From the beginning of the technological revolution, people's aesthetics thinking have changed. Aesthetics has been redefined on account of human and nature are in harmony. Later, the combination of aesthetics and other disciplines produced more branches, such as technological aesthetics, chemical aesthetics, mathematical aesthetics, and architectural aesthetics. After in-depth study of the physical and chemical beauty, people discovered that life nature has a special beauty that attracts us. At this time, a new discipline came into being-biological aesthetics. Biological aesthetics is to explore the world of life and the beauty of life from the perspective of aesthetics. The beauty is unique and very attractive.

### **3.2. The Beauty of The Composition of Cells**

In recent years, with the gradual development of bionic technology, people have paid more and more attention to the aesthetic value of biology. From the previous Sydney Opera House, designed

based on orange petals, to the Beijing Bird's Nest, more and more applications of bionics have been applied, which shows that the design industry is gradually looking for design inspiration in biology. Taking biology as the theme can also better reflect the current society's global focus on ecological sustainability. As a branch of biology, cytology embodies its unique aesthetic value, bringing new design inspiration to designers, enriching people's aesthetics, and increasing the diversity of market products.

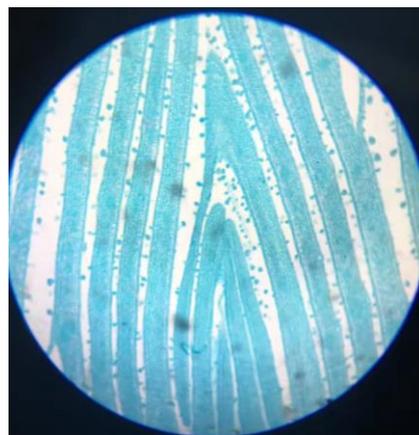
### 3.2.1. Balance Constitutes Beauty



**Figure 3.1.** Cross section of lily anther at young stage    **Figure 3.2.** Cross section of pine needles

Because the balanced thought of "the Golden Mean" in Chinese "Confucianism" thought makes people more fond of balanced things, and many things in nature are in a balanced state, it is very important to create a sense of balance when modeling. Balance brings people visual satisfaction and leaves a deep impact on people. In traditional structural design, balance gives people a sense of stability and balance. Since ancient times, under his ideological concept of "Symmetrical Beauty", the concept of "Symmetrical Beauty" and the artistic value it brings have penetrated into various fields and exerted its own value. The picture of Figure 3.1 reminded butterflies. With the central axis as the line of symmetry, the left and right structures and shapes are symmetrical. Even the patterns and colors on the thin are symmetrical, and they all exist in even pairs. The picture of Figure 3.2 is also a symmetrical shape, which is of great aesthetic value.

### 3.2.2. Repetition Constitutes Beauty

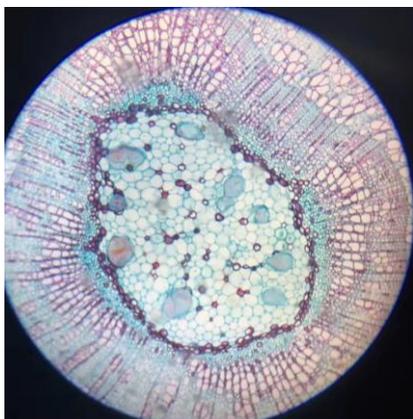


**Figure 3.3.** Cross section of wheat stem    **Figure 3.4.** Longitudinal cut picture of eupatorium

The unit used to repeat in the repetitive structure is called the basic type. The basic type is generally a simple structure that forms different patterns through different permutations and combinations. Ordinary basic repetition is monotonous, and if used improperly, it will give people a boring and "empty" feeling; but this basic form itself has a sense of beauty, if it is matched with a reasonable layout, it will bring people unlimited imagination force. The repetition of these two cells

is not a single repetition. The Figure 3.3 is a circle through different sizes and arrangements, and the color changes make the whole picture look very harmonious; while the Figure 3.4 is a linear arrangement and combination, but it is not Simple arrangement, it changes size and direction at the same time to form a different aesthetic feeling. On the whole, both of these can give people a visual impact.

### 3.2.3. Launch Constitutes Beauty



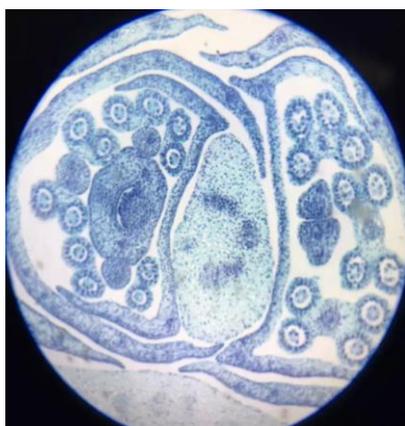
**Figure 3.5.** Transverse section of three-year-old stem of tilia amurensis



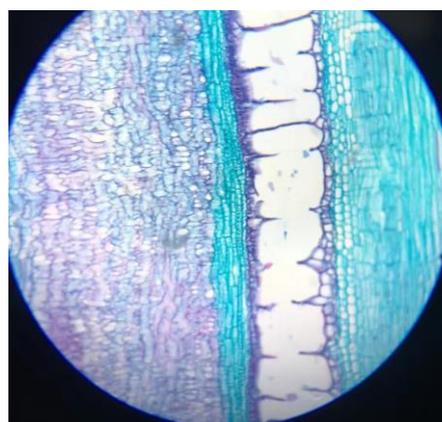
**Figure 3.6.** Cross section of young stem of sunflower

Emission phenomena are very common in nature, such as the opening of flower petals and the spreading of the sun's rays to the surroundings. Launching things often give people a feeling of unrestrained and lively. This is because launching has a certain regularity. With the launching center as the focus, the image objects are regularly launched from the center to the surrounding direction or gathered from the surrounding to the center direction. This emission phenomenon can bring a strong sense of visual movement. The Figure 3.5 belongs to the center emission, which is launched from the dense cell structure in the middle, and the Figure 3.6 belongs to the concentric emission. This kind of emission takes the center as the focus and surrounds layer by layer, like a "spider web." This concentric circle surround makes the pattern more intense. Adding color changes to the composition of these two pictures at the same time can give people a strong visual impact when used on clothing.

### 3.2.4. Uniqueness Constitutes Beauty



**Figure 3.7.** Cross cut picture of broad bean leaves



**Figure 3.8.** Cross cut picture of peach leaf of bamboo

People are often interested in something unique and think that it is more unique, contrary to the usual rules, giving people a novel feeling. The formation of peculiar composition just caters to the rebellious psychology of people in a certain group of people to behave. Peculiarity refers to

deliberately breaking the original order in ordinary patterns, making individual basic elements stand out, and breaking the inherent laws in people's hearts. The Figure 3.7 is an irregular arrangement and combination. It makes people look bright and has a strange beauty although it looks messy. The Figure 3.8 shows a large element in the overall small unit, which is kind of the feeling of standing out from the crowd highlights the middle elements, and the overall look is harmonious. There are not a few specific components in the cell, highlighting their special features.

#### 4. The Application of Cells In Clothing

Tiny cells construct harmony and order in nature. Each stage of cell growth, whether it is growth, division, or death, has a different shape and beauty.

##### 4.1. Cell Pattern



**Figure 4.1.** Fabric with cell pattern printing pattern

Foreign designers learn from the pattern of cells and print them as printed patterns on clothing. Silk fabrics are dyed with dye diffusion and dyeing technology to form this cell-like pattern, and different cells will have different patterns, which can not only be used in silk fabrics, it can also achieve unexpected aesthetic effects when used on other clothing fabrics. This cross-border combination gives people a new visual enjoyment.

##### 4.2. Cell Profile



**Figure 4.2.** Clothing modeling designed according to cell morphology

The famous esthetician Rudolf Arnheim once stated that "Vision is the most basic tool of thinking" and "Art is a visual form and the visual form is the main medium that creates thinking". The beauty of the cell tissue morphology can be used for reference on the outer shape of the clothing. As shown in Figure 4.2, the color and shape of the cells are created on the clothing, and the exaggerated shape is designed, which is a different kind of biological beauty. Therefore, we can design the outer contour of the garment by the tissue morphology of the cells used.

#### 4.3. Cellular Fabric Reconstruction



**Figure 4.3.** Fabric reconstruction based on cell pattern

Fabric reconstruction is the redesign of original fabrics, or the innovative reconstruction of other materials onto ordinary fabrics, so as to enrich the types and patterns of fabrics. Cell patterns can also be used to create creative inspiration for fabrics. For example, the cell-themed fabric transformation in the picture Figure 4.3, the bright and bright macaron color system with cell texture, is interesting and beautiful.

#### 4.4. Cell Jewelry



**Figure 4.4.** Accessories created according to cell morphology

In an environment where people live in harmony with nature, people use technology as a medium to learn from the "natural art" in nature and extract all available elements through their infinite knowledge of nature and expressed in material form. In the microbial world, Seulgi Kwon, a contemporary jewelry designer from South Korea, uses jewellery as a medium through cell shape,

internal structure, and external morphology, and incorporates it into the accessory design through organic combination, and through color matching form and special changes in environment show the role of the organic movement and posture of cells and microorganisms in accessories. The main material used in this group of accessories in the picture Figure4.4 is silica gel.

## 5. Summary

In human history, there are various kinds of beauty in various fields of society, nature, art, and science; although their manifestations, appearances, and characteristics are different, but the essence of beauty Are the same. Rodin said, "There is never a lack of beauty in life, but the lack of eyes to discover beauty." There are many things worth learning in nature, especially in the field of our design. Nature will bring us many unexpected inspirations. We have to learn, explore, and comprehend the enlightenment of nature and the real society, so that our aesthetics can be improved and sublimated step by step. Looking at the world, all countries are exploring innovations in fashion design, and the research on biological clothing has just started. It is a new point to get inspiration from biological cells. Beauty comes from nature, and "learning from nature" has gradually and profoundly influenced contemporary fashion world.

## References

- [1] Jibin, Liu. (1995) Preliminary study of biological aesthetics. Journal of Jiujiang Teachers College (Natural Science Edition), 14(5): 88-91.
- [2] Xiang Zhou, Juan Shi. (2011) Brief analysis on the beauty of composition of ornamental insects. Chinese Journal of Nature, 33(01): 48-53+64-65.
- [3] [https://www.sohu.com/a/330808513\\_120252270](https://www.sohu.com/a/330808513_120252270). (2019) Found fashion design clothing and biological. 08, 01.
- [4] [http://blog.sina.com.cn/s/blog\\_a39d494c0102w22h.html](http://blog.sina.com.cn/s/blog_a39d494c0102w22h.html), (2015)Biotechnology new product: Bacteria can also be used to make clothing.11, 04.
- [5] Rudolf, A. (1997) Visual Thin King. FL: Un iversity of California Press, 22-23.
- [6] Xin Yang, Lin Gan, Rongkai Liu. (1989) Outline of Aesthetic Principles. Beijing: Peking University Press, 157-171.
- [7] Nan Yu. (2017) Study on the law of construction art in graphic design. Heilongjiang Science, 8(16): 114-115.
- [8] Shiqi Huang, Yu Zeng. (2020)Aesthetic characteristics of plane composition in design style- cite an example of ZINE's culture. Chinese & tural Science, 16: 244-244.
- [9] Dakai Wang. Modern design language of dress pattern. (2010) Times Literary, 01, 158-159.
- [10] Xue Zhang. (2016) The application of chinese traditional dress pattern in modern dress design. Art Science and Technology, 1,146-146.
- [11] Ke Xu. (2015) Analysis on the Composition of Fashion Style Beauty. Shandong Textile Economic Journal, 3, 24-26.