

## 과학기술에 의한 예술원소의 확대에 관한 통시적 연구

The diachronic study of the expansion of artistic elements by science and technology.

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## 목 차

1. Introduction
2. Art Category and Art Elements
  - 2.1 Division and analysis of art categories
  - 2.2 The current status of artistic elements
3. A Chronological Analysis of Art Elements
  - 3.1 points, lines, areas
  - 3.2 Space
  - 3.3 Color, tone and texture
  - 3.4 Form
  - 3.5. Time, sound, light, montage
4. Conclusions and recommendations
- References

## Abstract

Art has always been in the process of dynamic evolution. There is no recognized definition, classification, or even basic elements of art. Today, when all fields are combined with big data and artificial intelligence, the establishment of the underlying basic concepts that constitute art appears to the future development of art seems especially important. In today's solid and rapid development of science and technology, borrowing the relatively objective and rational perspective of science and technology, by using literature research, combining, and reasoning methods to interpret the basic concepts of art, so that perceptual art research can get the same knowledge in the industry. Throughout the history of art development, we can see that technology will participate in developing and transforming art as it grows along with its logic. Specifically, the development of science and technology has strongly confirmed the emergence of new art elements (this is not to say that technology has produced new art elements). The add

ition of this newly established art element will promote the development of modern art forms deliver. This paper takes time as the mainline, combs and analyzes the historical evolution of eight art categories, and establishes architecture, music, painting, sculpture, poetry, dance, drama, and film as art types. The integration and analysis of related theoretical articles on art elements proposed internationally offered to add "Dot" and "Montage" as two new elements, establishing a total of twelve art elements. By explaining the expansion of art elements by technology, it promotes the transformation and development of art.

**keyword**

Technology, Artistic Elements, Art Types,

**논문요약**

예술은 줄곧 동적으로 진화하는 과정 중에 있다. 지금까지 예술에 대한 공인된 정의나 분류, 심지어 기초원소도 없다. 각 영역에서 빅데이터와 인공지능이 결합된 오늘날, 예술을 구성하는 밑바닥 기초 개념이 확립되는 것이 예술의 미래 발전에 대해 중요하다. 과학기술이 갖진 객관적이고 이성적인 시각을 통해 문헌연구 및 추리하는 방법으로 예술의 개념을 해독하며 감성적으로 나오는 예술연구를 업계에서 공통의 인식을 받게 바란다. 예술 발전사를 보면 자신의 논리에 따라 발하는 전시 과정 중, 과학 기술은 예술의 전시와 변혁에 참여할 것이다. 과학 기술의 발전은 새로운 예술 원소를 추진시키는 바를 증명했기 때문이다. 여기서 과학기술은 예술적 요소를 만든다는 것이 아니라 예술적 요소가 확립되어 다시 새로운 예술적 형식을 탄생시키는 것이다. 이 글은 시간을 주선으로 하고 역사 연혁에 대해 빚질 및 분석하며 건축, 음악, 회화, 조각, 시무, 연극, 영화까지 총 8개를 예술유형을 확립되었다. 세계에 제시된 예술적 원소에 관한 이론적 문장을 통합 및 분석하여 '점'과 '몽타주'를 두 가지를 새로운 원소로 추가하다는 주장하여 총 12개의 예술 원소를 확립했다. 이에 따라 과학기술이 예술 원소에 대해 확대시켜 예술의 변혁과 발전을 촉진하고 있다.

**주제어**

과학 기술, 예술 원소, 예술 유형,

**1.Introduction**

Humankind's an exploration and art research has never stopped. However, so far, there is still no recognized definition of art, and there is no recognized standard for the classification of art. The research results on the basic elements that constitute art are also very few. Today, when all fields are combined with big data and artificial intelligence, the establishment of underlying basic concepts su

ch as art elements and art types is particularly important for future artistic development. Technology and art started at the same starting point. They are both concentrated expressions of human creativity and civilization. In their respective development, they gradually differentiated due to different ways of thinking and social division of labor. However, technology and art have always been regarded as the product of the two modes of thought. They are even regarded as the representative of the opposite of human sensibility and reason. Analyzing the relationship between

the two from the perspective of dialectics, the relationship between technology and art is complementary. That is, technology provides strong support for art and promotes the development of art; art as the spiritual demand of people also inspires and guides technology's direction of development. There are many types of research on the influence of a certain key node in the development process of science and art history on art. Still, there are fewer related researches on the expansion of specific art elements from science and technology and fewer systematic studies on developing art elements from science and technology. The evolution of art elements by technology has long been in a fragmented, discontinuous state of research.

## 2. Art Category and Art Elements

2.1 Division and analysis of art categories  
Art is like science and technology, and each has its research object. However, through an exploration of the etymology of "art", we find that most Eastern and Western arts refer to technology, craftsmanship, material production, or general practice. There was unity between the original art and global production and technology. The boundaries and categories of art are continually expanding with the development of society. The term "art" does not have a static and invariant feature<sup>1)</sup>. Art in ancient Greece generally refers to all human activities, including what we know today, science and technology and handmade art. The concept of "free art" emerged during the ancient Roman period. Among the nine art subjects listed by Faro: grammar, rhetoric, dialectics, geometry, arithmetic, astronomy, music, medicine and architecture, and lat

er passed through Kepler and Sykes Six is adjusted to six types. From about the 4th century AD, grammar, rhetoric, logic, arithmetic, geometry, music and astronomy were fixed as "seven arts" and became the standard course of higher education in Europe<sup>2)</sup>. During the Middle Ages, the academic world divided the "seven arts" into three university subjects (grammar, rhetoric, logic) and four university subjects (arithmetic, geometry, astronomy and music) based on predecessors. San Victor's Hugo added seven other crafts (including drama) based on seven free arts. During the Renaissance, the humanities research was expanded based on three university subjects (grammar, rhetoric, logic), among which Poetry has increased, and at the same time painting, architecture and sculpture have emerged as a group. In the 17th century, the European cultural centre was transferred from Italy to France and established schools of painting, sculpture, architecture, music, and dance in France, including science and other cultural branches. At this time, science and art began to have a clear distinction. The art systems proposed by Pei include eloquence, poetry, music, architecture, painting, sculpture, and optical and mechanical mechanics<sup>2)</sup>. Francois Blondel's paper published in 1765 listed architecture, poetry, eloquent, comedy, painting, sculpture, music, and dance as art<sup>3)</sup>. In "Lectures on Aesthetics", Hegel put forward the "five arts" of "architecture, sculpture, painting, music, poetry". The Italian poet and film pioneer Ricciotto Canudo (1911) published the film "The Birth of the Sixth Art" as the sixth-largest art after architecture, sculpture, painting, music, poetry. Later, he felt that dance was born so long, and it should be counted, so he made the film seven

nth. Ricciotto Canudo believes that the film synthesizes the above six significant arts to form a plastic art in motion. Then the drama was added as the "eighth art". At this point, the so-called "eight major arts" category began to appear. From the dynamic changes of the above art categories, we can see that the categories, categories and specific expressions included in "art" are continually changing, and new forms and categories of art are updated continuously and emerging.4) Technology has expanded the expression and creation methods of art, and at the same time has subtly influenced the ideas, concepts, and methods of art, and changed the state of the entire art ecology 4). There is no authoritative statement about the art classification 5) 6) 7), and the above clue is that a more convincing taxonomy can be found through literature research. Although the emergence of these views has not been unanimously recognized by the industry, as in an era of rapid development, we should take the initiative to meet the extension of the expanding art concept. This article tries to use eight art categories of this clue: architecture, music, paintings, sculptures, poems, dances, movies, dramas, and classification analysis.

Now through Wikipedia's expression of art classification: According to the different means and methods of expression, it can be divided into performance art, visual art, language art, and comprehensive art; according to the nature of time and space, it can be divided into time art, space art, and comprehensive art. The author agrees with the latter classification method. If the above eight types of art are shown in Table 1 according to the nature of time and space

<Table 1> The distribution of art types in time, space and comprehensive elements.

Space Element Art	Time Element Art	Comprehensive Element Art
Painting	Music	Film
Sculpture	Dance	Opera
Architecture		
Poetry		

## 2.2 The current status of artistic elements

Artistic elements refer to the basic units that constitute artistic works. First, let us look at the current research status of cultural aspects. Perhaps because researchers believe that the factors involved in artistic creation are relatively subjective, there are currently fewer relevant academic papers that take artistic elements as research objects. Still, through the Internet, it can be seen that more of the art elements are expressed and tracked by some training institutions. The source can be seen and found, these sources all point to the proponents of visual design elements 8) 9). Painter and design theorist Maitland E. Graves (1902-1978), who attempted to gestate the fundamental principles of aesthetic order in visual design<sup>10)</sup>, in his book, *The Art of Color and Design* (1941), defined the elements of design as line, direction, shape, size, texture, value, and color, concluding that "these elements are the materials from which all designs are built."<sup>11)</sup>The J. Paul Getty Museum in Los Angeles, California, USA, is an art museum. The art elements they defined do coincide with visual design elements at a high rate: lines, shapes and forms, space, color, texture<sup>12)</sup>; In the art system of the former Soviet Union and China, artistic elements are usually referred to as artistic language.

This view holds that: any art has its unique ways and means of expression, using unique material media To carry out artistic creation, which has unique aesthetic characteristics and cultural characteristics. This unique way of expression or means of expression is called artistic language<sup>13</sup>). This party believes that the artistic language that forms an artistic work is mainly composed of visual vocabularies (i. e. cultural elements) such as shape, light and shade, color, space, material, and texture<sup>14</sup>). It can be seen from the listing of art elements by the above institutions and individuals that the focus of the early academic circles on art elements mostly fell on space art. The author believes that the Victorian Curriculum and Assessment Bureau published in recent years (2017-2021)<sup>15</sup>) has a more comprehensive and scientific definition of artistic elements. What they define is 1. Line 2. Colour 3. Tone 4. Texture 5. Shape 6. Form 7. Sound 8. Light 9. Time. Obviously, the artistic element proposed by the United States has added the cultural component of time compared with previous studies. The latest method of statistical induction can be summarized in Table 2.

<Table 2> Current research on artistic elements

Institution or individual	Art element									
The J. Paul Getty Museum	Line	Shape	Form	Space	Colour	Texture				
Victorian Curriculum and Assessment Authority	Line	Shape	Form		Colour	Texture	Tone	Sound	Light	time
Wang zongtai				Space	Colour	Texture	Tone			

From Table2, we can find that many of the artistic elements proposed by the concept have similar options, and of course, there are some differences, but the "dot" as a most basic artistic element has not been mentioned. The author expressed deep doubts. The dot is used in geometry and modeling. The most basic components have a very close relationship with lines and shapes. The movement of points forms a bar, and the direction of lines creates a surface (figure). So here, I added the issue as the missing art element to the list of art elements. Among the design elements similar to artistic elements, "dots" are among them<sup>11</sup>). Another artistic feature that needs to be added is "montage".With the emergence of film art, the participation of "montage" as a unique element, Eisenstein's monograph "On Montage," writes that "the juxtaposition of two shots and their internal conflicts will produce a third factor – Describe the evaluation and viewpoint of things". Therefore, the artistic elements assumed in this article integrate the above ten items: 1. Line 2. space 3. Colour 4. Tone 5. Texture 6. Shape 7. Form 8. Sound 9. Light 10. Time adds "point" and "montage" two items total of twelve articles. If we control the space-time classification to classify the art elements, we can get Table 3

<Table 3> The distribution of artistic elements in space and time

Space element	Time element
Point	Sound
Line	Time
Shape	Light
Space	Montage
Colour	
Tone	
Texture	
Form	

In human philosophy and science development, we have continuously expanded and iterated our understanding of time and space. The interpretation of "time and space" in Chinese dictionaries is as follows: the basic form of physical existence in motion. Time is the continuity, interval, and sequence of the movement of matter, and space is the extension and extension of value. Time is characterized by one-dimensionality, that is, irrever-

above elements in the space-time range of the artworks, the static three-dimensional space elements are easier to understand in this table. In contrast, the many art elements in the one-dimensional time are relatively unfamiliar because they appear late. Still, the two art forms of music and dance were produced almost simultaneously as human civilization. The time dimension has been neglected, just like the air in our lives. From the above research on the current art elements, we can also see that "sound, time and light" as a dynamic time element; it is the list of artistic features being implemented (2017-2021) and being implemented by the Victorian State Curriculum and Assessment Agency.

If we focus on the "eight major arts" categories mentioned above and the existing twelve artistic elements, we can draw the following table 4.

<Table 4> Distribution list of art elements in eight art types

Due to space reasons, it is impossible to li-

Art element	point	Line	Colour	Space	Tone	Texture	Shape	Form	Sound	Light	Time	Montage
Architecture	○	○	○	O3D(inside)	○	○	○	○				
Music								○	○		○	
Painting	○	○	○	O2D	○	○	○	○				
Sculpture	○	○	○	O3D (outside)	○	○	○	○				
Poetry								○				
Dance							○	○			○	
Film	○	○	○	○	○	○	○	○	○	○	○	○
Opera	○	○	○	○	○	○	○	○	○	○	○	

sibility and area are characterized by three-dimensionality. Time and space are inseparable from the movement of matter. No time and space leave matter and matter movement, and no case leave time and space. Focusing on the classification of the art mentioned

st the elements of various art forms one by one. The point of this article is that each art category is different due to the other aspects of the art. From the above table, we can see that various art categories have different compositional art elements. It should be note

d that the basic elements of architecture, sculpture, and painting in the list are the same. Still, it should be pointed out that the "space" element here is different between two-dimensional and three-dimensional. The artwork is displayed in two-dimensional space, while architecture and sculpture are three-dimensional-space manifestation. In the same t

rding to time and space, Table 5.

<Table 5>Classification of Art Elements in Integrated Art in Time and Space.

Whether in a movie or a drama, 1.point, 2.space 3.Colour 4.Tone 5.Texture 6.Shape 7. The form that makes up their space art part should not be difficult to understand. We can assume the stage layout, and these elemen

Art element	point	Line	Colour	Space	Tone	Texture	Shape	Form	Sound	Light	Time	Montage
Film	○	○	○	○	○	○	○	○	○	○	○	○
Opera	○	○	○	○	○	○	○	○	○	○	○	
	Space element								Time element			

three-dimensional architecture and sculpture, architecture pays more attention to its closed internal area, while sculpture pays more attention to its volume of external space; music and dance have similar components, and both have time elements (continuity, interval, and Sequential) This is not difficult to understand, both also have form elements. The form of music is reflected in the combination of notes, and the state of dance is reflected in the variety of movements. The difference is that dance requires space, and music requires the participation of sound elements. Among the eight art categories, poetry is an independent language art and a relatively special type of art. The formal aspects of poetry are expressed in different choices and combinations of words, words, or sentences. A talented poet can use words that most people are familiar with every day to make an amazing poem. Drama and film are art types with richer constituent elements. They belong to comprehensive art. According to the classification of time and space, complete art is divided into two parts: space art and time art. If the art elements are also classified acco

ts are in the set in the movie studio. In the art part, we believe that both drama and telephone require continuous lighting or intermittent flashing lights when creating an atmosphere. Both also need background music to enhance the atmosphere and steady physical performance of actors or consistent language interpretation. The continuity of the plot of the story is the embodiment of the time element. If there is no montage added here, then the two art forms will not find the essential difference. The montage in the film refers to "the juxtaposition of two shots, and their internal conflict will produce a third factor—the evaluation and perspective of the narrated things," Eisenstein wrote in his monograph "Montage."

### 3. A Chronological Analysis of Art Elements

We put those mentioned above twelve artistic elements into the long river of time and interpret them one by one. Technology and art started at the same starting point. They are both concentrated expressions of human

creativity and civilization. During their respective development processes, they gradually differentiated due to different ways of thinking and social division of labor. Still, technology and art have always been regarded as the product of the two modes of thinking is even considered as the representative of the opposite of human sensibility and reason. Analyzing the relationship between the two from the perspective of dialectics, the relationship between technology and art is complementary. That is, technology provides strong support for art and promotes the development of art; art as the spiritual demand of people also inspires and guides technology's direction of development. Because of its more emotional elements, art is not conducive to proving its basic elements. However, it can be established that a factor in art is relatively more important by using relevant statements put forward by an institution or authority in the scientific and technological field with relatively strong rationality.

### 3.1 points, lines, areas

In ancient Greece, geometry was produced by scientifically measuring land. Geometry is the science of studying shape. In the process of studying the shape, it is necessary to use the "points" and "lines" that make up the "shape". Euclid explained the geometry in two-dimensional planes and three-dimensional spaces in his "Geometry", which is based on the assumption of points, lines and planes. A point where the line is the intermediate state connecting the point and the surface, the line is the art element defined by the point moving in space, it is usually used to define the edge of the shape. The edge lines that define the outline of things and the lines used to write the symbols, as one of the earliest e

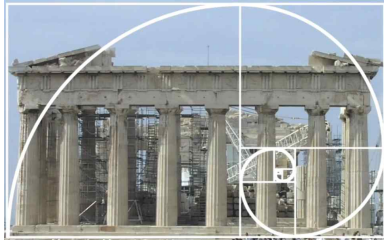
xpressions of the primitive people, in ancient Egypt and ancient Greece, people realized its value in their way<sup>16</sup>). In his book "Points, Lines, and Surfaces", Skye detailedly analyzed the relationship between points, lines, surfaces in geometry and points, lines and surfaces in art. She made a lot of correspondence and analysis. Among them, the geometry part is more based on the concept of points, lines, and surfaces based on Euclidean geometry.

At the same time, under the influence of the second proposition 11 of Euclidean "Geometry Original", the application of the golden section theory represented by Pythagoras to art has a more direct impact on artistic creation. The golden section theory establishes a theoretical and rational basis for the proportion of shapes in two dimensions. Ancient Greek time artists were particularly fond of the "golden section" principle in art creation to divide the entire picture and arrange the visual centre. The German philosopher Chasing (Chasing) formally put forward the principle of "golden section" in his two works "New Theory of Human Body Balance" and "Principles of Aesthetics" and elaborated on it theoretically. At this time, the Parthenon Temple in Greece and the famous ancient Greek marble statue "Venus with Broken Arms" unearthed on Milos Island in the Aegean Sea in 1820 skillfully used the rule of golden section<sup>17</sup>). To give people overall harmony and charming beauty, the golden section rule has laid a scientific foundation for the proportion of lines and surfaces in the two-dimensional space of artistic creation.

In the period of ancient Greece, the emergence of geometry and the application of the golden section theory laid a scientific unders

tanding for the establishment of the three essential elements of art elements: point, line, and surface (shape).

<Fig. 1> The relationship between badinon temple and golden section



<Table 6> The establishment of three artistic elements: point, line and surface

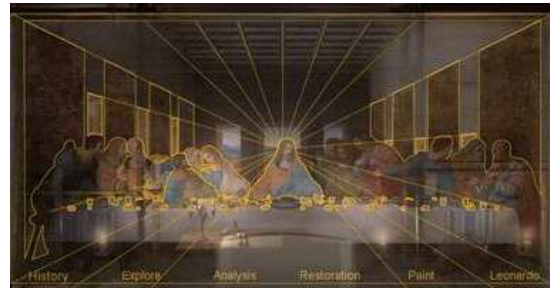
Time	Representative	Representative technology	Artistic elements
Fourth Century B	Pythagoras	golden section	Point, line, shape

### 3.2 Space

During the European Renaissance, Western basic disciplines have significantly been developed compared with medieval times. In 1435, the Italian painter, architect, mathematician, and writer Alberti published the book "The Theory of Painting", focusing on the perspective of perspective geometry. The painting method was scientifically systematized. Art at this time has also entered a crucial period of succession. As the head of the "Three Masters" of the Renaissance, Da Vinci has a wide range of explorations. He is a perfect combination of science and art. He studies how to apply geometry, perspective anatomy and others to the paintings. In order to bring the objects in the depiction from the individual structure to the physical space closer to space and things that our daily eyes see Da Vinci's work, The Last Supper is a typical representative of the perspective of space in this period.

The relationship between space and architecture and sculpture is a natural combination. Space is intangible and infinite. We need to define a limited space through tangible entities. Architecture focuses on the composition of internal space, while sculpture focuses on the composition of external space. The limited space is the inner space, and the space that defines it is the outer space. Therefore, the inner space and the outer space are limited spaces, and the difference between them is only relative<sup>18)</sup>. For example, the American Statue of Liberty, as a sculpture, defines infinite space as a limited space through the use of tangible entities. The body of the goddess limits the external space; as architecture, the body is a tangible entity that limits the internal space.

<Fig. 2> An analysis of the application of spatial perspective in Leonardo da Vinci's last supper



<Fig. 3> The American goddess of liberty is a model of the comprehensive application of sculpture and architecture to space



<Table 7> The establishment of space as an artistic element

Time	Representative	Representative technology	Artistic elements
14th Century A.D.	Da Vinci	Perspective anatomy	space

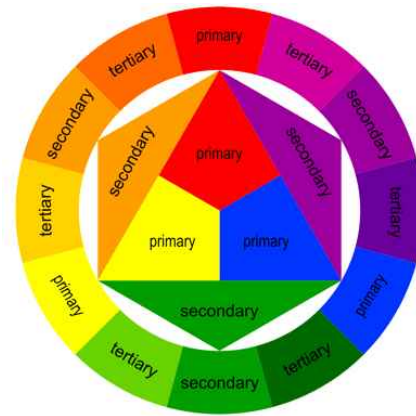
### 3.3 Color, tone and texture

#### 3.3.1 Colour and tone

In the 1660s, Newton discovered that light was composed of seven colours through a prism. By the early 19th century, French chemist Schaeffler's book "On the Coordination of Simultaneous Contrast between Colors and the Inherent Color of Objects" became a painter's essential basis for exploring and expressing colour. The emergence of optical and chromatic theories has made painting enter a new stage of colour expression. The emergence of these theories has given artists a systematic understanding of the attributes of colour (hue, lightness, purity). At the same time, the emergence of tin tube technology allows artists to move their creations that were limited to indoors to the outside. Artists have focused their attention on the depiction of external light. This significant change in art history has brought art to the modern art period. The Impressionist painters represented by Monet solved the problem of the reproduction of light colour, and the new impressionism represented by Seurat was based on the sensitive light colour of impres-

sionism and realized a nearly scientific analysis of the colour composition. He follows a scientific and rigorous approach to artistic creation. Representative works include Monet's "Rouen Cathedral" and Seurat's "Sunday Afternoon on the Big Bowl Island". We know that light and colour are intimately connected. Without light, there is no colour. The intensity of light directly determines the production of light and shade. It is beyond doubt that optics and chronology directly establish the production of "colour" and "value" in artistic elements.

<Fig. 4> Color



<Fig. 5> Tone



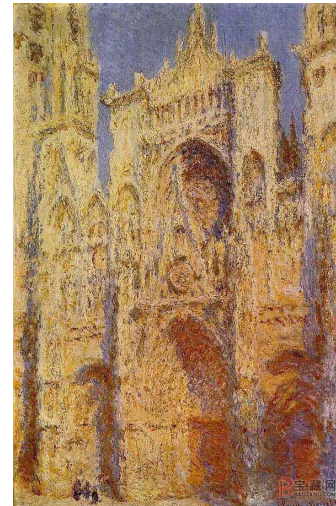
#### 3.3.2 Texture

Through the etymology, "Texture" is considered to be "texture" and "texture" related to touch, but here we prefer "texture" because objects of the same texture will produce different surface effects due to different processing methods. The texture does not exist indep-

endently, and it belongs to the detailed treatment of modelling, which is equivalent to the material selection and surface treatment of the product. As early as the late 19th century, under the influence of photography technology and the industrial revolution, Impressionist artists valued colour and despised form and space. At the same time, because of the large number of artificial objects that went out to sketch into the artist's creative vision, the "materials" of the artificial materials vary. Different tactile sensations are generated due to the different arrangement, structure, and organization of the surface of the material. Tactile sensations are divided into sensory tactile sensations and visual, tactile sensations. Visual, tactile sensations are the direct response to visual texture. The visual texture is mainly derived from the texture of objects with the participation of light affects—the visual perception produced by shape, colour and smoothness<sup>19</sup>). Therefore, artists in the later period of Impressionism paid more and more attention to the arrangement (side by side, cross or overlap) and distribution of brushstrokes when expressing things through painting, and even used the thickness of the paint when painting to distinguish the difference in the hue of adjacent areas on the screen. This indirectly led to the appearance of "Texture" in the artistic elements. Post-Impressionism Van Gogh's work "Starry Sky" is a representative work of this period; "Texture" as an artistic element is more direct evidence that Picasso in work "Wicker Chair" "Still Life", he implanted ready-made objects into the picture for the first time. Discussing the "texture" that can trigger visual haptics as a new point of view of plastic art elements began in the 20th century. One of the concrete

manifestations was the tactile manifesto issued by the future mentor Malevich in 1921<sup>20</sup>).

<Fig. 6>Monet, an impressionist painter, began to pay attention to the expression of texture elements in Rouen cathedral



<Table 8>The establishment of color, tone and texture as artistic elements

Time	Representative	Representative technology	Artistic elements
19th Century A.D.	Newton	Optics and color science	Color, tone, texture
Impressionist Period	Michel Eugène Chevreul		

### 3.4 Form

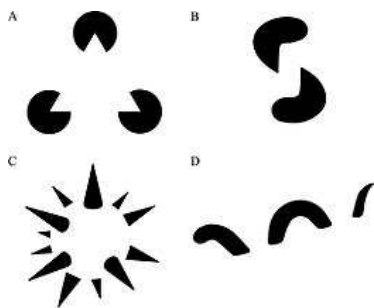
The German Gestalt School at the end of the 19th century (German: Gestalttheorie) is one of the important schools of psychology, also known as Gestalt Psychology. Three German psychologists by Marcos Wetmer (1880-1943), Wolfgang Keller (1887-1967) and Kurt Kaufka (1886-1941) based on the study of the phenomenon of movement Founded on. Gestalt is a transliteration of German Gestalt, which means "pattern, shape, form", etc. These theories are also called the principle of Gestalt in visual perception. Gong Bu Lixi's book "Sense of Form" systematically introduces t

he connection between the principle of Gestalt and the "form" of artistic elements. Gestalt psychologists believe that these principles exist because the brain is inherently able to perceive patterns in stimuli according to certain rules. These principles are divided into five categories: proximity, similarity, continuity, closure and connectivity.

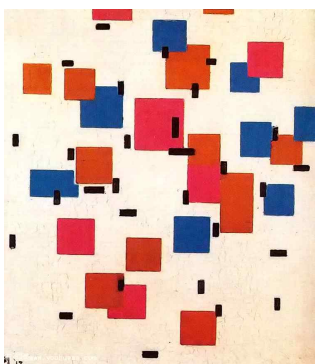
Gestalt psychologists argued that these principles exist because the mind has an innate disposition to perceive patterns in the stimulus based on certain rules. These principles are organized into five categories: Proximity, Similarity, Continuity, Closure, and Connectedness<sup>21</sup>).

Mondrian's mature works are representative works of rational abstraction, also known as cold abstraction.

<Fig. 7> Visual Gestalt in Gestalt Psychology



<Fig. 8> Mondrian's early cold abstract works are influenced by Gestalt Psychology



<Table 9> The establishment of form as an artistic element

Time	Representative	Representative technology	Artistic elements
19th Century A.D.	Marcos Wetmore et al.	Gestalt psychology	Form

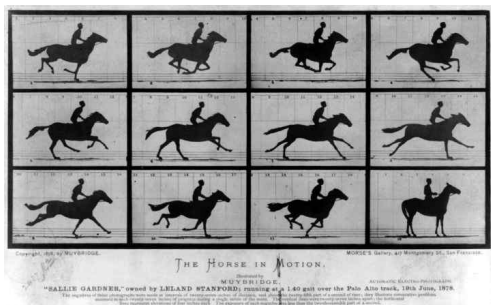
### 3.5. Time, sound, light, montage

#### 3.5.1 Time

Discussing "time" as an independent artistic element is abrupt here because time has been running between heaven and earth since the beginning of human consciousness. Time is also naturally integrated into the creative process of dance, music, opera and other arts, and it is easy to be overlooked. The author believes that time and space have a double identity. It is both an artistic element and a new dimension. After art enters the time dimension, the "sound" accompanying music has a reasonable identity as an artistic element; at the same time, "time" can be distinguished from various static arts. Mohori Naki and Alfred Ge Alfred Kemeny mentioned in 1922, "Dynamic Composition Depends on Various Forces" mentioned that we should replace the static principle of ancient art with the principle of motion. The earliest recognized "sports" work was an active sculpture composed by Alexander Calda in 1931 using the principle of balance between vibrator and mechanics. However, the production of the film is the most persuasive evidence. The film is composed of dynamic photos. Twenty-four pictures are played in one second. The human eye will be regarded as a coherent process due to the phenomenon of visual persistence. The film participates in the film through 1/24 second of each picture as the basic unit of the film and further explains the establishment of

the identity of "time" as an element from the perspective of technology. A powerful practitioner of this theory is the British photographer Eadweard Muybridge. In 1872, he was invited to help solve the problem of the position of the horseshoe in the running. In 1877, he studied a mechanical system and took consecutive photos of the running horse, so that we can see the image of the running horse's four hoofs. This experiment by the photographer made us realize that "photographs can not only see the reality but also stay in time". Time gives the continuity of works of art.

<Fig. 9> In 1877, for the first time Eadweard Muybridge took a series of pictures of the running horse.

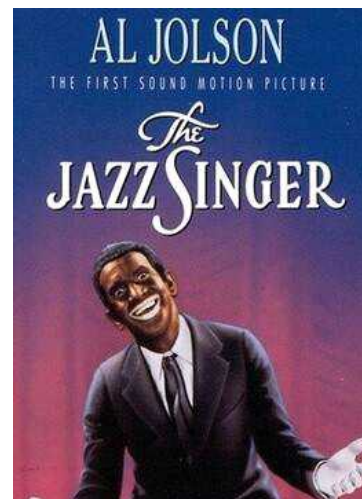


### 3.5.2 Sound

In August 1877, Edison invented the phonograph, which was called "the talking machine" at that time. Since then, the film has experienced a leap from silent to sound. In 1900, the first sound film was screened in Paris. At this time, the dubbing was still immature. Most of them arranged a small band to play or play some recorded sounds with the help of playback equipment. In October 1927, the first sound feature film "Jazz Singer" was released. While enjoying the movie screen, the audience could also hear all the "sound" elements in the play (including music). People began to realize the unique charm of music ("

The aesthetic value of film and television music "Wang Liming) Page 2 lines 15-17) At this time, the soundtrack and soundtrack in the film stripped the artistic element of" sound "from its natural parent" music "art. In the film," music "is As a part of "sound", "sound" as an independent element and visual elements together form the "audiovisual" art.

<Fig. 10>The first audio feature film, Jazz Singer, directed by Alan Crossland, is released in the United States on October 6, 1927



### 3.5.3 Light

The participation of light as an artistic element in artworks can be cut from photography. Photography is not in the scope of the art we discuss, but it has been involved in artworks as a unit in movies (moving photos) since 1839. The attention and application of natural light began with architecture. The famous British architect Rogers believed that "architecture is a container to capture light." However, light, as an artistic element, participates in artistic creation, starting from the way of electricity. It is also directly related to Edison's invention of electricity and electric light, which directly leads to a new art form-lighting installation art, also known as lig

ht art. At the same time, the emergence and development of optoelectronic technology have much promoted the form of light. In 1920, Naum Gabor linked the metal rod with the jittering motor in his work "Motorization Composition", and left a light plane on the retina of the audience by using the principle of persistence of vision. Although there was no light participation in the whole process, it was considered to be a light art. The source of f<sup>22</sup>)Bauhaus's Najib's work "Light Mystery Space Adjuster" is the first purely light-based work. These two works are strong evidence of the expansion and establishment of new artistic elements with the participation of science and technology.

<Fig. 11> Naum Garbo's "Mobile Composition" in 1920 was considered the first work of light elements



### 3.5.4 Montage

As a direct product of modern technology and art, the film is also called "montage". Quentin Tarantino once said: it is a word for a writer, a note for a composer or musician, and a little lattice for a filmmaker. The "small grid" here is the most basic unit of the movie, "frame", Spielberg said, when editing "Great White Shark": a shot cut into 36 frames or 38 frames, giving people a huge difference<sup>23</sup>). The task of film art is to embody and express the logic and plot of the narrative th

rough the combination of shots, interspersed plots, and the use of montage techniques<sup>24</sup>). Soviet filmmakers represented by Eisenstein believe that the significance of the film is not the lens itself. However, the collision between the lenses, which can produce a higher level of meaning<sup>23</sup>), Eisenstein established the identity of "montage" as an artistic element in movie art through his monograph "On Montage". On the other hand, in the view of French film narratology researcher Francois Jost, what is more, important is that "diachronicity and synchronicity are closely combined in the film, and film artists particularly favour the simultaneous performance of action. Is a way to make the film particularly compelling<sup>25</sup>).

In the age of electrical, also known as the Edison era, the production of movies brought art from the static space art into the dimension of "time", and the participation of time, light and sound as artistic elements was only recognized in recent years. The establishment of these artistic elements is directly related to the participation of technology in art. With the improvement of people's spiritual needs, with the deactivation of technology and the enrichment of artistic elements, new types of art will inevitably appear.

<Fig. 12> Film: Jaws



<Table 10> The establishment of time, sound, light and montage as artistic elements

Time	Representative	Representative technology	Artistic elements
19th Century A.D. The birth of film	Edison and Louis Prince	Montage theory	Time sound light montage

that is, technology provides strong support for art. And promote the development of art; art as the spiritual demand of people also inspires and guides the development direction of technology. Once again, technology has always accompanied the entire growth process of art. However, as perceptual art, because of its relatively weak logic and empirical characteristics, it uses a scientific system dominated by reason to support and establish artistic

<Table 11> Establishment of artistic elements

Time	Representative	Representative technology	Artistic elements
Fourth Century B	Pythagoras	golden section	Point, line, shape
14th Century A.D.	Da Vinci	Perspective anatomy	space
19th Century A.D. Impressionist Period	Newton Michel Eugène Chevreul	Optics and color science	Color, value, texture
19th Century A.D.	Marcos Wetmo et al.	Gestalt psychology	Form
19th Century A.D. The birth of film	Edison and Louis Prince	Montage theory	Time, sound, Montage and light

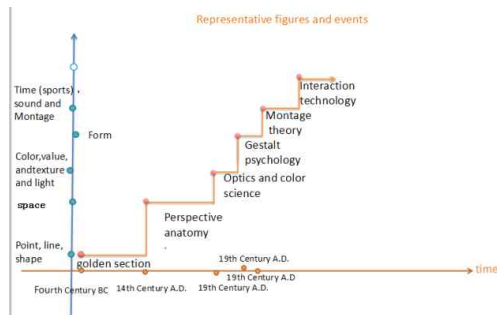
#### 4. Conclusions and recommendations

This article tries to analyze the underlying concepts such as the formation of art categories and the basic elements that constitute art to prepare for the future integration of skill and artificial intelligence. The article sorts out through the use of relevant literature research in the development of science and technology. It analyzes the evidence and establishment of the identity of the twelve artistic elements ("dot" and "montage" that are added to this article) in the process of art development. Through the above-mentioned diachronic analysis of the formation of art elements, we at this moment summarize the inner relationship between technology and art and their characteristics: First, the relationship between technology and art is complementary;

artistic elements' identity. In the deduction of art types, we found that the technological aspects of art have gradually increased. Technology has enriched the expansion of the number of artistic elements (see Table 11). We can even boldly predict that the establishment of the next art category (the ninth art) will involve the participation of technology. The composition of art elements will be changed due to the involvement of technology. In short, it is science and technology, as the driving force behind the scenes, that enrich the expansion of artistic elements, enabling the emergence of more complex new types of art, and satisfying our increasing spiritual needs from multiple angles.

<Table 12> The layout of technology in time of representative figures and events in the p

rocess of developing artistic elements



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