

# Arts in the History of Science Technology: Harmonious but Different

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**Abstract:** *Through the discussion of four parts, including “arts throughout the history of human science technology”, “the recording, education and communication functions of arts”, “the similarities and differences and relations between art and science technology”, as well as “mathematics and arts, arts and science technology with the same origin”, this paper looks for the close relationship and interaction between science technology and art from the history of human civilization for thousands of years. Based on the analysis of the historical facts revealed by the current verifiable history of human civilization, this paper believes that art is a unique thinking and behavior of human beings different from other animals managed by special brain areas merely belong to human beings. It is an important condition for the continuous inheritance, exchange and development of human science technology. In the process of promoting the evolution of civilization, the two are harmonious but different and they mutually support each other.*

**Keywords:** *Science and technology, Art, Education, Spread*

## 1. Introduction

Since 2017, the most frequent and seemingly important concept we have seen in Chinese art circles is "science and technology art" or similar words related to the integration of art, science and technology. Almost at the same time, Chinese contemporary art circles, traditional art circles and art education circles began to invest heavily in the research on "the integration of art and science and technology". Seminars in the art world have paid unprecedented attention to art science, science and technology art, and the integration of art and science and technology. International forums attended and delivered speeches by artists, scientists, engineers and educators have also appeared all over China.

In this context, Chinese artists have obviously turned to the exploration of the cross-border integration of art, science and technology from the general state of focusing on humanistic care and critical topics in the past few decades. The constantly updated frontier achievements of new science and technology have been rapidly applied to the field of artistic innovation. The ethical thinking of scientific and technological development changing human destiny has also become a hot topic of contemporary art.

The cross-border integration of art, science and technology seems to be a fashionable and cutting-edge innovation direction in China. However, in fact, the integration and symbiosis of art and science and technology is almost accompanied by the development history of human civilization. From the perspective of linguistics and human pedagogy history, they are homologous. The separation of the two did not occur until the 19th century because of the needs of socio-economic development and educational innovation. Art runs through the whole history of human scientific and technological progress, and is an indispensable support for the development of science and technology in many aspects, such as innovation, inspiration, recording, communication and so on. At the same time, art is also developing and progressing. The changes in materials, tools and observation methods brought about by scientific and technological innovation are also important basic conditions and driving forces for artistic progress.

## 2. Art throughout the history of human science and technology

Most people think of the Renaissance in the history of science and technology when talking about art in it, which is based on the common sense of them. Although in the history of art, the Renaissance is more a renaissance of humanism, from the perspective of science and technology historians, the history

of scientific and technological progress in the Renaissance is also a great chapter in human history. If we extend the topic of "art in the history of science and technology" in depth and breadth, we will find that no matter in the history of Western science technology, the history of Chinese science technology, or the history of scientific technological exchanges between the East and the west, the spirit of humanism and art has never been absent. The role of art in recording, education and dissemination of history in a broad sense are closely associated with and affect the whole history of human scientific and technological development and civilization progress.

In fact, the reason why the history of science technology and art is inseparable from art should be found in the characteristics of ancient human beings, or in the special structure of human brain.

In ancient times, the "modern Homo sapiens" who evolved into modern humans won in the competition for resources and energy with other animals and Neanderthals and Heidelberg people who are better than modern Homo sapiens in physical strength, body shape and brain capacity. Some scholars believe that this is because modern Homo sapiens who came out of Africa have different brain structures from other species, especially the language and word processing centers in multiple thinking centers of human brain Hearing centers, centers related to music and art, and other structures that other species do not have, have led to a more developed imagination, especially the ability to imagine things that do not exist. This is an important condition for human intellectual development, which is generally considered by scholars as the source of human creativity, that is, the core factor for human achievements in science and technology. In addition, the brain structure of modern Homo sapiens also determines that they can carry out more complex and symbolic communication. Some anthropologists believe that the strong communication ability of our ancestors is an important reason to win the race of species and become the creator of world civilization - the more we have an advantage in communication ability, the stronger we will have the ability to manage people and manage a larger number of Similar groups with the nature of "collective" in Marx's theory, so that in ancient times, people and animals and other savage and ferocious primitive races can win with less and win with wisdom in the process of competition. At the same time, the unique ability to use symbols in the human brain structure is also a necessary condition for the generation of words. The center of some abilities of managers in the brain structure of modern human ancestors enables them to store and inherit the information they need to remember and exchange, and can store a large amount of information due to its complexity - which determines that one of the characteristics of the history of human science and technology - scientific and technological achievements can be superimposed and effective. In this part of the narration of the history of human science and technology in ancient times, there is a key message, that is, historians, anthropologists, paleontologists and anthropologists almost all agree that the part of human brain structure that manages music and artistic talents determines human fantasy and imagination, and it is also a prerequisite for the emergence of science and technology, This is one of the important characteristics that distinguish human beings from other animal species.[1]

There have been several glories in the recorded history of human civilization for about 5000 years. In the view of some historians, the earliest should be the Assyrian civilization in Sumeria, the Babylonian civilization in Cuba and the ancient Egyptian civilization. Later, ancient China established a unified civilization Empire, and a prosperous civilization also emerged in ancient Greece before the beginning of the ad. These ancient civilizations, which took place in different regions, not only mastered the extraordinary achievements of human science and technology in city construction, construction technology, water conservancy and bridge, metal smelting, vehicle and horse travel, but also the increasing maturity of characters, the development from counting to abstract mathematics, and the achievements in literature and philosophy, There was even the king Alexander Library - the first library in human history that can be tested today. It was an early education institution that collected and sorted out the achievements of human wisdom and provided learning and exchange opportunities for young scholars around the world at that time.

The existing archaeological achievements show that in the Assyrian civilization more than 5000 years ago, the Sumerians invented the wheeled carriage. They have complicated clothes, imperial etiquette, travel by car and horse, and their achievements in studying astronomy and geography and the migration of stars. All this is due to the stone carving art left by the ancient Sumerians discovered by the ancient archaeologists, as well as the carved clay tablets burned by them for recording events. It can be learned that the ancient Egyptian empire had developed many principles and formulas in mathematics, including Pythagorean theorem, and their scientific and technological achievements in construction, forging and clothing 4000 years ago. It also benefited from the clues provided by the Mysterious Pyramids handed down for thousands of years and the physical confirmation of the food, clothing, housing and transportation of many ancient Egyptian kings that have been preserved to this day. Ancient Chinese

people left inscriptions on oracle bones, inscriptions on bronzes, Chinese characters on bamboo slips, stone carvings and murals in tombs, etc., which are the basis for us to clarify the scientific and technological process of ancient China. The 10000 year old immortal China's earliest high-temperature glazed porcelain unearthed in the Yangtze River basin provides evidence older than these pictures and words, which can be confirmed as early as 12000 years ago, Chinese ancestors already had the technology to make high-temperature glazed porcelain to prevent water leakage and make it smooth and beautiful.

In addition to the most brilliant renaissance of the integration of art and science and technology and the history of science and technology created and inherited by human unique artistic ability in ancient times, the integration of art and science and technology has not stopped in the 500 years after the Renaissance.

The progress of material science in the Renaissance is not only the demand of the progress of art history, but also driven by the creativity of artists; The restoration of medieval architecture in the Renaissance and the realization of ancient Greek architectural manuscripts are inseparable from the mathematical and geometric principles in ancient manuscripts, as well as the aesthetic and creativity of Renaissance art masters. Since then, art forms have constantly broken through the tradition, from tempela to linen oil painting, from painting to photography, from static to dynamic, from indoor to outdoor... Artists' self transcendence and era transcendence have been accelerating in the evolution of scientific and technological innovation. The progress of science and technology, the renewal of products and the dissemination of scientific knowledge are also significantly inseparable from the support of art.

After the industrial revolution, scholars during the French Enlightenment made great efforts in terms of "science", "Applied Science", "technology", "craft", "art" and "art", narrowed the meaning category of "art" originally containing the meaning of technology and science, reduced craft to pure technical labor, and raised art and science to the level of elitists with high social status.[2] On the one hand, it denies the creativity of Arts and crafts in art, science and technology, on the other hand, it promotes the further subdivision of disciplines within the scope of art and Science in modern education. However, this redefinition history of terms promoted by industrial production and capitalism tells us that the relationship between science and art has always been a historical fact, and the differences are often displayed by people through the continuous reinterpretation of concepts and the continuous creation of new terms according to the needs of the development of the times.

With the rapid progress of human science and technology since the 19th century, it is increasingly obvious that art and science are indispensable to each other in industrial production and social life. For example, when the automobile appears, it is not only the product of scientific and technological formula, but its birth requires the hands of artists and designers to turn it from formula to material object with the beauty of art; The birth of modern and contemporary architecture comes not only from the support of mathematics and geometry, but also from the aesthetics and ideas of artists and designers; The new military equipment produced by the science and technology competition in the last century is also inseparable from the balance of the United States; The Internet, digital, artificial intelligence and new biology in the new century have also obtained the external form of beauty and stronger public communication power in the company of art.....

The history of human science and technology has been accompanied and promoted by art for thousands of years since its birth. The history of human civilization is almost a history of the integration of human art and science and technology.

### **3. The recording, education and dissemination role of art**

How are the scientific and technological achievements created by mankind over the past ten thousand years recorded and passed on, disseminated, applied and advanced through education? Art in a broad sense is actually the core tool and means for human beings to achieve the above-mentioned goals. In the west, the English word "art" corresponding to the concept of "art" we recognize today comes from ancient Latin *ars*, whose original meaning is skill or skill, and its ancient Greek "τέχνη" It also refers to skills and skills. "Refers to skills or specialized forms of skills such as carpentry, ironwork, surgery". As mentioned above, the general recognition of the category of "art" today has been since the 19th century. Some scholars believe that the starting point of this concept division is earlier, which occurred in the middle of the 18th century.[3] However, today's broad art includes a series of forms such as painting, sculpture, writing, image and even arts and crafts, which have the function and value of recording, education and dissemination.[4]

Human civilizations are distributed in different regions far away from each other and have different occurrence times. Then, what kind of communication path did Assyrian civilization, ancient Egyptian civilization, ancient Chinese civilization and ancient Greek civilization have thousands of years ago? What are the consequences? To sum up, science and technology rely on the logical philosophy of mathematics to move forward, rely on words, paintings and carvings to be recorded and handed down from generation to generation, and rely on education to inherit and develop. Many of the achievements of human civilization in ancient times and ancient times we have seen are recorded and passed down with literature and art as the carrier, The precise hands-on ability contained in art is an indispensable skill for human mathematical logic and scientific imagination to become practical objects in practice.[5]

Looking back on the ancient history 2000 years ago, after the Shang and Zhou Dynasties and before the Qin and Han Dynasties, China experienced years of war, and many scientific and technological achievements were difficult to retain. The ancient Babylonian Kingdom and the ancient Greek Kingdom also experienced heavy historical losses destroyed by war and power replacement. In particular, how Europe, which has experienced thousands of years of darkness, has maintained the continuation and revival of the scientific spirit of ancient Greece for thousands of years. All these questions are worth finding answers in history. Thousands of years later, archaeologists judged the level of science and technology at that time on the basis of many works of art that can withstand the millennia - stone carvings, statues, buildings, murals, bronzes, pottery, etc. the forms, materials, pictures and words contained in these works of art recorded and inherited history. Thousands of years ago, most of them were not created to solve the most basic survival problems, But for some kind of power symbol or etiquette rules, or educational dissemination. These special purposes are also important factors to attribute them to works of art rather than ordinary utensils.

Around 200 BC, China's Qin Shihuang unified China, with a large urban population of more than 100000. Alexandria, the scientific and cultural center in Europe at this time, also had a population of 300000. The large-scale development of the city, the development of industry and commerce, and the conditions for learning and research of the powerful class provided the foundation for the birth and development of science, and ushered in the first peak period of civilization for mankind. Over the next two thousand years, all parts of the world experienced different development conditions. After this peak of civilization, Europe fell into a dark medieval period of thousands of years. Under the harsh rule and oppression after religious autocracy, continuous war disasters and alien invasion, it fell into the stagnation of science and technology, culture and art, and many fields declined, It was not until the Renaissance between the 14th and 17th centuries that rapid progress and changes in various fields began. After the industrial revolution in the 18th century, Europe and even the whole world really ushered in a complete change - the industrial revolution not only changed Europe's mode of production and production capacity, but also changed the pattern of the whole world, greatly improving the energy utilization ability and productivity of the whole mankind, Make the world civilization enter the stage of joining and advancing; However, in the early Middle Ages, the economy, culture and science and technology of the Arab world and China were all-round prosperous and developed. Some historians believe that it was the spread of Oriental Science, technology and lifestyle to Europe that triggered the Renaissance and the re prosperity of Europe, creating the foundation for the birth of the subsequent industrial revolution.

Looking at the archaeological achievements displayed in museums around the world, we can find that the above-mentioned series of historical stories and communication paths with a long history are displayed from these archaeological achievements. Although the written records directly describe the history of the above-mentioned scientific and technological communication, the sculptures, paintings, carvings, utensils and living objects found in archaeology, It can more clearly restore various scenes in history, whether grand or small, for today's people. The level of ancient science and technology and the path of its dissemination and development depend on these works of art to spread and display. It is conceivable that even hundreds of thousands of years ago, the recording and dissemination of science and technology will rely on these works of Art - they can break the barriers of writing and language differences between regions and nations, and even become another more efficient communication language.

For example, the common portrait bricks and stones in Chinese Han tombs, especially the portrait bricks, have a large number of records of ancient Chinese science and technology - a series of portrait bricks unearthed in Sichuan recorded the technology of digging salt wells and deep wells from the mountains, and the achievements of ancient people in chemical and physical sciences are recorded in the picture; The common travel pictures of cars and horses in Han paintings clearly show the design of transportation vehicles more than 2000 years ago. In addition to the aesthetic feeling of art, they are also a display of ancient scientific and technological achievements; Moreover, the scene of large-scale musical

instrument ensemble commonly seen in Han painting is another display of the integration of art and technology - painting art, music art and the ancient research results on sound science are integrated into a simple picture. The art of the ancients seen in archaeology carries and records the scientific and technological achievements of the ancients, which shows the important role of art as a tool for scientific and technological recording, dissemination and education.

Today, we can study the history of science and technology in ancient times by taking unearthed cultural relics - objects that condense human artistic creativity as the research object, and looking for symbols, information and images from them as auxiliary materials of historical documents. At the same time, the words and images contained in broad art are the prerequisite for human beings to record and inherit, so as to promote the progress of science and technology from generation to generation, It is also a unique ability of human beings. It can be said that art runs through the whole history of human science and technology, and even the birth of art is much earlier than the emergence of science and technology. Without art, the history of science and technology is difficult to survive.

#### **4. Harmony but different, mutually support each other**

Looking for the figure of art in the context of the history of science and technology, one is to find the significance of art to science and technology at the ideological and theoretical level, and the other is to find the significance of art to science and technology at the practical level. The former is more of the significance of "Enlightenment" and the promotion of logical thinking and human's pursuit of surpassing animal nature. The latter is more direct. Without thousands of years of observation, description, manufacturing and painting ability, it is difficult for human beings to master the skills of truly depicting all things, and it is more difficult to sketch and manufacture things that are only conceived in the brain but do not really exist, especially man-made objects such as bridges and buildings, Without complex calculation and strong aesthetic drawing, it is difficult for mankind to build immortal large buildings. From a young age, if Leonardo da Vinci didn't have the skills of a top artist, it would be difficult for him to visualize and reapply the ancient dome drawings, physical drawings and notes seen in tribute to the ancient Greek civilization, and to express the results of autopsy, the results of observing the wind, rain and lightning of all things in the world, the thinking of conceiving weapons and cities on paper, And let some achievements be realized with the support of the royal family and nobles, which can be handed down to the present and shock the world.

Aristotle's division of the three major fields of broad philosophy is the beginning of mankind's finally beginning to establish systematic science. Rational science (Physics and other science and engineering contents we understand today), practical science (literature includes political science, logic and Economics) and Creative Science (poetry and Art) are the most accurate classification of all human thinking and creative abilities, His classification guided the correct path of human beings in the process of continuous construction and enrichment of the scientific system in the next two thousand years. At the same time, it also revealed the homology between science and technology and art in human intellectual structure, and expressed the view that poetry and art are the source of creativity for rational science.

However, on the contrary, through technological creation and the use of primary tools, human beings can achieve twice the result with half the effort, and can obtain food more easily. Instead of relying on the basic energy required to maintain life by collecting and hunting for a long time every day, they have more time and energy to imagine and create, such as drawing hunting scenes on rock walls, peeling animal fur to make warm clothes Discover and learn to make all kinds of appliances, build houses, and even domesticate animals, so as to achieve greater development. Ian Morris, a professor at Stanford University, once put forward such a view in his book the measurement of civilization. His view just shows that scientific and technological achievements are the prerequisite for people to have the time and possibility of artistic imagination. As the Chinese say, "full of warmth and lust", only after meeting the most basic desires and needs of survival, can human beings have the conditions of "poetic and picturesque". With this condition, human artistic thinking has greatly improved their imagination and creativity. At the same time, the improvement of living conditions will also put forward new requirements for these ancient humans, stimulate them to create new tools, technologies and methods, and record these valuable experiences through early written symbols to the young people of the tribe, so as to ensure the growing strength of the ethnic group, To resist risks from nature, beasts and other early human populations. For example, in terms of daily behavior under the most basic living needs of eating, humans have invented pottery before the Neolithic age as a storage device for water and grain and a "pot" for cooking the planted rice. According to the inference of most archaeologists, the earliest pottery may have appeared in China 16000 years ago, and it was still in China about 12000 years ago, The emergence of

high-temperature resistant pottery fired by adding calcite into clay has made great progress in the history of human science and technology in ancient times from changing physical shape (making stone tools) to changing chemical composition (firing high-temperature resistant pottery). However, the achievement of scientific and technological progress has been widely disseminated in the follow-up long history. The success of a case has evolved into a common phenomenon of the whole era, which is inseparable from the recording, sharing and dissemination of knowledge. The process of teaching knowledge to people and younger generations can be regarded as the earliest form of human educational behavior.

In his *General History of Global Science and Technology*, Wu Jun clearly put forward: "The accumulation and progress of human's livelihood skills gradually enable some people to engage in work other than obtaining food, and liberate a few people from manual labor to specialize in artistic, scientific and religious activities. In the short term, these people are energy consumers, but in the long run, their achievements in scientific research, especially in astronomy and geometry, are of great significance to agricultural production and Later urban construction was of great help. "[6]

It can be seen that art and science and technology are the same way for human beings to explore and understand the world. Even if they are inseparable and coexist harmoniously, they are essentially different. They are two different things, which are realized by taking each other as the condition of existence.

## 5. The beauty of mathematics, science and art are of the same origin

When mathematics appeared, science was born.

The Pythagorean School believes that "all things are numbered", and everything in natural science is based on numbers, which is similar to the theory of "two, two, three and three things in life" said by Chinese Taoism. In the more than 2000 years of history after the two philosophical theories based on numbers were put forward, we did find that mathematics is not only the foundation of astronomy, physics, chemistry and later computers, the Internet and today's artificial intelligence, but also the core element of scientific and technological research and development and progress, but also music, painting, architecture The balance, harmony, proportion and rhythm in mathematics, which are the core elements of all art categories, such as poetry, songs and Fu, and even today's film shooting, are the original basis for the emergence of all things and the existence of all art related to beauty.

Since ancient times, many great philosophers, scientists and artists have discussed the beauty of mathematics. Galileo once said, "mathematics is God's language to describe nature"; Einstein said, "pure mathematics enables us to discover concepts and laws connecting these concepts, which give us the key to understand natural phenomena"; Leonardo da Vinci once studied the famous golden section ratio in his painting, namely 0.61803398... Which is a proportion number widely used in many art works and architectural works. Leonardo da Vinci called it "sacred proportion" and believed that "beauty is completely based on the sacred proportional relationship between various parts".[7] Venus sculpture is said to be a typical case of perfect human body art created in strict accordance with the golden section ratio. In nature, the body size ratio of many creatures is also exactly equal to the golden section ratio.

In fact, when we walk into any museum, we can see almost all the patterns on all the exhibits from ancient civilization to now, as well as the aesthetic modeling, sculpture and painting of utensils. Almost all of them contain the repetition of geometric figures and premeditated digital proportion. Through an interview with artists who have been engaged in painting teaching for many years, we know that when painting teachers start teaching students who have no foundation to learn painting, they first talk about points, lines Surface and various cubes, triangles, cylinders, spheres and geometric forms interspersed with combinations of different shapes that make up all things in the world - it can be seen that before everything enters the picture, it is necessary to summarize geometry, and everything can be reproduced by geometry and geometric principles.

## 6. Conclusions

In short, both art and science and technology come from the continuous upgrading of human cognition and use of numbers, but they move in different directions. Art moves towards metaphysics and science and technology moves towards metaphysics. At the same time, they are indispensable to each other in the evolution of human civilization. They are harmonious but different. The completion of each progress goal of mankind needs mutual support between them.

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