

The reintegration of science and art and the worth

"The fairest thing we can experience is the mysterious. It is the fundamental emotion which stands at the cradle of true art and true science." (Einstein, 1934). This account was an initial notion for the project. I am inspired by the concept of true art and science, and their mutual connection.

Most people may think art and science are incompatible. However, I believe that originally, they share a common root: creativity and curiosity for understanding the Universe. Science collects observations and uses reasoning and data analysis to construct a realistic image of the cosmos. On the other hand, Arts is inspired by experiencing the world and depicts an enhanced version of reality. In order to explore how science and arts can contribute to each other, I began by exploring and bringing together astronomical concepts/ objects and their representation/interpretation through paintings. My studio work in unit 2 is the challenge to create a new perception of the universe for the future by turning back to the essential baseline/ foundation of science and art. In the project, an important element is combining accurate scientific information with the artist's imagination and perspective. Different paintings of astronomical bodies will be demonstrated as an outcome of this effort, but the main topic is exploring the possibility of the integration of art and science through painting.

The definition of science and art in my project is following the description of Mae Jemison, the first woman of color in space. She says: science is a manifestation to share with everyone our understanding and experience about what the world is. It doesn't rely on us individuals. Arts manifest our desire and attempt to share/influence others through the experience of unique as individuals. In other words, "science provides an understanding of a universal experience, and arts provide a universal understanding of personal experience". According to her, the relationship between science and arts is like the front and back of a coin. To demonstrate an understanding of the universe, art shares the idea based on individual experience, but science does it by constructing accumulated evidence supported by analyzing data.

Also, Mae Jemison mentioned about the necessity of the reintegration of art and science: in these few centuries, science and art are separated by analytical/logical or intuitive/creative. However, this classification could be argued as wrong, people are creative and logical at the same time. For example, an artist creates artwork while analyzing to remove extra elements. If we built the society on either one recent understanding of science or art, we would be messing the future because both having a problem. The most important thing is keeping the balance of logical and creative perspective to judge what we are doing. (Jemison 2003) She describes the dangers by separating the concept of art and science. When we believe in only a logical or intuitive perspective, society will be uncreative or illogical. The heart of science and art is building an understanding of the world/universe around us. The human understanding of the universe is established as a result of the scientific and artistic perspective influenced and complemented each other. It is a natural thing science and art share the inspiration or ideas to deepen the understanding of the universe/ world. Our perspective to the world is built on the balance of scientific and artistic postulate.

The hybridization of science and art in painting has a long history. An art historian Patricia Railing explains painting style has been developed with science. For example, Renaissance and natural science, impressionism and physics of color, and cubism and relativity (1989, Railing). Since the Renaissance or older time, science has been inspiring the subject matter of painting, painters have visualized/demonstrated science throughout their creativity in various ways. Especially I focused on the works of Leonard da Vinci, cubism, and a contemporary artist Tom Shannon to build my own integration method.

Leonard da Vinci is worldly significant as an artist or as a scientist. According to NASA, one of Leonardo's finest works is that he solved the ancient riddle of Earthshine. His theory has some mistakes, but he invented that moonlight is the reflection of the sunshine same as modern science proved. Then, how such scientific discovering is connecting to his painting? James Ackerman explains his knowledge always were integrated with observation: he distrusted learning without visual evidence, so his main source of learning was the observation and recorded evidence in drawings. Ackerman points out that is the key to Da Vinci's outstanding works. In the time of renaissance, science means theory which put the importance on the ideal more than

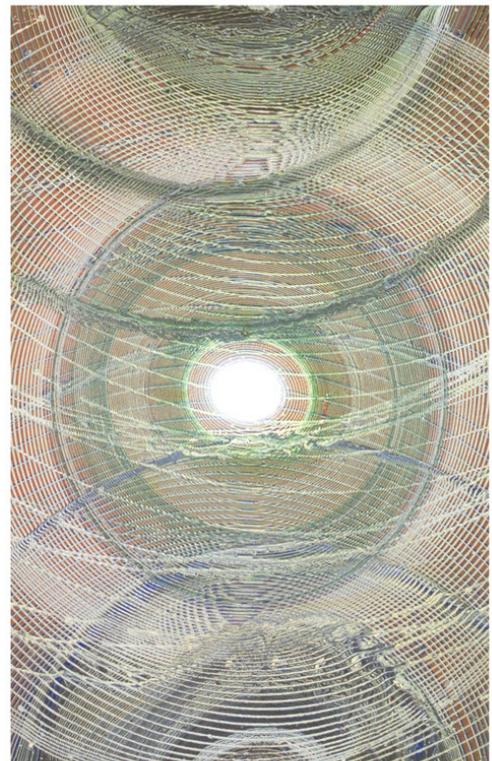
actual. However, Leonard established own science theory of nature by individual observation. Ackerman writes, "His observation had a way of leading him to more observations rather than to principles or laws of nature" (1969, Ackerman, pp209). The result of the observation appeared in his paintings. For example, his passion and close observation of the light and shadow not only brought the invention of the Earthlight but also helped to give reality in his paintings more than other painter's work by the accurate gradation of light and shadow. Moreover, the accumulation of Leonard's close observation for natural phenomena constructed his cosmology. The cosmology made it possible to visualizing inanimate nature in the painting. (1969, Ackerman) Leonard's paintings are the visualization of his scientific cosmology as a result of personal observation.

On the other hand, cubism paintings are the visualization of a new scientific theory of the universe. In the age of cubism, there were the revolutionary discovering of space that relatively. Einstein's theory changed perspective for the universe/nature, painters endeavored to visualize the abstract concept. Cubism is one of the most successful examples. They reduced the intangible and invisible scientific concept of forth-dimension to two-dimensional painting by adapting the scientific experiment into the painting process. Furthermore, the painted images in cubism painting are mostly still-life, people and landscape. Cubists reconstructed the theory of the universe throughout the everyday object. Paul M Laporte questioned, "can a scientific work like Einstein's Theory be understood only by specialists?"(1988 Laporte), but cubists generalized the new perspective of the world throughout translating scientific theory to visual language.

Cubism is a challenge to new art which doesn't depend on the right drawing nor on right construction, proposition symmetry, perspective, and anatomy. The principle of cubism is that "Art, rather than being a copy, becomes the subjective deformation of nature" (1989, Railing). It attempted to the visualization of the invisible science concept. Cubism painting seems like abstractive because it doesn't depend on three-dimensional geometry. Cubism is related to the relatively and four-dimensional geometry which was published by Einstein. Four-dimension means hight, width, and depth is the dimension in space. The difference between three and four-dimension is that there are no shadows in four-dimension because objects sink into space.

According to Elijah Bodish, fourth-dimensional objects are impossible to visualize in three-dimensional our world except for two methods. One is the slicing method and one is the projection method. Cubists depicted the fourth-dimensional geometry using the slicing method which is a way of visualizing the sunk part of a fourth-dimensional object by slicing space. Cubists constructed paintings with a various slice of space reduced to two-dimensional images following the method. (2009, Bodish)

FOVIAL SUN
1995
Water paint, wax on panel
305 cm x 152.5 cm
Collection: private



Tom Shannon(1995), FOVIAL SUN, water paint and wax on panel

Tom Shannon's paintings are the integration of natural science and creative intention. He paints the invisible part of nature on canvas using painting mediums and natural force through a pendulum. He adapted the scientific system of natural force to the painting process. The painting process is quite simple. Setting the canvas under the pendulum which is filled six colors of painting mediums, and just spins it. The natural force of gravity, centrifugal force, and fluid dynamics paint the even space the lines on the canvas automatically. Tom Shannon explores his painting process. "It is the paint actually, makes it real. It's really manifested there. If I throw a very concentric circle or concentric ellipse, it just dutifully makes these evenly spaced lines, which get closer and closer together, which describes how gravity works. There's something very appealing about

the exactitude of science that I really enjoy. And I love the shapes that I see in scientific observations and apparatus, especially astronomical forms and the idea of the vastness of it, the scale, is very interesting to me."(2009, Tom Shannon) He locates his painting is the visualization of the invisible forces of Earth's magnetic field. He explains that the sun has a tremendous field that extends way beyond the planet, the magnetic field force of the earth is protecting us from the sun. The painting with pendulum visualizes these invisible forces that are holding the magnets up. (2009, Shannon)

Those three painters I adjusted have an all different approach to the science that observation, translation, and automatic painting with natural force. However, the purpose in common is to depict their understanding of the world. Science is naturally adapted to their painting process to figure out the shape or system of nature. For my practice, I referenced those three ways of integration to depict an astronomical concept or objects in the painting. My practices in unit 2 and 3 is the challenge to figure out the way of expressing astronomical understanding of the universe on canvas. The good examples are here that the sun and 55 cancri A and E.

According to Nasa, the sun actually emits energy at all wavelengths from radio to gamma ray. It means the sun has each different colour and motion by watching through different wavelength of light. My painting of the sun is a synthesis of varied views and motions of the sun human being have observed throughout science and personal experience. As a painting method, I was inspired by Leonard's observation of nature and cubism ways of constructing a painting with various images. An astronomer Tsiaras, A(2019) says a star is one of the most mysterious parts of nature because none haven't seen the actual form, color, or movement of stars. Even our closest star of the sun, we still don't know how it actually looks like, what is going on inside, and how many hidden aspects the sun or star has. I started to depict the mysterious astronomical object star by analysing shape and colour on the sun we have revealed in our history. I collected the image of sun seeing from a varied wavelength of light and combined all images together on a canvas based on the inspiration by my observation and drawing of the sun. the sun in my painting represents a color and movement of the sun which observed, but none have seen at the once.



The Sun(2019), oil on canvas



Drawing of the sun(2019), watercolor and charcoal on paper

Regard to the painting 55 cancri a and e, paintings are supported by the combination of the analyzed data given by astronomers and my imagination throughout the experimental observation. In this painting, I challenged Tom Shannon's style of paint because the texture of the star and planet is much beautifully come out with the power of gravity paints automatically than hand painting. To paint the invisible star and planet, I got the basic information of 55 cancri solar system from a researcher Tsiaras, A such as exact size, amount, materials, construction, location, and temperature. And then, I collected my experience around the information. For example, I attended to the natural history museum to draw and observe varied types of lava stone or minerals which has same construction with the surface of the planet, I went to the stone hedge to grasp the scale of a huge rock and the presence. I imagined how it is big and what is constructing the star and planet from my real experience, reconstructed 55 cancri a and e on the canvas as a visualized astronomical observation. My works of 55 cancri a and e is the visualization of invisible star and exoplanet. Painting made it possible to share the invisible result of the scientist's observation as an image.



55cancri (2019), oil on canvas



55cancri e(2019), oil on board



Drawing of 55cancri e(2019), watercolor on paper

Recently, science and art could be stated as being separated each. However, as Mae Jemison stated science and art are like a front and back of the coin. Those have the same origin to build a human understanding of the universe. The balance of artistic and scientific sense of view has created the history of our perspective of the universe. Some say that the painting needs in society ended when the photo and digital technology swept the public. However, nature is still full of the mystery, we will continuously find or learn something new from it ever forever. Art and science need each other for the inspiration to further development of human perspective. Particularly, painter's creativity based on personal experience could effectively support modern science which lost the visual or empirical description. I suppose approaching a new perspective of the world by cooperation with science is one of the most important subject matters of art. The view to the world of the next generation is going to be made as integration of scientific and artistic postulate of now.

1973words

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