The Science of Impressionist Paintings

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Quick brush strokes and blurred lines characterize a genre of art known as impressionism. These visible characteristics are the results of the underlying scientific characteristics of this genre of painting. Therefore, when impressionist works, such as those of Vincent Van Gogh, are examined, several things can be learned about this style of painting. Viewers come to understand that the rich history of impressionism not only influenced the materials but the manner in which the materials interact with one another and their environment to create the overall image.

Beginning in 19th century France, impressionist artists made their first appearance. They moved out of the studio and into their environment to capture the world around them in paint. The pieces created by these artists differed from the popular art form at the time, which were dictated by the French Academy of Art. (Introduction to Impressionism 1) This led to criticism by many. Among these was the art critic Louis Leroy whose response to an impressionist piece was, “"Impressionism- I was certain of it. I was just telling yourself that, since I was impressed, there had to be some impression in it...and what freedom, what ease of workmanship! Wallpaper in its embryonic state is more finished than that seascape (Hammerstingl 2)." This new style, dubbed incomplete by some, was inspired by the invention of the camera which was able to capture movement and light in a different manner. Therefore, artists began to move away from the historical, dramatic paintings, and instead they focused on capturing the moment by focusing on nature and people. (Thomson 33-36) Not only did this mean the omission of detail in the figures- as noted by Leroy in his critique, but artists also began using brighter colors and placing contrasting colors near to one another creating a whole new visual effect.

All of the intense visual effects created by impressionists began with the preparation of the canvas and ground. The ground itself began to have a very distinct use in impressionism, unlike in previous studio paintings. Van Gogh, like most impressionist artists, used tightly stretched linen stretched over a wooden frame (Lincoln Center 4). However, there was also an option of hemp and cotton canvases. Some impressionists preferred the hemp canvas because its fibers stretched more than the other two fabrics. Regardless of the fabric used in the canvas, all canvases were sealed. The most common seal used on the canvas in impressionism was an animal glue in water that needed to be applied warm (Bomford, Kirby and Leighton 49). This animal glue served as a size to prevent the oil paints from seeping into the canvas as well as to shrink the canvas onto the support (Taft and Mayer 3-4). Over the size, priming is applied. Impressionist paintings commonly used the priming layer as part of their completed image. Therefore, the priming commonly consisted of a white pigment with a black or earth tone pigment (Bomford, Kirby and Leighton 47).

On the sized and primed canvas, the impressionist artist captured motion, light, and everyday life. As artists shifted their focus, the use of darker earth tones began to disappear. In their place brighter colors more capable of capturing light came into use. These paints usually consisted of pigments suspended in drying oils made from a vegetable source (Bomford, Kirby and Leighton 72). Unlike other types of oils used in the creation of paint, drying oils do not have a solvent. Instead, over time, these dry oils become semi-solid due to chemical reactions when exposed to oxygen in the air. (Taft and Mayer 38) The time it took for the drying oil to become solid varied by the vegetable source used to create it. The three most common drying oils used in impressionist works are linseed, walnut, and poppy. Linseed oil was known for its use mainly in Northern Europe but also because, of the three most common drying oils, it was the quickest to harden. In many impressionist pieces, a combination of linseed oil and slow drying poppy oil were found in the same piece of artwork. (Bomford, Kirby and Leighton 73)

Suspended in the drying oil, artists used a variety of vibrant pigments to depict their impressionist scenes. In the 19th century new scientific discoveries led to the ability to create several new pigments for artists. The creation of synthetic pigments resulted in more vibrant colors and cheaper production costs for paints. Many pigments were created through lake making. This process consisted of combining dyestuff with “translucent inorganic base material (Bomford, Kirby and Leighton 54).” Through lake making as well as other work with dyestuff, more shades of colors became available. Additionally, the new pigments available could be stored in tubes and were ground by machines which created not only portable paints but also paints that were more uniform in consistency (54). This created a new texture for painting.

In addition to the chemical contributions to new textures in impressionist painting, there were several unique chemical make-ups that went into the creation of the pigments that became popular in impressionist paintings. Vincent Van Gogh made use of many of these new pigments in his paintings. Among his choice pigments were chrome yellow, cobalt blue, emerald green, vermillion, zinc white, and lead white (Van Gogh Museum, Amsterdam 1).

Each of the pigments, utilized by Van Gogh and other impressionist artists, has a unique chemical makeup. Chrome yellow is created from chromium, known for its ability to produce yellow and orange pigments. When chromium is in the form of lead chromate it can be used for the pigment chrome yellow. The original down fall of this pigment though is that they faded and discolored easily (Bomford, Kirby and Leighton 62). Another common pigment in impressionism is emerald green pigment which is characterized by a concentrated green hue. To create this pigment’s scientific name is copper acetoarsenite, and is created from the “dissolving verdigris in vinegar, and adding to the warmed solution a quantity of white arsenic (58).”

A pigment color that saw great improvement in quality was blues. Through the combination of cobalt with other compounds two paint pigments can be created. Cobalt blue was originally created by combining cobalt phosphate with alumina through means of heat. This blue was recognized for being one of the only blue pigments without a green tint. (56)

Some pigments in impressionist pieces had already been in common use in studio painting. Among these were lead white and vermilion. Vermilion is a bright red color created by grinding mercuric sulphide. However, this pigment was difficult to produce in a paint that could be successfully kept in a tube. (Bomford, Kirby and Leighton 67-68) White hues are prominent in all impressionist pieces. Two main white pigments in this style of painting are zinc white and lead white. Lead white had been the white pigment of choice up until the 18th century. Composed of a basic carbonate of lead, it met most artistic needs of a white pigment, but presented health concerns. Therefore, zinc white began to be investigated for its properties as a white pigment. Unlike lead white, zinc white did not blacken when exposed to sulphurous gas. (64-65)

The bright pigments were painted closely together and in some cases overlapping colors. Color theory was becoming increasingly studied around the time that impressionism came into use. The use of color theory came into use as artists attempted to create an additive effect when they combined primary colors on top of one another. Another manner in which it was used is that artists used the contract of complementary colors to create intensity in their pieces. (Impressionism: Art of Impressionists 2) This was accomplished by placing colors that are opposite on the color wheel right next to each other in the painting.

Impressionist art, while commonly characterized by the blurred images and ability to capture the moment, can also be characterized by the scientific components that go into its creation. Van Gogh, along with other impressionist artists, benefitted from scientific advances that provided inspiration for their work. Further than that though, scientific advances brought the tools such as vibrant paint colors, various binders, multiple canvas types, and grounds into being. When the viewer examines impressionist work closely the scientific work behind the components of the piece are almost as astounding as the artistic image.

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