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The Geography of Paint Colors

Recently, some mysterious paintings have come to life in bestselling novels and movies—the wry smile of *Mona Lisa*, by Leonardo Da Vinci, and the velvet-lipped *Girl with a Pearl Earring*, by Johannes Vermeer. Yet old masters of art have more secrets to tell. Imagine the palette of any European old master painting today as a key to a map of the known world, in all of its variety and strangeness. Da Vinci and Vermeer couldn't buy tubes of richly colored oil paints at a store. Instead, paint colors always began in nature. An apprentice's hand ground the raw stuff of pigments in studio, mixed them into egg yolk or oil, and then filled them in pig bladders. Pigments could come from semi-precious stones, tree sap, beetles, flower stamens, and in the case of mummy brown, even the ground-up remains of ancient Egyptian mummies. These materials were mined, tapped from trees, and plucked and crushed, respectively; the mummies were looted from their tombs and smuggled as contraband into European markets. Old masters knew the ingredients and the very texture of their paints in a way unfathomable to most contemporary artists. Often, old masters had to rely on explorers a world away to deliver the raw materials to make their paint.

Scott Gellatly, an oil painter and technical support representative for Gamblin artist colors in Portland, Oregon, says, “There's been a shift from the era of old masters to today. Back then, colors were made specifically for artists or textile-makers. Basically, all of the colors we use now in making oil colors are handed to us from other industries—there's earth colors for concrete and cadmium colors for plastics.” In this age of factory-

made color, some artists have a natural curiosity for the quirky paint secrets of the past. Philip Ball, a British science writer and author of *Bright Earth: The Invention of Colour*, says, “There's a real market now for the old colors, which some paint manufacturers make specially, according to old recipes.” Artists can flock to stores such as Kremer’s in New York City, which offer pigments and recipes that re-create the palettes of old masters. In keeping with Vermeer’s time, these stores don’t sell tubes of paint, only the raw materials to make them. Artists who consistently frequent these stores might be seeking more than just trivia—perhaps they seek the allure of Vermeer’s uncanny, sunlit luminosity. Philip Ball understands the appeal: “We don't really know how to make a painting that will retain the jewel-like clarity and splendor of a Vermeer centuries from now.”

Gellatly, of Gamblin, advocates less romantic but higher quality factory-made paint. He believes the old masters would have been quite jealous of artists today, who have a rainbow of ready-made, long-lasting, easily mixable, and increasingly non-toxic paints at their disposal. Hand-made paint colors also constrained the way artists painted. “Hand-made color was a lot less varied and less vivid when mixed with white,” he says. “Artists had to resort to using thin glazes to create color. Their paint was also a lot thinner in consistency; they didn’t have access to the thicker factory-made paints of the impressionists.” Also, old masters couldn’t paint with an impressionist’s abandon—almost encrusting the canvas with paint—given the often exotic sources of their pigments, and the trouble and care it took to find and prepare them.

Ultramarine Blue

Few famous painters seem more provincial than Vermeer, who favored quiet, intimate paintings of people in his hometown of Delft, Holland. In the northern light of his attic studio, he painted a woman in a blue gown reading a letter, a map on the background wall. Typical Vermeer: an ordinary person, an ordinary pose; even the seemingly exotic map on the wall details Holland. Yet Vermeer didn't paint the woman's gown with smalt, a cheap color made from the powdered blue glass so common to the kilns of Dutch tile-makers. Instead, he used ultramarine blue, a deep, purplish blue and the jewel of any 17th century oil painter's palette. Artists from the Middle Ages to Vermeer's time prized ultramarine much like gold, and altarpiece painters reserved it in the iconic ultramarine blue gown of the Virgin Mary. Maybe Vermeer wanted to convey the preciousness of everyday life by painting the gown of an ordinary woman with ultramarine; he even mixed ultramarine with white and other colors to give the gown a satiny depth and modeling. With luminous color, Vermeer made otherwise ordinary scenes timeless.

Other than its rich hue, why was ultramarine worth as much as gold? Its name comes from the Italian word *oltramarino*, or "beyond the seas"—Europeans depended on a place called Badakshan, present-day Afghanistan, to find the raw materials for their paint. In Afghanistan's rugged northeast corner, miners extracted ultramarine in its raw form as *lapis lazuli*, semi-precious blue stones flecked with fool's gold. This resonant blue stone came from near the town of Bamiyan and its towering cliff-side Buddha statues. Destroyed in recent times by the Taliban, long ago these giant Buddha statues were rumored to have painted auras of frescoed lapis lazuli—the same stones found in the heavenly paintings of Europe and Vermeer's paintings of everyday life a world away.

Julia Jacquette, a visual artist based in New York City, reveals lapis lazuli's present plight: "A tourist on the subway noticed that I was wearing a ring with a lapis lazuli stone in it. He said that he was from China, fairly close to where miners find lapis lazuli in Afghanistan. He told me how the war had greatly disrupted the flow of this stone, and now it's nearly impossible to get." Indeed, some paint-making companies have turned away from Afghanistan to find natural ultramarine pigments in more accessible locales, such as Chile. Others brew ultramarine blue in factories without even using lapis lazuli, the fabled semi-precious stone encased in Jacquette's ring. Says Jacquette, "Using factory-made paints is mostly a cost-cutting decision, but current factory-made colors are actually quite good. I always use ultramarine blue, permanent green medium, alizarin crimson, cadmium red, cadmium yellow, and burnt umber."

But how did Jacquette ever get the factory-made paints on her palette, so vivid in their imitation of natural pigments? A chemist by training, Philip Ball has the answer: "The history of pigments is full of lucky accidents." Some 300 years ago, a lucky accident brought a color almost like ultramarine closer to the West and more inline with artists' slim pocketbooks—forcing many artist apprentices to abandon the mortar and pestle forever. Sometime around 1705, a Berlin dye-maker tried to make a non-fading, synthetic red out of iron sulfate and potash unwittingly contaminated with animal oil. He was trying to make color for utilitarian rather than artistic purposes. Yet the tweak in the formula ultimately produced a surprising deep blue substance resembling ultramarine's luxurious color. Manufactured from Berlin, this color, named Prussian Blue, sold at a fraction of true blue ultramarine's cost and turned into the first factory-made paint color, the kind found at art supply and hardware stores today. Gellatly, of Gamblin, says once

ultramarine was made in a factory, “The most expensive pigment in the world became the cheapest overnight, the most readily available.”

However, many artists, weaned on ultramarine’s deep, purplish blue hue, complained that synthetic Prussian Blue seemed grayish and impermanent. In the early 1800s, the French government sponsored a lucrative competition to create the best synthetic ultramarine. After a protracted dispute between the recipes of German and French entrants, French Ultramarine was born. It rivaled Prussian Blue as the factory-made color most akin to real ultramarine. French Ultramarine became the choice blue of many painters working in France: think of all those blues paired with yellows in the feathery paintings of the Impressionists, the shimmering patterns of Paul Cézanne, and finally, the brilliant impasto of Vincent Van Gogh, who passionately flattened many of the fat paint tubes sent by Theo, his wealthier brother. In a letter to Theo, Van Gogh writes, “...in order to paint a ground forcefully, or to keep a sky clear, one must sometimes not spare a tube.” Later, in perhaps an understatement, he tells Theo, “During this month I shall really again be in need of ...two tubes of ultramarine.”

Gamboge Yellow

Rembrandt, a Dutch predecessor of Van Gogh and contemporary of Vermeer, was certainly reserved in using real ultramarine blue in his brooding, warm paintings. On the rare occasions when Rembrandt painted blue hues, he often used cheap smalt. As an oil-paint color, smalt would become obsolete with the invention of Prussian Blue. Even though smalt was cheap and abundant, Rembrandt seemed almost philosophically averse to the cool hue; instead, he preferred colors in the dark and earthy realm. Such paintings

were so dark, the colors so modulated, Van Gogh claimed Rembrandt used “twenty-seven blacks” to mix his colors. Perhaps not surprisingly, unlike Van Gogh, Rembrandt never traveled beyond slate-gray Holland to find the vibrant colors further south.

Yet even in Rembrandt’s seemingly insular color palette, chemists have found traces of a faraway world; namely, gamboge yellow, a mustard-yellow color from Southeast Asia. Extracted as resin from tall relatives of the mango tree, hardened, and then pulverized, gamboge—a corruption of the word Cambodia—was then shipped to Europe by the Dutch East India Company. The pigment resided alongside other, better-known sensual goods, such as fragrant teas and spices from India, Indonesia and South Asia. Even into present times, paint color companies such as Winsor and Newton extract gamboge from Southeast Asian trees for their watercolors.

Carmine Red

In the 16th century, even before Rembrandt’s time, Italy’s master Renaissance painters turned to surprise locales for their colors. In Venice, the artist Tintoretto possibly mixed his paint glazes with convenient crushed Venetian glass. Yet Tintoretto, whose name means “little dyer” in Italian, painted with a vibrant carmine red that owed its glow to a legacy of blood and treasure a world away. In Mexico, Spanish conquistadors oversaw the Zapotec peoples and their traditional harvesting of cochineal insect blood for paint color. Plucked from cactuses and then crushed, these beetles produced a scarlet color that dried into brownish pellets, ideal for dyes and paint pigment. By 1575, Spanish ships carried about 80 metric tons of this carmine red to Europe. Insect dyes for red paint could also have come from India, imported into Venice by Dutch ships.

All of the known colors

Titian, another one-named Venetian Italian artist, painted with nearly every known color in his *Bacchus and Ariadne*, from 1520 to 1523. This riotous painting shows a parade surrounding the Roman god of love as he returns from India. “Titian is one of the finest colorists in Western art,” says Ball, “but he was helped immensely by working in Venice, a major port, which gave him first pick of the gorgeous colors imported from the East.” Indeed, Titian painted on linen canvas leftover from nearby ship-masts—a fitting surface for so many colors that came from distant shores. Ball maps the constellation of colors in *Bacchus and Ariadne*: sky-blue ultramarine from Afghanistan; azurite, a blue-green color from copper, from Hungary or Germany; umber, an earth brown from Turkey; lead-tin yellow, now known as Naples Yellow, from its possible, long ago origins on the sulfuric slopes of Mt. Vesuvius; and realgar orange, a highly toxic pigment imported to Venice from Asia Minor. One might even find a dash of Egyptian mummy brown in the painting’s shadows.

By the 1960’s, a layer of grime had settled over *Bacchus and Ariadne*, rendering its colors greenish and dull. When art historians restored the painting to its original brilliance, they also revealed why Titian, and other Renaissance artists, went to such great lengths to find their pigments: pure hues and colors that sing. But the hand-made paints certainly constrained their painting technique, and who knows what Titian could have done with a rainbow of present-day, factory-made paint colors? What could these great artists have done, freed from the endless quest for color in the form of faraway lapis lazuli stones, tree sap, and crushed beetles? Says Gellatly, of Gamblin, “Any time color-

makers in a factory seek to expand an artist's palette, it's so artists can better express their ideas and recreate the colors of the natural world." He continues, "If there is any allure in traditional pigments, it's solely in re-creating the palettes of old masters and understanding their painting techniques." But by studying old master palettes, artists and enthusiasts also begin to see a lapsed world unbounded by any frame—an age of exploration, conquest, and discovery.