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| [Native Paint Revealed](http://www.nativepaintrevealed.com/) |

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| Picture3500 year old pigment grinding stone with celadonite pigment. Collection of SFU.Colors have universal associations, for example, blue evokes the calming sense of the vast expanse of sky and waters. Green gives us a sense of vitality and harmony. At the same time, different cultures imbue colors with particular meanings. In the Northwest specific culture groups have associated deep meanings with particular colors for thousands of years. This is evident in the consistent palettes that have persisted throughout a culture’s history. Contemporary Northern Northwest Coast and Coast Salish artists are still painting with colors used by their ancestors more than three thousand years ago as evidenced by pigment grinding stones bearing red ochre and celadonite which are dated at 3500 to 4000 years old by the archeology department of Simon Fraser University, Burnaby, British Columbia2.Among the Northern tribes, Haida, Tlingit and Tsimshian, the palette was and still is narrow, consisting of only three colors: black, red, and blue or green. In the north color schemes are based on a long tradition of designs consisting of primary, secondary, tertiary and negative space. Primary spaces are usually black and occasionally red.  Secondary space is usually red.  Sometimes black and red are reversed as primary and secondary colors.  Only in the tertiary spaces are blue or green used. Among the Tlingit, prior to trade with Europeans, blue was apparently most often reserved for shamans and ritual work. The Haida used a pale green in tertiary fields. In the north there are long-standing rules about the design elements and about color use.The Coast Salish have always displayed more freedom in their carving style and in their use of color. They have used a wider palette of yellows, blues, greens, black, reds, and white.**Yellows, reds, blues, and greens are earth pigments** found as clays or stone. These pigments were ground and mixed with the proteins and oils from salmon eggs and a little human spit, which provides an enzyme to help bind the oils and pigments together. Black pigments were made from a variety of materials including charred woods, soot, and burnt calciferous materials such as bone. The minerals magnetite and graphite were also used for black.**White** was made from calcium carbonate (chalk), gypsum, and a soft white clay called Kaolin which has been used by Europeans and Chinese for making porcelain and china  and is one of the most common minerals in the world. White was also obtained from roasting a particular species of clam shell. Greens were made from the mineral**Celadonite**. Celadonite is an iron silicate found all over the world; it is often called Green Earth. For many years it was believed that greens and blues came from copper compounds, but research done by the Canadian Conservation Institute has  shown that there is no copper in these pigments, that the beautiful greens we see are celadonite.  Celadonite has the interesting characteristic of being able to be used with or without a binder like fish egg oil. It can be applied simply with water and is surprisingly durable. I have seen well-used objects painted with celadonite and water that are in excess of 400 years old and the paint is still intact. When water is used, the color tends to be powdery and pale but gives a good range of transparency (functioning more as a stain and letting the wood show through) to opacity (coating the wood so it is not visible). When mixed with oil, Celadonite darkens, has a harder finish and has a satin patina. Fish egg oils are not the only oils that can cause this alteration; spindle whorls painted with water-based Celadonite have changed color and patina from contact with lanolin (oil) in the sheep wool spun on them. The mineral **vivianite** provides a wide range of blue to dark blue-green hues depending on its state of oxidation and photochemical process. Vivianite is an iron phosphate, another “earth” pigment known as Blue Earth, and is widely occurring along the NW Coast. Vivianite only requires three things to form: anoxic environment such as the bottom of a pond, bog, etc., and iron and decomposing organic matter. The phosphates from the decomposing material binds with the iron and vivianite rapidly begins to form.It can be found as friable (easily broken up, usually dry) clay, heavy wet clay, as a medium hard stone. Vivianite can also be found in areas of heavy thermal activity; here it presents as crystals. The crystals make a very poor quality paint so weren't used.Among the Northern tribes, vivianite appears to have been used almost exclusively by Tlingit shamans and warriors, but the Coast Salish, and nuuchahnult on the west coast of Vancouver Island, used it freely on all variety of objects. Like celadonite, it can be used with a water base or an oil base, with similar results.    | PictureSeveral yellow ochres from my collection.**Yellow** paint came from yellow ochres (a general term for clays used to make what are known as earth colors) and is now known as Mars yellow. Yellow ochre is hydrated ferric (iron) oxide. Red ochre is a variant of yellow ochre which can range in hue (*hue* meaning actual color, identified by a common name such as red or bluish green) from a golden yellow to a brown.**Red**ochre today is frequently called red iron oxide. There are many oxides and the Earth’s crust is made up primarily of solid oxides (and sulfides which are another chemical compound not addressed here) which occur when an element such as iron is exposed to oxygen in the air.  Red ochre can be obtained from yellow ochre by roasting the yellow to drive out the hydrogen, darkening the mineral to red in the process. Red ochre also occurs naturally as a loose earth, a clay or stone. Hematite, although black or dark gray as a solid stone, was also used as red; ground hematite oxidizes and offers a variety of reds during the oxidizing process. Hematite is also found in a soft form. These ochres and hematite have a very similar chemical makeup, requiring only some manipulation, such as roasting or grinding (which exposes the molecules to oxygen), to achieve particular hues.                  **Ochre** and other mineral pigments are found and mined all over the world. Red and yellow ochre have been and still are used by virtually every culture in the world for a variety of purposes. Celadonite (Green Earth) is an iron silicate found the world over and has also been used since prehistory.  Celadonite paint has been found at rock painting sites in Argentina3 and on a Mayan temple in Honduras4. This pigment was used frequently by the Renaissance Masters to tint (adding a small amount of another color to modify the base color) flesh colors as well as adding depth to greens in landscapes. For hundreds of years, Celadonite has been prized for use as a facial mask beauty treatment. I can walk into my local food co-op and buy it ground to a fine powder by the ounce or pound. These pigments have been used since prehistoric times by innumerable cultures and are still in use today among indigenous cultures and are also used by high tech cultures for a wide variety of applications, not just as pigments.Native people of the Northwest Coast have a long oral history that passed down the knowledge of how to find resources in their environment which allowed them to find these mineral pigments in the landscape. Over time they became masters at making paints, sometimes by trial and error, sometimes by process of deduction, sometimes by intuition and ingeniousness, and maybe, sometimes by happy accident. They also became masters of paint technology; learning which types of furs or bristles (almost every brush I have examined which number in the hundreds, used porcupine hair) to use for brushes. They used an ingenious method of laying the long bristles along the length of the brush then wrapping it, sometimes in elaborate patterns, with spruce root. As the bristles wore out, they loosened the wrapping and extended the bristles, re-wrapped and went back to work. The majority of brushes I’ve examined all bear these same characteristics, and all have bristles worn down. Of all the brushes I have seen, less than  half a dozen were not beautifully ornamented with carved, often highly detailed, designs. We can only make educated guesses at how they learned to obtain the minerals and what to use as binders, how to process them using methods such as roasting, determining which ones needed an oil medium, which ones were durable with just water as a medium, and how to manipulate the range of a color to achieve a desired shade (a full, definite degree of difference between two colors.5) How they chose the colors and color schemes demonstrates they clearly understood how to manipulate the interplay of light and shadow with color to evoke particular effects.  The methods by which Native Northwest artists developed their science of pigments are lost in history, but Native artists have carried the use of traditional mineral pigments on from generation to generation through millenia. |

# <http://www.nativepaintrevealed.com/coloring-the-northwest-coast.html4>

# Native Paint Revealed, Vegetable or mineral

*Written by:*[Melonie Ancheta](http://activeartist.net/author/melonie-ancheta/) · [Leave a Comment](http://activeartist.net/native-paint-revealed-vegetable-or-mineral/#respond)

**Vegetable or Mineral**

I have had the opportunity to study a wide variety of prehistoric painted artifacts from the NW Coast and have only found one object that had a color on it that wasn’t a natural pigment. I was fortunate in picking a time to do some research at University of British Columbia’s (UBC) Museum of Anthropology when they had several old Coast Salish horn rattles on loan from another museum. One of those rattles dated at 3-400 years old and was extraordinary in a number of ways, not the least of which were two small spots of pinkish red are on the backside. Both spots are very obviously berry juice rather than a pigment and are quite faded. After looking at hundreds, if not thousands, of artifacts, and finding only one that has vegetable color on it makes it quite apparent to me that NW Coast indigenous peoples clearly grasped the difference between a pigment and a dye.



Fig 15. Red ochre in situ, Wilgie Mia mine, Australia

Around the world throughout history many people have substituted vegetable matter for pigments with little success. Vegetable matter such as berries, flowers, leaves, roots, even bark are chemically and physically different from pigments, and while many work beautifully as dyes, they cannot give the same results as pigments. Dyes are colorants with small particulates which are soluble in water and typically need a mordant, or fixative, to make them bond semi permanently or permanently with the fibers of fabric. On leather, wood and other materials with which they can’t be fixed or bonded, they tend to fade rapidly, simply soak into the medium and can’t be seen, and are not water proof.

Fig 16. Ground red ochre. B.N. Mine.

Pigments are pure colored powder of which the particles are not soluble in water, oils or resins. The colored particles are mixed with a liquid binder or vehicle (in the case of NW Coast native paints they were most often mixed with the lipids and proteins from salmon eggs very much like egg tempera used on ancient Mediterranean frescoes. Salmon egg paint displays much the same durability as egg tempera paint.) in which the particle is suspended. If there aren’t enough particulates in the binder you end up with a transparent, weakly colored paint. Mixing plenty of pigment into the binder gives an even textured and evenly opaque (opaque means not allowing any light or background show through) paint with good saturation of color. Most pigments, unlike vegetable dyes, are lightfast, waterproof and “stand” on the surface of the support (support is the material on which the paint is applied.)

**Making paint**



Fig 18. Cake and powder. Yellow ochre. Personal collection.

The process someone had to go through to achieve a good paint was not simple even if one already knew where to find the pigment and knew the process. One has to go to the nearest deposit (which could be a long distance) and collect the pigment (pigment isn’t usually found just laying around on the ground here in the Northwest. You have to know from geologic indicators where it’s likely to be, then dig for it.) then clean it of debris and impurities. If it’s in a hard state (clay or stone) it needs to be broken down and ground to small grains. It can be cleaned of impurities such as silica and quartz by washing in a container and letting anything lighter in weight float off, or anything heavy sink to the bottom and then pouring off the lighter pigment into another container. It is then left in suspension, letting most of the fluid evaporate. When the pigment reaches a point where the water has evaporated but is still moist it can be ground into a paste (which is called levigating) at which time it’s easy to separate the smaller from larger particles. Often, at this stage the pigment is formed into a cake or ball and let dry for easy storage. The pigment can also be left until dry. Before mixing as paint it would need to be ground to a fine powder.



Fig 19. Pigment grinding stone. Personal collection.

Grinding requires a fairly flat or hollowed surface without bumps or holes (although a smooth, polished surface won’t abrade the pigment grains and reduce them) and a pestle which fits comfortably in your hand and is flat or slightly convex on the bottom.  In my research I’ve come across a number of grinding stones, all about 2-3 inches thick, of a fairly uniform shape, a bit smaller than a dinner plate and all have been hollowed at least minimally. Most of the grinding stones I’ve seen are made of fine grained sandstone and pestles  are usually made of basalt.



Fig 20. Pigment mortar. Blue pigment. Burke Museum.

When looking at pigment grinding stones, I’m always impressed by the work that went into the grinding stone alone. Fig 20.  is a particularly good example of a mortar that was chosen wisely. Its shape is ergonomic, with the point on the left acting as a handle; I tested it and it can be gripped very comfortably in your hand while working. It is heavy enough to stay in place while working but light enough to carry around easily. But the time spent hollowing it is incalculable as with the small mortar below and with all the grinders, mortars and dishes I’ve studied. I’ve seen many small mortars like this which fit into the palm of a hand perfectly. While the outer shape may be mostly natural, the hollow is obviously human work. The uniformity of the walls of the small mortar in Fig 22.  along with the little rolled lip makes this mortar a piece of artwork unto itself.

Fig 21. Double pigment dish. Red and yellow ochre. UBC Museum of Anthropology.



Fig 22. Small pigment mortar. Red ochre pigment. Burke Museum.

Studying pigment grinders, mortars, paint bowls and brushes has shown me very clearly that early artists were quite meticulous in the use of their tools.  Grinding stones, mortars, paint bowls and brushes all indicate the use of a single pigment for each; to date I have yet to see any of these tools with more than one pigment on it. This means that any artist would have to have each of those tools for each color used. This coincides with my own practices and care of my tools. Early in my career as an artist I learned to have separate tools for each pigment and paint I use. I discovered that red paint (I use Golden Acrylics exclusively when working with manufactured paint) wears out my brushes (I use only one brand and size of brush for all my work) faster than any other color no matter what I’m painting on: wood, leather, cedar bark, grandsons, etc. And I learned quickly that it’s all but impossible to clean all the paint out of a brush before using it for another color. I use separate containers of water for rinsing my brushes of each color. Since I only have one large mortar for breaking down the chunkier pieces of pigment, I scour it thoroughly and bleach it so as not to contaminate the next pigment I grind in it. I have small mortars and pestles for grinding different colors finely. The fact that artists were meticulous in using individual tools for each color is yet another aspect to the lengthy task of getting to the point where they could actually apply paint. An artist would have to make a number of mortars, grinding stones, etc., as part of the prep work. Fortunately, once made, if taken care of they could be used for lifetimes if not generations.

Once ground the pigment can be stored for indefinite periods of time. When the artist is ready to use it, he would have finely ground some in a mortar; typically only enough for one day would be mixed with the binder because the paint would dry out and be unusable by the next day. He’d (I say “he” because there is no evidence of women carvers and painters until modern times) then add salmon egg oil and human spit to the pigment to create paint. (While many other binders were available: blood, hide glue, bird eggs…the almost exclusive use of salmon eggs leads me to believe there was some potent relevance for using salmon eggs.)  To get the salmon egg oil, fresh skeins of eggs were mashed and broken open in a container and let sit until the membranes separated from the fats and proteins inside the eggs. The membranes were then skimmed off and a “soup” was ready for use as a pigment binder. If fresh eggs weren’t available, dried eggs were chewed and the resulting mash was spit into a container and mixed with the pigment; it’s easy enough to just push the dried membranes out of your way when painting. Early people became aware that paint which was mixed with human spit adheres better and spit became part of all the paint recipes (some of the earliest cave paintings are handprints which have been made by putting pigment in the mouth and spitting it around the hand). Human spit carries an enzyme which helps to bind the pigment molecules together. Sometimes pigments were simply mixed with water and spit then painted on. With this technique I’ve discovered that adding some spit helps to keep the pigment evenly dispersed in the water and helps with adhesion.



Fig 23. Detail of spoked spindle whorl. Red ochre and celadonite on surface altered by lanolin. Burke Museum.

**Altering hue and patina**

In my research I’ve had the opportunity to study many artifacts, some of which are painted with salmon-egg paint, some of which are painted with water-based paint. I have found that there is little difference in the durability between the two techniques, both showing good adhesion and about equal signs of wear through use. What does occur is a change in texture, patina and hue. When pigments are mixed with water they have a gouache-like texture and powdery patina; the hue remains the same as the pigment. When mixed with salmon egg oils the paint takes on an almost plastic texture and a satiny finish. The hue is usually darkened with a little more saturation of color. Of course, this also depends upon how much pigment has been mixed into the binder. When the pigment has been heavily loaded it overrides the oils and can take on a flat, grainy finish. The oils in salmon eggs aren’t the only fat that changes the paint though. Fig 23. is a detail of a spoked spindle whorl painted with red ochre and celadonite (green mineral pigment) paint. The surface paint of this spindle whorl has a smooth satiny finish and both pigments have darkened from the lanolin soaking into it from spinning sheep wool.



Fig 24. Detail of edge of spoke on spindle whorl showing the original color and finish of the paint before lanolin soaked into the top.

In Fig 24. you can see along the edge of one spoke where the original green pigment is a pale, soft color with a flat finish. This is what the green originally looked like all over. This is just one example of artifacts I’ve studied that show alterations like this. Many objects that were often held show by the altered paint where they’ve been touched most and picked up oils from hands; sometimes there are actually fingerprints left on a piece. There seems to be little difference in the durability of water-based and oil-based paints.

Even today it’s an extremely time-consuming and detailed process to make paint. For colors of which I don’t have large amounts of natural pigment, I can buy them from reliable suppliers. I don’t like doing this though. If I’m working on a piece that has some natural pigments on it, I won’t shift to using purchased pigments. Although it is a lengthy process to do it today, I’m lucky in that I have plenty of light, warmth, premade mortars and brushes, reusable containers for water, a cushy chair and workbench, and containers that seal tightly for storing paint so I don’t have to make a new batch each day. I try to imagine how difficult it must have been to do this under the rough conditions that artists lived in and just can’t imagine myself pulling it off. It takes determination, stamina, knowledge, technical skills and physical abilities, and a deep commitment to achieve just one dish of paint.

<http://activeartist.net/native-paint-revealed-vegetable-or-mineral/>

## How the Art Was Made:

*Materials You’ll Need:*

* Photo of traditional paint and paintbrush
* Photos of wood boxes, house fronts, cedar hats, spoons, animal skins (see above).
* Small bowls for mixing containers
* Newspaper for covering desks
* Oil
* Charcoal
* Rocks for grinding charcoal
* Saliva

Brushes for painting (fine Chinese paint brushes are excellent, if you can find them)

### *Lesson Introduction: Teacher Monologue and Questions*

“Northwest Coast designs were painted onto many items. Who can remember some of the things that Northwest Coast People paint?” (After they have answered) “Let’s look at the pictures we saw before to remind us.”  (Show pictures of bentwood boxes, housefronts, canoes, animal skins, spoons).

“What colours do you see in the paintings? The main colors used were black and red. Black was the main color, used for the outline, or **formline**. Red was used for the inner shapes. Green-blue was also common. White, and yellow are seen in use as well. Paint was made by mixing ground up colorful materials with salmon egg oil and saliva. Black was made by mixing in charcoal dust. Red was made using red ochre, a clay like material. Green, or green-blue was made using green-earth (glauconite or celadonite).”

“Look at this picture of a traditional brush and paint set.” (Show picture) “Where do you think a Northwest Coast artist got his paint brush from? The store? What do you think artists would have to do to make paint brushes and paint?” (Listen to answers.) “Yes, paint brushes were carved from wood. Brush tips were made of hair, usually porcupine hair, and they were tied to the handle of the brush using cedar twine (string made from the roots of the cedar tree). The brushes were also cut at an angle. Why do you think brushes were cut at an angle?”

“We are going to try making paint, today. Since we can’t really go out and hunt a porcupine, cut down a tree to carve a wooden handle, or even burn wood for charcoal, we’re just going to have to do an activity that gives us an idea of what it might have been like to make and use our own paint. Imagine you have chopped down a tree that you used for many things, but also you used a tiny bit to carve your brush handle. Imagine you harvested cedar root, and made twine from it, and wrapped it around porcupine hairs from a porcupine your family member caught. Imagine you have taken bits of charcoal from the fire, and crushed salmon eggs to get the oil. Now you have your paintbrush, oil, and charcoal. You are going to mix it all together with your own saliva to make paint!”

[](https://www.sfu.ca/content/dam/sfu/brc/images/EducatorResources/Paint/McLennan%20and%20Duffek%2C%202000_Transforming%20Image-91.jpeg)

Ground pigments typical of the Northwest Coast painter's palette. CLOCKWISE FROM TOP LEFT Red ochre, charcoal, green earth, vermilion, Reckitt's Blue, and umber or yellow ochre. Paint brush and pigments made by Lyle Wilson. Photo: Bill Mclennan.

### *Activity:*

* Take time to explain that this is an activity that must be executed respectfully, and that spitting be done carefully and with consideration for others- that it be done only into their own bowls for their own use. Model the activity for students before letting them begin, then review the steps and write them on the board.
* Hand out the materials to all the students and draw their attention to the steps written on the board.
* Have the students grind charcoal into powder with rocks.
* Invite the students to put the ground charcoal in a bowl.  (This is best done with a small piece of newspaper used as a shovel of sorts).
* Then ask students to carefully add some spit.
* Circulate and dispense a small amount of oil to each bowl.
* Invite students to mix it around until it forms a smooth paste.
* Then, ask them to use the charcoal mixture to paint one of their ovoid sketches from last lesson.
* When the students have had a chance to try one or two ask them to clean up. Remind them to use soap to clean out their bowls, brushes and also their hands. “Be sure to wash your hands and clean your workspace well afterward!”

<https://www.sfu.ca/brc/educator-resources/paint_grades-k-to-3.html>