THE "ART" IN STEAM

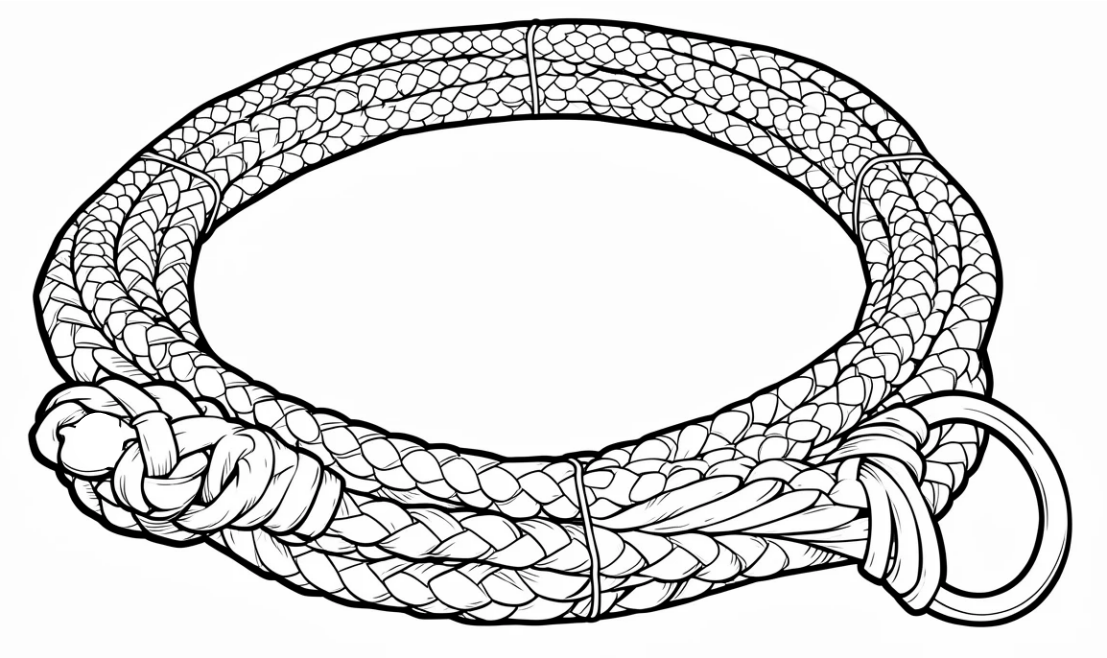
WESTERN TRADITIONS

NATIONAL COWBOY & WESTERN HERITAGE MUSEUM

WESTERN ART: STEAM AT WORK

TEAM POWER OF THE BRAIDED ROPE

Have you wondered why cowboys use ropes that are tightly braided together instead of just using a single piece of leather or fiber? Braided ropes are a masterpiece of engineering—which means they are designed to solve big problems. Every single twist and knot on a rope has a special job to keep the cowboy and their horse safe.



What is Tensile Strength?
Imagine trying to pull a heavy wagon with a single string. It would snap instantly! Braiding weaves many single threads into a "team." When a cowboy ropes and catches a heavy cow, the weight is shared equally by all the threads of the rope. If one little thread gets a tear, the other threads keep the rope from snapping.
Some parts of a cowboy's roping gear are decorated to look good, but they are actually hidden tools! Cowboys might use different interwoven colors of material (fiber, leather or nylon) to create geometric patterns that are very artistic. But did you know that the different colors help the cowboy know it's time for a new rope? If the rope begins to fray, the geometric pattern starts to blur. This tells the cowboy that the rope is worn and might snap!

What is Elasticity and Shock Absorption? When a rope suddenly catches a running cow, it gets a violent yank. If the rope were completely stiff, that hard jerk could hurt the horse, the cowboy and the cow. Braided ropes act like giant rubber bands. They stretch a little to absorb the sudden pull, then snap safely back into shape.

What is Energy Transfer? To catch a cow, a cowboy swings a big open loop in the air. Braided ropes have "memory," which means they remember their shape. The braid makes the rope stiff enough to remember and hold that big circle open while it flies through the air.

Watch and Learn: https://www.youtube.com/watch?v=Q44Aihr0v9A

WESTERN ART: STEAM AT WORK

FANCY FRINGES?

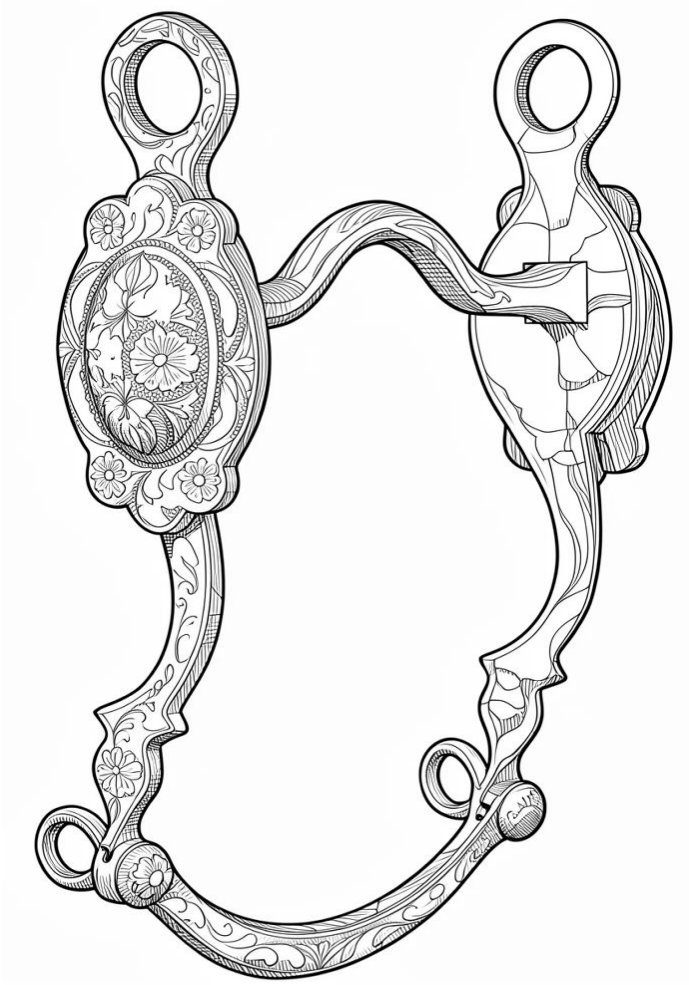
When you see clothing worn by many Native Americans or cowboys, you might notice long, dangling strips of leather on their jackets and pants.
This is called fringe. While it looks good, fringe wasn't invented to be fashionable. It is actually a brilliant invention designed to solve a survival problem in nature!

Water Management
Leather is like a sponge. When it gets wet from rain, it gets heavy, cold, stiff, and can even rot and fall apart. But fringe turns the jacket into a row of tiny waterslides. **Gravity** pulls the water down the dangling strips and the water drips right off instead of soaking into the coat. This keeps the wearer warm and dry! It is called "wicking." **Wicking** is when a material pulls liquid away from one place and moves it to another.

Insect Management
Long ago, there was no bug spray. Swarms of biting flies, mosquitoes, and ticks were constantly attacking people and horses. Fringe acts like a row of pendulums. Every time a person takes a step, the fringe starts swinging back and forth on its own. This swinging leather brushes bugs away from the person's arms and legs.

Wearable Toolbox
Animal hides have uneven shapes and edges. Instead of throwing away the uneven edges, people slice them into fringe so no leather is wasted. Fringe is also a "wearable toolbox." If a shoe or saddlebag rips, there were no stores around to buy a replacements. Fringe is like carrying a box of emergency spare parts. If something breaks, the wearer can simply slice off a strand of fringe from their jacket and have a strong leather string to fix what breaks.

COWBOY ART: STEAM AT WORK

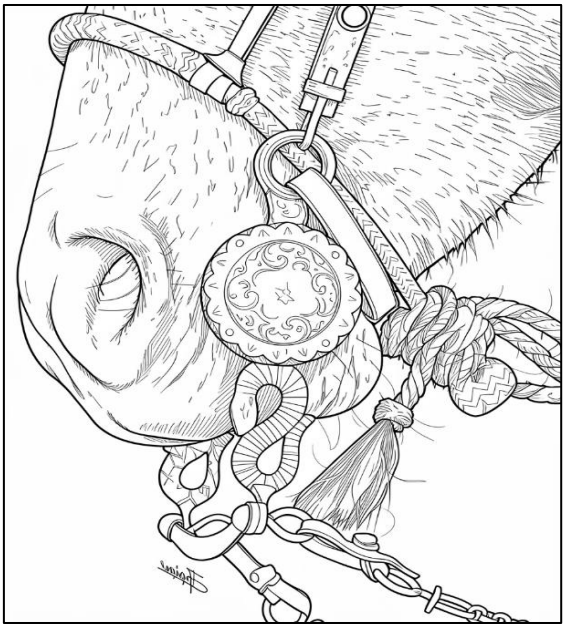


THE SECRET OF SILVER

When Spanish conquistadors and settlers arrived in the New World, they brought their silversmithing traditions with them. To this day, traditional Western horse bits have fancy, hand-engraved silver designs built over iron foundations. But did you know silver was not just to show off the wealth of a rancher? It was good for the horse's health, too!

People noticed long ago that silver kept water fresh or helped wounds heal. But it was Spanish blacksmiths who decorated horse bits with silver. It helped prevent the iron from rusting and offered medical benefits for horses. You see, silver is one of a few natural metals found that has an **oligodynamic effect**. When silver comes into contact with moisture (horse saliva), it releases microscopic **ions.**

These ions can kill bacteria. Silver also prevents fungal spores from germinating and stops fungal colonies from spreading.



The Role of Sweet Iron

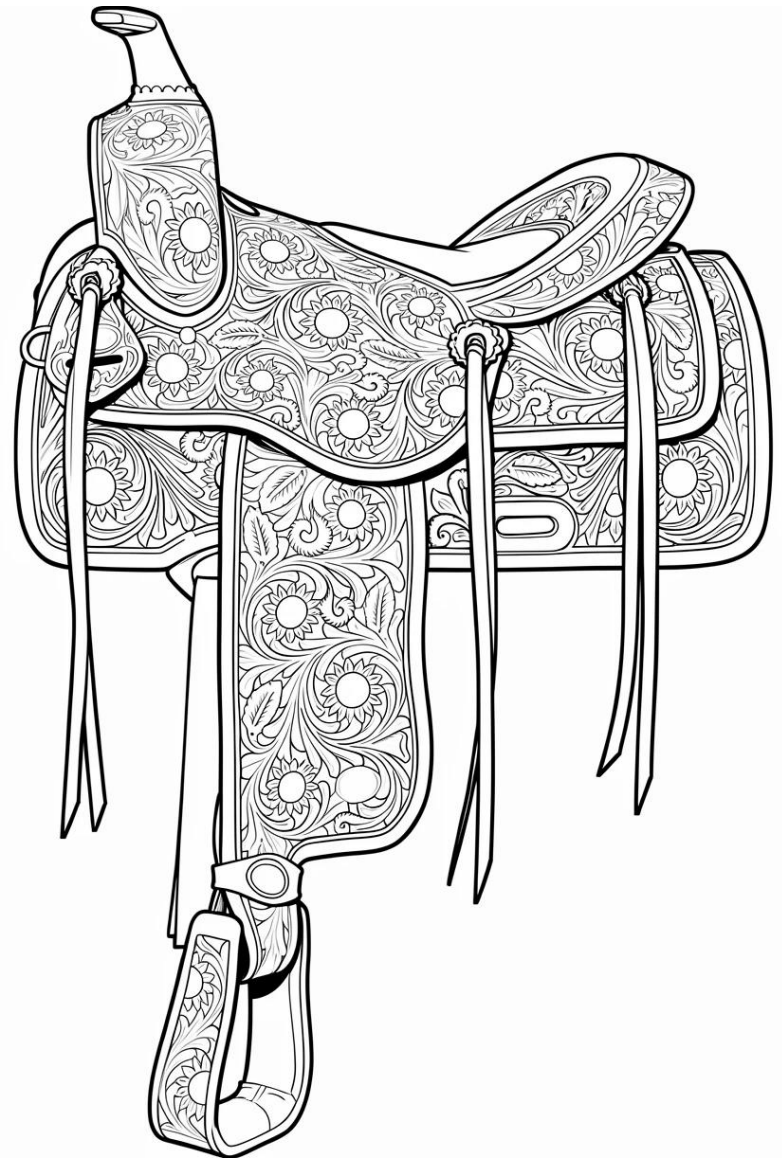
Spanish and Western bits sometimes combined silver with a base of **sweet iron** (rolled steel). Blacksmiths chose sweet iron because it rusts quickly. The oxidation creates a sweet taste that horses love. The combination of sweet iron (that horses like to chew on) and silver (which kills the bacteria) created a perfect, hygienic piece of equipment.

Watch and Learn:

https://www.youtube.com/watch?v=JN6I3WeaKAQ&t=13s

WESTERN ART: STEAM AT WORK

THE SCIENCE OF LEATHER TOOLING



Imagine you are a cowboy riding a horse at full speed to catch a runaway cow. Suddenly, the horse turns sharply! If your saddle is made of smooth, shiny leather, it will be as slippery as ice! You could slide right off!

To fix this, cowboys use **leather tooling**. This is when a craftsman uses knives and heavy metal stamps to carve beautiful designs, such as flowers or basket-weave patterns, directly into leather saddles, boots and belts. It looks like amazing art, and it is. But it is also science and engineering at work!

What is Friction?

Have you ever looked at the bottom of your favorite sneakers? They aren't smooth. They have bumps, lines, and patterns. Those patterns create a force called **friction**, which grips the ground and keeps you from slipping. Leather tooling does the exact same thing for a cowboy. Carving patterns into smooth leather creates thousands of tiny ridges and bumps. This texture creates friction against the cowboy's jeans. It locks the cowboy into the saddle, so they don't slide off during a bumpy ride.

What is Compression?

To tool leather, a craftsman must first soak it in water and then repeatedly hit it with heavy metal stamps and mallets. When they pound on the leather, it smashes the tiny fibers inside the leather tightly together. This is called **compression**. The stamped parts of the pattern become denser and more solid than the smooth parts. This creates a hard "shield" on the saddle where the cowboy's legs rub the most. That's how tooling can help the leather from wearing thin too fast.

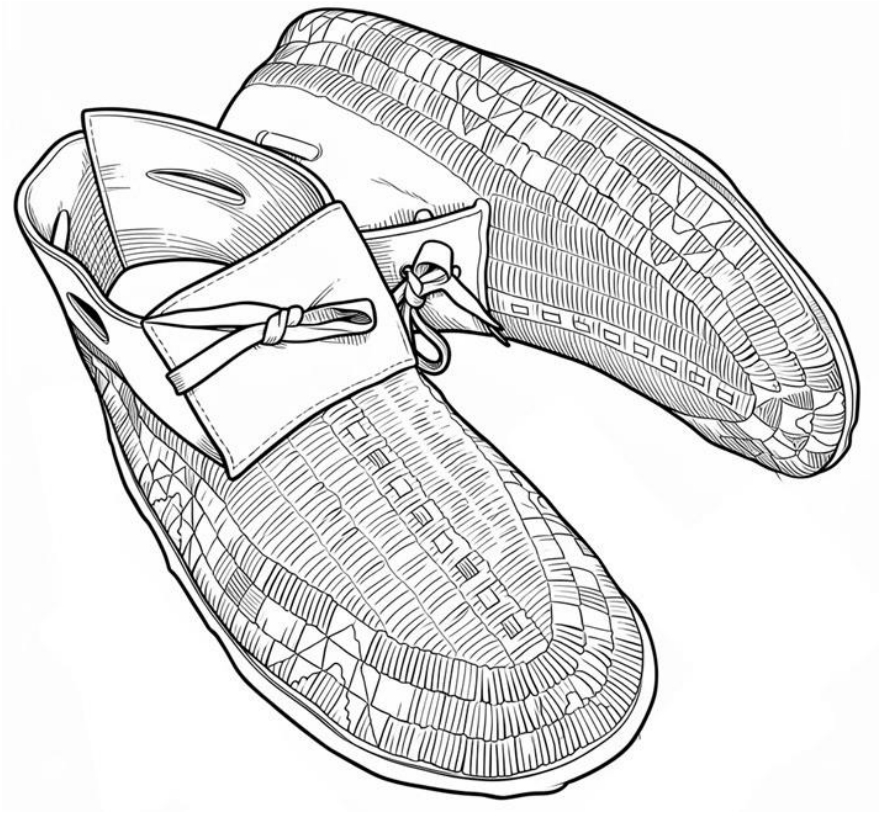
Watch and Learn:

https://nationalcowboymuseum.org/blog/tcaa-saddlemaking/

WESTERN ART: STEAM AT WORK

THE BRILLIANCE OF BEADWORK

Imagine you are living hundreds of years ago. You need to make gear for a long journey across hot deserts, rocky mountains and freezing plains. How do you protect your feet, keep your hands safe, and make your gear look good, too? You use STEAM. Many early Native Americans were not just artists; they were clever engineers of who knew how to use the natural resources around them.



A Need for Insulation

Native designers adjusted to the weather. Before glass beads existed, they harvested porcupine quills. By understanding the animal's **biology**, they knew the quills were hollow inside. They also knew about **thermodynamics** (the science of heat) and that trapped air inside a hollow tube acts as a natural insulation barrier (**thermal shielding**). Moccasins covered in quills were a technology that kept a hunter's feet from freezing on winter days and blistering in the summer.

When glass beads arrived from European traders, Native American designers kept making moccasins from animal hide, a flexible layer of defense. But they now added hard glass beads that acted like armor. When walking through the rough terrain, the dense rows of glass beads blocked sharp rocks and cactus thorns, preventing painful wounds to feet and legs.

Math and Art

The many beautiful designs that are found in Native American beadwork is based on artistic traditions of various cultures. But did you know that when you look closely at a beaded moccasin, belt or bag, you are actually looking at a computer program? To create beautiful geometric patterns, Native artists use mathematics. They count every single bead and repeat the sequence perfectly to make a design. It takes mathematical balance to make the final product both beautiful and durable.

Watch and Learn: https://www.youtube.com/watch?v=frjA8MHMARQ

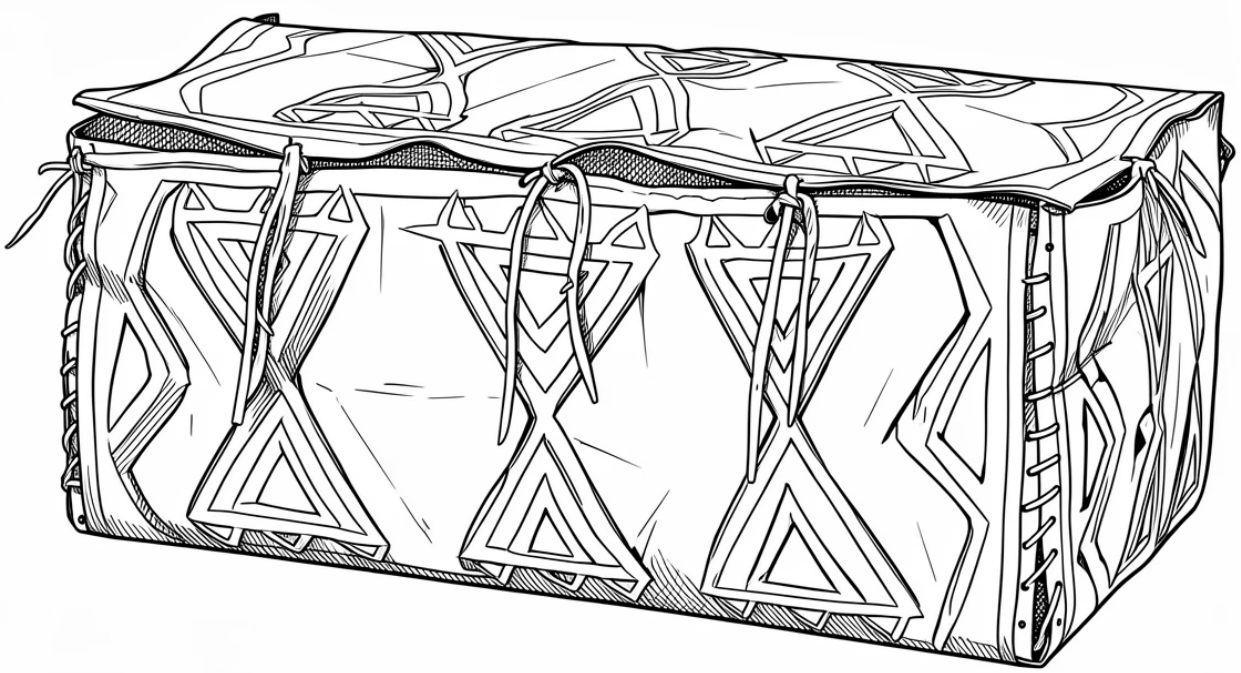
WESTERN ART: STEAM AT WORK

MOBILE TRANSPORTATION ENGINEERING

Imagine that you are going on a long trip hundreds of years ago. You won't be using a car; you will be packing everything onto a horse or carry it yourself. You don't have plastic bins, luggage, or even cardboard boxes, either. Native American Tribes living on the Great Plains and Plateau regions faced this same problem. To solve it, they used clever science and engineering to invent a tough, weather-resistant suitcase called a parfleche (par-flesh).

An Engineering Choice: Rawhide or Leather?

The first big choice was picking the right material. Many Native Americans used bison hides, but they did not turn them into soft leather used for clothing or shoes. Instead, they made rawhide. To make rawhide, the wet hide is cut into a shape and folded to create an envelope or box. Then the hide is stretched tight on a frame to dry in the sun. As it dries, the natural **proteins** inside the skin lock tightly together. This turns the hide into a stiff, hard envelope or box. It is so strong it can protect food and clothes from weather and rough travel.



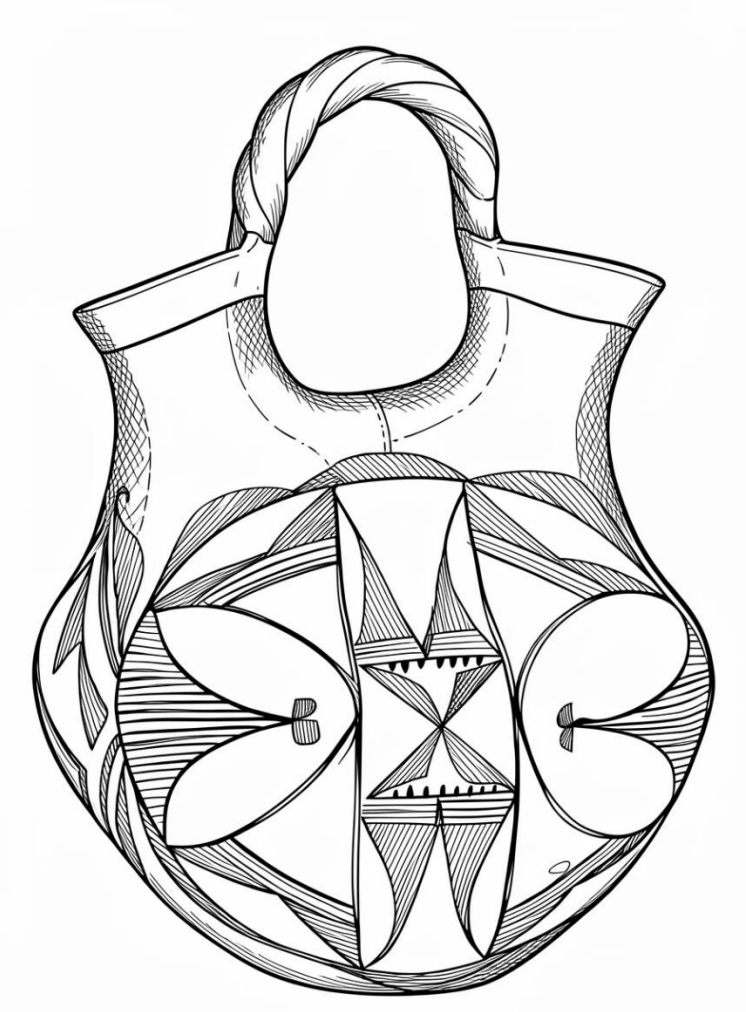
The Artistic Touch

After the bag was formed, artists painted beautiful geometric shapes—like triangles and diamonds on the outside. While these designs were often connected to family and Tribal traditions, the engineering purpose of the paint used clever chemistry! Artists mixed dirt and colorful rocks with a sticky glue made by boiling animal fats. This glue is called a **binder.** When this special paint dried on the rawhide, it did more than look pretty. It created a sealed layer to protect the bag and keep the items inside nice and dry. The entire process was a masterpiece of Indigenous engineering. Native Americans created the perfect suitcase for a mobile way of life.

Watch and Learn: https://www.youtube.com/watch?v=4bH-Te8QptI&t=8s

WESTERN ART: STEAM AT WORK

HIGH-HEAT MAGIC



Imagine you just painted a picture with your classroom paints. Now, imagine throwing that painting right into a roaring fire. What would happen? It would burn up and vanish in a cloud of smoke! Ancient Native American potters faced a problem. They wanted to decorate their cooking pots with colors and symbols, but those pots sat in hot fire pits every single day. If they used regular paint made from berries or flowers, the heat would cook the paint right off.

To solve this, Indigenous artists became chemical engineers. They discovered how to make a special "magic" paint using rocks and plants that could survive the extreme heat. Instead of using plants for color, potters searched for specific rocks that contained heavy metals like iron (that makes a deep red or orange color) and manganese (that makes a dark black or brown color). They crushed these heavy minerals into a powder and mixed them with water for paint.

The Science of Mineral Paints

Because rocks are already made by the heat of the earth, these mineral paints don't melt or burn away in a normal campfire. The heat actually makes them stronger! Once a pot is painted, it is placed into a large oven with a super-hot fire. This is where the real chemical engineering happens!

Inside the fire, the temperature gets so hot, the high heat causes the mineral paint and the clay pot to fuse together. This means that the minerals melt just enough to chemically lock into the clay itself. The artwork doesn't just sit on top of the pot like a sticker—the paint becomes part of the pot! Because of this clever chemistry, the designs never scraped off, never melted when cooking food, and lasted for thousands of years.

Watch and Learn:
https://www.youtube.com/watch?v=8s2KRS6d5pg&t=25s