

CHAPTER THREE

TOOL-MAKING TECHNOLOGY

STUDENTS LEARN HOW THE TIMUCUA USED NATURAL MATERIALS TO MAKE TOOLS - AND HOW THESE TOOLS HELPED THEM TO SURVIVE.



WHAT IS TOOL-MAKING TECHNOLOGY?

Except for a few animal species (including apes, crows, and elephants), humans are the only tool-makers on the planet. Every human culture creates and uses tools. Tool-making is more than simply picking up a sharp shell and using it to chop wood (that's tool USE). Tool-making is the intentional creation of tools to solve problems. Interestingly, modern Floridians don't spend much time making their own tools. If they need to chop down a tree, they buy an axe. Or they hire someone to chop the tree for them. If they had to make their own axe, they probably wouldn't know where to start. In the modern world, work has become very specialized. Specific people do specific things. Most of our tools are not made by people at all. They're made by machines.

Life was very different in early Florida. There was little specialization. Every woman knew how to make pottery. Every man knew how to knap stone points. Everyone understood how to carve wood, bone, and antler. Everyone knew how to manufacture shell tools. They did not attend school to learn these skills. Instead, mothers and fathers, aunts and uncles, grandmothers and grandfathers made tools as daily life required, and the children observed and asked questions. Timucua kids were expected to master these tool-making skills as they approached adulthood, in the same way that modern kids are expected to learn to read, to swim, and to drive a car.

What are Tools? Tools are items used to make something or solve a problem. They are not consumed (used up) in the process. For example, glue is not considered a tool because once it is used, it cannot be used again. A clay pot, however, is a tool. It can be used many times. Tools can be classified according to the kind of work they do. (Many tools do more than one thing, so they can fall into more than one category.) The Timucua made each of these types of tools.

Tools that Cut or Crush: awl (pierces leather or skin for tattooing); axe (cuts wood); chisel (chips bits of wood from a dugout log); drill bit (drills holes in shells or bone to make jewelry or net weights); knife (for cutting meat and hides); and mortar and pestle (for grinding corn)

Tools that Move Things: bow (flings an arrow), canoe and paddle (transports people and materials), containers (to hold materials and make it easy to transport them), hammer (chips chert flakes off of stone points), lever (lifts heavy things), pottery paddles and implements (move and reshape the clay), scrapers (remove hair or fat from animal hides)

Tools that Cause Chemical Changes: fire drills (for starting combustion reactions – fires)

Tools that Guide and Measure: net gauge (for ensuring the holes in a fishing net are all the same size)

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Tools that Shape Things: hammer (to shape a chert point by chipping flakes of stone), hammerstone, knives (to carve bone, antler, and wood), scrapers and pottery paddles (shape pottery)

When analyzing data, archaeologists try to interpret the purpose of the artifacts they find. A shell with a sharpened edge was probably a cutting tool. A stone point with no wear at all was probably ceremonial, and not a functional tool. However, in many cases, it is impossible to clearly assign a purpose to each tool. Instead, archaeologists record the artifacts according to their material, which can be proven by chemical analysis. Let's look again at the tool items listed above, this time categorized by what they're made of.

Stone: drill bit , hammerstone, knife, scraper

Teeth and Spines: awl, drill bit, fishing spear tip

Bone and Antler: awl, hammer, net gauge, scraper, tool handles

Wood: bow and arrow, canoe and paddle, container (wooden bowl, grapevine basket), fire drill, lever, mortar and pestle, pottery paddle, tool handle

Shell: axe, chisel, container (whelk shell bowl), hammer, net gauge, net weight, scraper

Clay: container (clay pot)

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ACTIVITY – GROUPING MODERN TOOLS:

INSTRUCTIONS, PART I: For each of the categories below, list two modern tools that fulfill that function.

Tools that Cut or Crush: _____

Tools that Move Things: _____

Tools that Cause Chemical Change: _____

Tools that Guide and Measure: _____

Tools that Shape Things: _____

INSTRUCTIONS, PART II: Look at each of the tools in your answer above. Think about what materials these tools are made from. Write each tool in the box below its primary material. If it has more than one main material, put it in both categories. The categories “metal” and “plastic” are provided. Feel free to add other categories on the lines below should you need them.

Tools Made From Metal

Tools Made From Plastic

Tools Made From _____

Tools Made From _____

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Most of the tools we use today are made of metal, plastic, or both. The Timucua had neither of these resources. Plastics had not been invented yet. And Florida soils have no hard metals, like iron. A bit of soft copper was traded down from the Appalachian Mountains, but these meager resources were made into jewelry or ceremonial items, not functional tools. So, what did the Timucua use instead of metal or plastic? That depended on the job they needed to do. North of Timucua territory, in areas with plentiful stone, stone was used to make most of the tools. The only stone in Florida was chert. And much of Timucua territory had no chert deposits at all. They had to trade to get it. As a result, if a tool could be made of something else, it was.

LET'S TALK ABOUT STONE TOOLS

Stone tools have been in use for a long time. How long? About 3.2 million years. That's right... million. That's long before *Homo sapiens* (that's us) roamed the planet. In fact, it predates the species *Homo* completely. Most likely, these first tool makers belonged to the species *Australopithecus*. Their simple pebble-shaped tools were used to crack the long bones of animals to get at the nutritious marrow inside.

Okay, let's fast-forward almost 3.2 million years. *Homo sapiens* have become expert stone tool-makers. They've migrated across the Bering Land Bridge, and 12,000 years ago, they're using stone tools to butcher mammoths alongside the Aucilla River in NW Florida. As time passes, the stone tools get smaller. Native peoples are no longer hunting giant mammoths, so they don't need huge points to pierce elephant hide. Smaller stone points are used to hunt and butcher smaller animals like deer, rabbits, and turkeys. By Timucua times, the bow and arrow have also been invented. These require tiny, light points to fly effectively. Unlike their Archaic ancestors, the Timucua people had settled, for the most part, in one location. Since they weren't moving around as much, they no longer had access to lots of chert sources. They had to use the poor quality chert available near home. How do we know? Archaeologists have compared the chert used to make Timucua artifacts with the chert found in outcroppings around Florida. This gives us a good idea of where the raw materials were coming from.

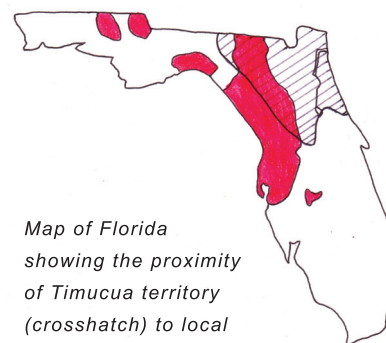
What exactly is chert? It's a quartz-like stone with a strong crystalline structure. When it breaks, it forms sharp edges, which makes it useful in creating cutting tools. Technically, chert is silicon dioxide (SiO_2). It is found in limestone, which forms the base rock for the entire state of Florida. Why? About 50 million years ago, while Florida was under the ocean, billions of tiny skeletons of ocean planktons settled to the bottom. These eventually became limestone. As time passed, the ocean levels dropped, and Florida limestone was exposed. It was covered by a thick layer of dirt and debris, but in some places, the limestone was still fairly close to the surface. Acidic rain water seeped down through the soil and into cracks in the limestone. A few cracks grew massive and formed caves or sinkholes. Other cracks simply filled with minerals as Florida went through its repeated underwater and above water cycles. Eventually, these minerals solidified into different kinds of rock. When the invading mineral

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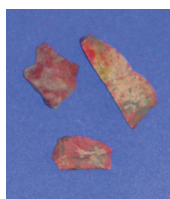
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was silicon dioxide (perhaps from ocean diatoms or fresh water sponges) the resulting mineral is called chert. Check out the map showing the location of Florida chert. The cross-hatch area shows Timucua territory. Some of the more western groups lived in areas that had chert outcroppings.

So, what's the difference between chert and flint? When you're talking stone tools, flint is a better material because it is made up of smaller crystals which allow it to take a sharper edge. It's usually dark gray or black, and a bit shinier than chert, which is dull, opaque, and whitish-gray. Florida only has chert. To improve the quality of the chert, native tool-makers heated it with fire.



Map of Florida showing the proximity of Timucua territory (crosshatch) to local chert deposits (color)



Fire-treated Chert Debitage

Heat-treating Chert: Because chert can explode when heated, the Timucua probably heated it underground. First, they chipped out the basic shapes of the tools they wanted. Why? If they tried to heat-treat big chunks of chert, the middle of the chunk would not get hot enough to change its crystalline structure. Next, they built a fire and allowed it to burn down to hot coals. These coals were scooped into a pit in the ground. Then they placed their small, half-worked pieces of chert onto the ashes and covered the whole thing with dirt. Finally, they built a large fire above the buried pit, which was allowed to burn down over the next 24 hours. When dug up, the heat-treated stones were often reddish in color with a bit of a shine.

Actually, that was the easy part. Flint-knapping takes years to master. It's not just knocking two stones together. It's physics in action. Force must be applied – enough to chip the stone, but not shatter it. This force must be applied in the proper location. If you take a chip from the middle of a point before thinning the ends, you've created a weak middle. Your point will snap in two. So you start at the edges. The force must be applied in the appropriate direction (towards an edge to take off a tiny spall and sharpen the edge) or down the length of the point to take off a long section that thins the entire blade. The force must also be applied at the proper angle. Accurate force and direction make the difference between removing a long, thin flake and breaking your point in two.

Percussion Flaking: Percussion is hitting one object with another. The tools of choice were a round, palm-sized, chert hammerstone and an antler hammer (made from the thick base of a deer's antler). They used a chert hammerstone for striking large chunks of stone and breaking off usable pieces. Another good use was chipping out the basic tool shapes before firing. However, hammerstones deliver so much force they can damage finer, thinner points.



Two Pre-Timucua Points, Right one snapped in half. Found in Duval County, FL

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That's when the antler hammer comes in. Antler absorbs some of the shock of percussion, instead of transferring the full force to the chert. This gives the flint-knapper finer control.

Pressure Flaking: Using this technique, native toolmakers pressed the thin tine of an antler against the edge of the point they were crafting. They used pressure, rather than a strike, to break off tiny chips. Pressure flaking was usually used at the end of the tool-making process, when the flint-knapper was putting the final touches on his point.

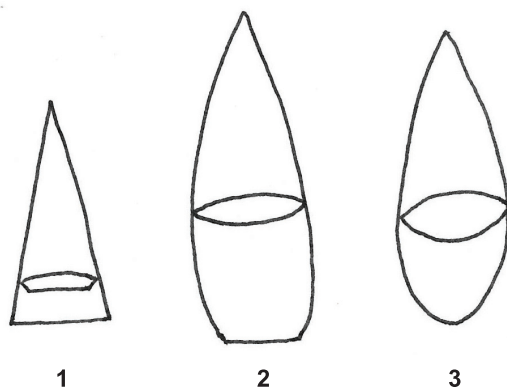
Indirect Percussion Flaking: This technique combines percussion and pressure flaking. The flint-knapper holds the antler tine against the edge of the point. Then he uses the antler hammer to strike the tine. You get the precision of pressure flaking with the greater force of percussion flaking.



*Pinellas Point,
courtesy of Dr. Stephen Granger*

Timucua Era Stone Points: What could all of this pressure and percussion create in the hands of a skilled Timucua knapper? If he was lucky, he made what is known today as a Pinellas Point. Three cm long x 2 cm wide x ½ cm thick. Teeny-tiny. Many Pinellas points are finely worked on only one side, with the other side appearing as though it had just been chipped from the core. These points were perfect little isosceles triangles with no stem, the most effective arrow point achievable with the least effort.

Two other points are common in Florida during the Timucua timeframe (1560s – 1760s). The Ichetucknee was more leaf-shaped and slightly larger at 4.5 cm. It was usually found in northwest and central Florida. The Tampa point was leaf-shaped and about the same length. However it was very roughly worked, with a thick cross-section at 1.2 cm. This point was generally found from Tampa Bay up through the same area as the Ichetucknee.



*Sketches of Timucua
Era Projectile Points:*

- 1) Pinellas Point
- 2) Ichetucknee Point
- 3) Tampa Point

Note: The markings in the middle represent the shape of the point through its width: the one-sided Pinellas point, the 2-sided Ichetucknee, and the 2-sided, very thick Tampa.

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Archaeological Note: Stone points are called “projectile points,” not “arrowheads.” Why? It’s not always possible for archaeologists to tell if the point was an arrowhead, a spear point, a scraper, a drill, or a knife.

What’s the basic flint-knapping process? The Timucua flint-knapper probably held the chert core tightly with a piece of leather protecting his palm. He struck the core with an antler hammer, applying force along the length of the stone. This detached a long flake, suitable for making into knives, projectile points, drills, or awls. He continued detaching flakes until the core was too small to provide useful tool material. Next, these tool blanks were fired. After they were cooled, an antler hammer was used to begin detail work. Using percussion flaking, long thin chips were detached from one of the flakes. This detail work occurred on both sides for Ichetucknee and Tampa points, but only on one side for Pinellas. Next, the antler tine, either on its own (pressure flaking) or being struck by an antler hammer (indirect percussion flaking) was pressed downward and outward to detach tiny flakes from the edges of the blade. This straightened any curve present in the blade and sharpened the edge even further.



*Modern Percussion Flaking
photo by Wikipedia*

What happened when a stone tool broke? Since it took so much effort to make stone tools, the Timucua didn’t just throw them away when they broke or became blunt. Stone tools could be resharpened using pressure flaking. As you might imagine, each sharpening event chips a bit more off of the tool’s edges, making it smaller. Tools were likely resharpened until they were too small to be useful. What about points that snapped in half? The broken end was blunted and smoothed a bit. This turned it into a scraper for use in the hide-making process. Back then, “reduce-reuse-recycle” wasn’t just an environmental slogan. It was a way of life.

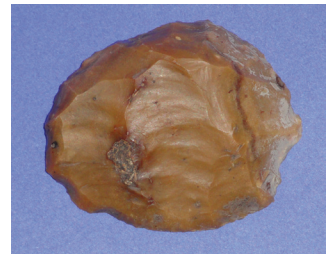
Archaeological Note: Because points became smaller with each sharpening, archaeologists rarely use size to identify projectile points.

What is debitage? All of those stone flakes and chips make a huge, sharp mess. This mess is called debitage (deh-bee-tazh). Archaeologists look for debitage deposits as a way of pinpointing where stone tools were being made. Even if they can’t find stone tools, debitage provides evidence of their manufacture. At one site in Hernando County (southwest of Timucua territory), archaeologists found 546 stone tools and 41,000 pieces of debitage.

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What can we learn from experimental archaeology? Experimental archaeology is a study which recreates the actions of extinct cultures. A modern flint-knapper can knap one tool using percussion flaking, another using pressure, and another using indirect percussion. The remaining debitage from each method can be compared to the debitage found at archaeological sites, helping the archaeologist to assess which methods were in use.

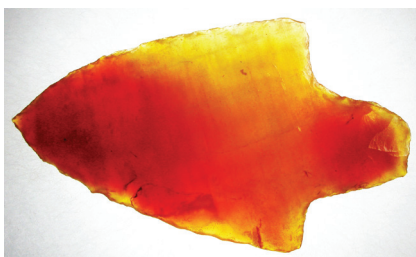


*Replica of a
Stone Scraper*

Modern flint-knappers often practice their knapping skills on the ceramic seats, lids, and basins of discarded toilets. When they become proficient, they switch to using real chert. Limestone quarries can often provide samples of chert for free. After all, it's a junk material found within limestone. Taxidermists and hunters can donate antler. But please remember, knapping is an inherently dangerous art. Safety glasses and leather gloves are a must. And as for cuts, it's not IF you're going to get cut, it's WHEN.

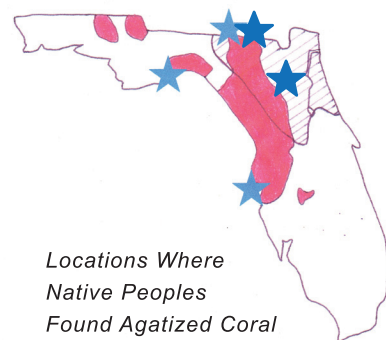


*Agatized Coral,
courtesy of the Museum
of Florida History*



*Agatized Coral Newnan Point, Claudia,
courtesy of Dr. Steve Granger*

One other Tool Material: Archaeologists occasionally find projectile points made from another local stone: agatized coral. Corals are tiny marine animals that have a limestone shell. Many corals clump together to form a coral reef. Sometimes, silicon dioxide from the water replaces limestone in these corals, and the animal becomes fossilized. This process takes about 30 million years. What you end up with is geodes. When you crack open the geode, you find a glassy material filled with ribbons of color. Agate (the base for the word, “agatized”) is another name for chert.



*Locations Where
Native Peoples
Found Agatized Coral*

Agatized coral is the Florida State Mineral. Points made from this material are particularly beautiful – and rare. There are only a few spots near Timucua territory

where this stone can be found. These spots are the sites of ancient coral reefs, now underground. Modern rivers are cutting down into these old reefs and eroding away chunks of stone. Crack one of these geodes open, and you'll find agatized coral inside. Florida's native people knapped this beautiful stone just like the more common forms of chert. Look again at the map showing Timucua territory and chert deposits. Stars have been added at the sites where people still find agatized coral today.

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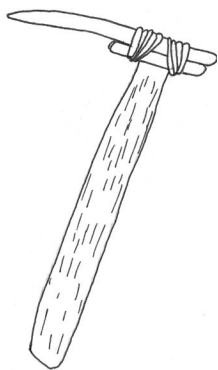
WHAT DID THE TIMUCUA MAKE WITH SHELL?

What shells did the Timucua use for tools? The most useful shells for tool-making were the whelks. Lightning whelks, at lengths of up to 40 cm (16”), provided plenty of sturdy tool-making material. However, the smaller knobbed whelks (at 23 cm or 9”) are much more common in northeast Florida waters and midden sites. Mussel shells were also used – for thin, fragile items like fish hooks. Oyster shells, cockle shells, and arc shells were perforated (a hole was knocked in them) and tied to the bottoms of fishing nets as weights. Quahog clams are very thick and sturdy. They were used for bowls and even as anvils (hard work surfaces on which nuts or other objects were struck or cracked).



Left: Oyster shell net weight
Right: Oyster shell
Both Pre-Timucua, found in Duval County, FL

How did the Timucua shape the shells? Cutting whelk shells is challenging. Since whelk axes are tough enough to chop a live tree trunk, you know it takes a lot of force to break one on purpose. If you simply slam it with a rock or another whelk hammer, one of four things might happen. 1) You smash the whelk, destroying it completely. 2) You smash your hammering tool completely. 3) You smash both tools completely. 4) Neither tool is damaged at all. In other words, brute force isn't effective. Two less forceful methods have been suggested. The Timucua probably used both, selecting the first for making heavy tools, like axes, anchors, or chisels. The second was probably reserved for making ceremonial or decorative items, like shell bowls, gorgets (breast plates), and ear spoons.



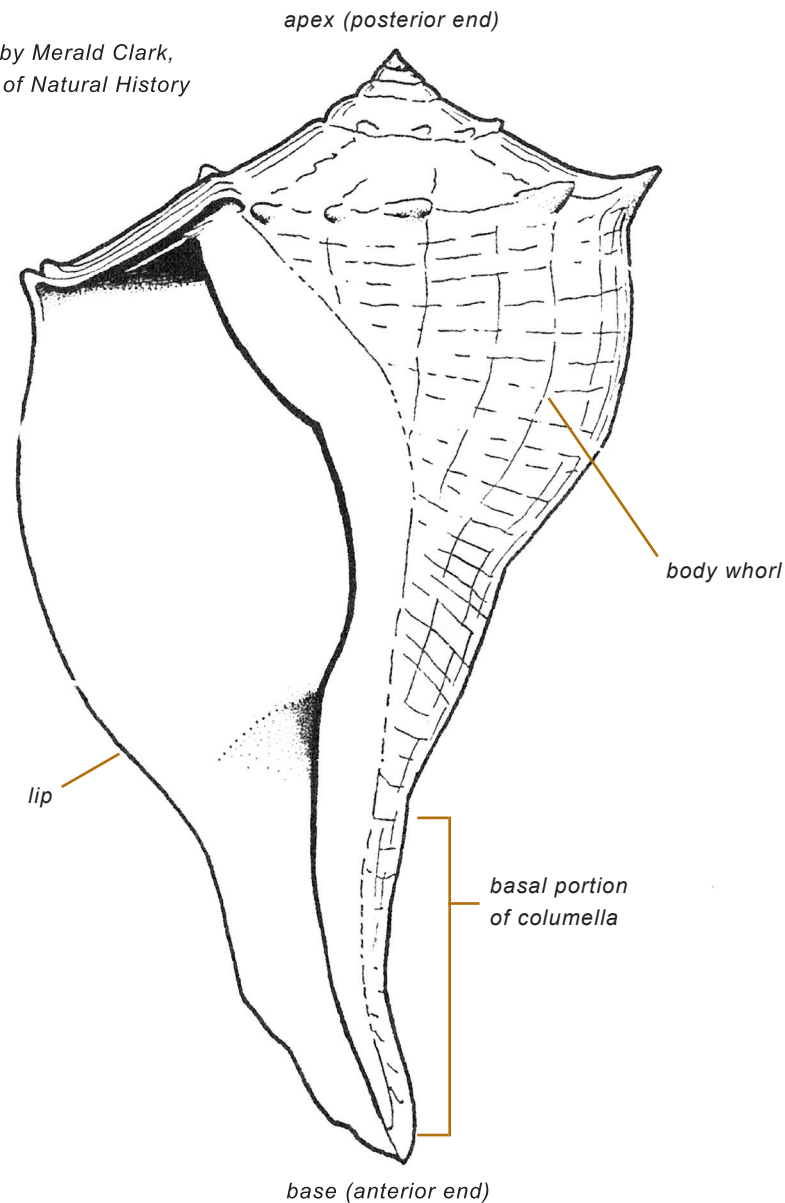
Shell Celt

Method 1 for Cutting Whelk Shells: Actually, there was a bit of bashing in the first step, when the lip (outer whorl) was removed. To prevent shattering, the Timucua struck the whelk at very specific spots, depending on how much of the whorl they wanted to remove. What did they strike it with? They probably used a shell celt (a specialized tool, usually for woodworking). The celt (pronounced selt) was actually made from a whelk shell whorl and hafted onto a wooden handle. The Timucua struck the whelk at just the right spot to weaken or fully detach the outer whorl. If it came off in one piece, great; that piece could be made into another tool. If not, well, archaeologists find A LOT of shell debitage in middens.

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*Whelk Anatomy, Drawing by Merald Clark,
courtesy Florida Museum of Natural History*



Once the outer whorl was removed, the toolmaker could further modify the tool into an axe or hammer. Alternatively, he could remove the columella (spiral) from the center of the shell. Columellae were made into cutting tools (chisels), perforators (pointed awls for poking holes), hammers, pulverizers (for processing acorns, etc.), sinkers for nets, and jewelry. So, how did they get that swirl out of the shell? It's a bit like creasing a piece of paper to make it easier to tear a straight line. The Timucua used a stone or shell tool to peck tiny holes across the columella in a straight line. Then, when they applied force to the shell (perhaps by indirect percussion) the columella broke where they wanted it to. Now the columella was free of the shell. Rough edges were smoothed using a sandstone grinder. These grinders were also used to abrade the bottom tip of the shells into a sharp angle. That created the cutting surfaces of axes and chisels.

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Method 2 for Cutting Whelk Shells: For jewelry items like gorgets and beads, as well as shell cups used in the Black Drink Ceremony, the Timucua used no bashing and no smashing. Stone tools were used to actually cut the shell. Sound time consuming? You have no idea. One experimental archaeologist used stone tools to score lines deep into the whorl of a whelk shell. It took six and a half hours to detach a single piece from a knobbed whelk. He went on to process this whelk into the following useful parts: one bowl, three pieces of columella, and 17 bead-sized pieces. It took 23 hours. Then he drilled a hole in each bead (add 20 minutes per bead). It's clear why these were prestige items. If it took days to make them, the artisan could demand a high price in trade. After all, he couldn't be out hunting, fishing, or gardening during the construction process. Some specialization probably existed in Timucua villages, but for the most part, everyone could make everything. Someone had to be the best though, and the most skilled artisans were always in demand for prestige items.



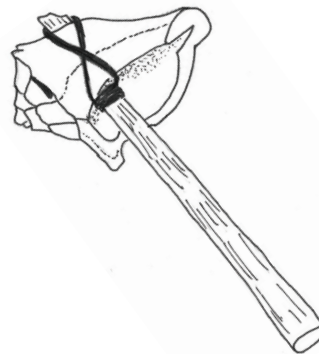
Shell Gorget, found in Marion County



*Shell Beads
Both on Display at Fort
Caroline National Memorial*



*Whelk Shell Axes – Outer view
is a modern replication*



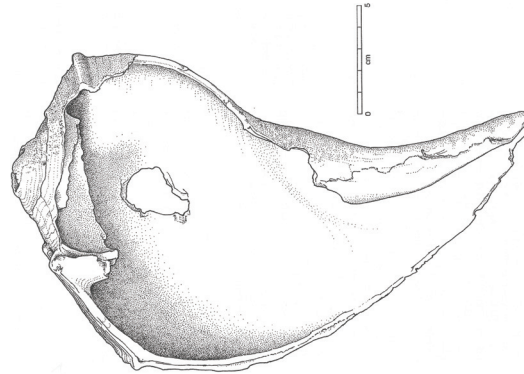
*Sketch shows
interior view with binding.*

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Two Lightning Whelks
(*Busycon contrarium*)

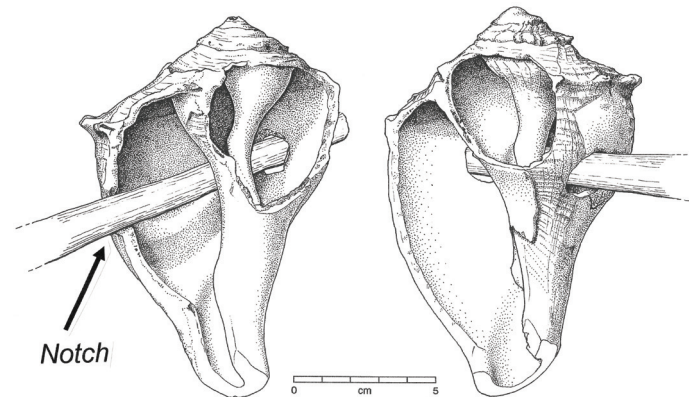


Lightning Whelk Bowl or Dipper –
Used in the Black Drink Ceremony. The columella
has been removed.

Drawing by Merald Clark, courtesy of the
Florida Museum of Natural History



Knobbed Whelk made into a hafted
tool. A notch was cut in the side
where a handle passed through.
(*Busycon carica*), found in Duval
County, FL



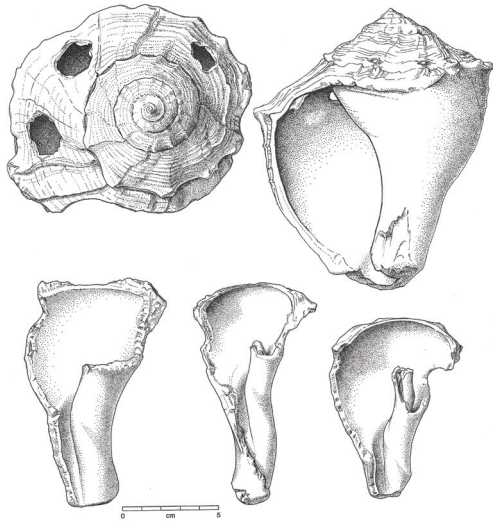
Two Hafted Lightning Whelk Axes

Left image: Type A Tools have one hole and one
notch cut in the shell for a handle to pass through.
Right image: Type B Tools have 2 full holes for a
handle to pass through.

Drawing by Merald Clark, courtesy of the
Florida Museum of Natural History

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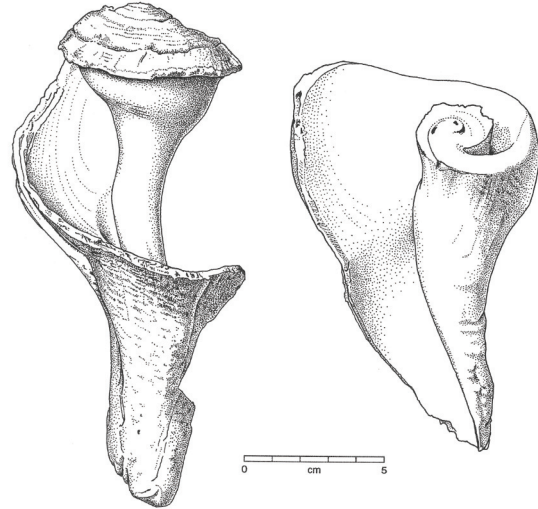
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Two Types of Whelk Shell Hammers.

The columella is the strong part of the shell, the part used for hammering. It can be used even when the outer whorl breaks away.

Drawing by Merald Clark, courtesy of Florida Museum of Natural History

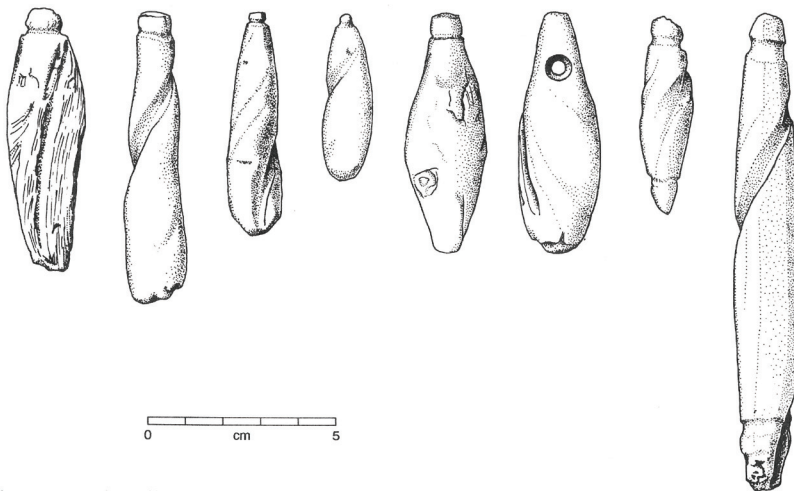


Lightning Whelk Tools

Left image: a hammer or pounder

Right image: a hand-held grinder or pulverizer.

Drawing by Merald Clark, courtesy of the Florida Museum of Natural History



Whelk Columella Sinkers or Pendants.

Archaeologists once considered these jewelry, but now, they are classed as fishing weights. Notice the fish face carved on the 4th sinker from the left.

Drawing by Merald Clark, courtesy of the Florida Museum of Natural History

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LET'S TALK ABOUT OTHER ANIMAL MATERIALS (TEETH, SPINES, BONE, AND ANTLER)

What did Florida's native people do with shark's teeth? They made tools, both from recently hunted sharks and from fossilized teeth, like the ones you find on the beach. What sharks did they hunt? One non-Timucua site in southeast Florida produced more than 150 sharks' teeth, including lemon, tiger, hemipristis, sand, and mako sharks. These incredibly sharp teeth were attached to handles via a hole drilled through their base. Both the tips of these teeth and their convex (outwardly bending) edge, show wear, including scratches, cracks, and chips. This wear is consistent with the marks we would expect to see on a well-used knife. Fresh sharks' teeth were also used for drilling, poking holes, and as studs on striking weapons, like clubs. The Timucua also utilized sharks' teeth to make tools, but not as extensively as the south Florida cultures.

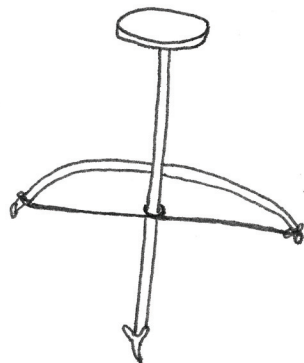


*Tiger Shark Teeth
photo by Wikipedia*

Fossilized teeth are no longer as sharp, but they're very durable. Long narrow fossilized teeth, like a sand shark's, made excellent awls. Sturdy triangular Megalodon teeth made good scrapers. And sharks' teeth jewelry never goes out of style.



*Megalodon Fossil Tooth,
photo by Wikipedia*



Bow drill

How did they drill a hole in a shark's tooth (or the canine tooth of land mammals)? They used a stone drill point, hafted on a long, narrow wooden handle. After placing the drill tip against the tooth, they used a bow drill to spin it against the tooth. How did this work?

The handle of the drill was twisted into the string of a short bow. When the bow was moved back and forth, it spun the handle. The disc on top allowed the user to apply downward pressure, forcing the spinning drill bit down into the shark's tooth, shell bead, or other material to be drilled. Once they had drilled halfway through, they'd flip the object over and drill from the other side. When the holes met in the middle, the drilling job was complete.

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What did the Timucua do with stingray spines? Southern stingray spines can be up to 15 cm (6”) long. They have very sharp points as well as serrated edges. The Timucua used them to tip fishing spears (similar to a gig). These stabbing tools could be used to hunt bottom-dwelling marine animals, including flounder, crabs, and other stingrays. Stingray spines, like other sharp native tools (stone projectile points, bone knives, and shell axes) were sometimes used as weapons.

*Stingray Spine,
photo by Wikipedia*



Deer Antlers

What did the Timucua do with antler? Deer antler bases and tines were used to knap chert points. An “arrow wrench” was another tool made from antler. A hole was drilled in a piece of antler (or leg bone). Then a hot, steam-heated arrow was inserted through the smooth hole. The wrench allowed the Timucua to safely hold the hot arrow. Now, they could exert pressure on the arrow shaft to bend or straighten it as needed. Antlers were also used as tool handles. They’re solid all the way through, unlike long bones which are hollow. As a result, great force could be applied to antler tools, force that would splinter bone. How did the Timucua cut the dense material of antlers? They used a stone knife, scoring it all the way around and then deepening this cut until they could snap the antler in two. Sometimes this meant cutting through an inch of solid antler – no easy task.

What did the Timucua do with bone? Deer long bones were cut to make long thin shapes like harpoon points, fishing gorges and hooks, hair pins, awls, needles, and knives. Turtle shells were cut into small rectangular net gauges. During the tool-making process, bones were soaked to soften them, and then cut with stone knives. Since long bones are hollow, they were worked differently than antlers.



Photo courtesy of Ponce de Leon’s Fountain of Youth Archaeological Park. On loan to the park from the Florida Museum of Natural History.



Deer Leg Bone

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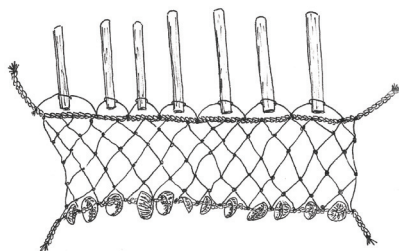
For example, to make four awls, the Timucua used a stone knife to score a line all the way down two opposing sides of the bone. They kept scoring deeper and deeper until they could snap the bone into two long pieces. They repeated this procedure with the halved sections until they had four long narrow pieces of bone. Next, they rubbed each bone piece with a sandstone abrader. An abrader is something rough that wears down the item it rubs. Sandpaper is an example of a modern abrading tool. The bone pieces were abraded until they were the shape of giant bone needles, one end ground very sharp for poking holes. The other end was blunt, perhaps with decorative carvings. The entire tool was abraded until it was smooth and round. Hairpins were made in a similar fashion, except the narrow end was blunt. Needles could be made by grinding the pieces of bone very thin. A bow drill with a tiny stone point was used to drill the hole for pulling sinew thread.

Making a knife or harpoon meant spending more time scoring and less time grinding. To start, the final shape of the knife blade or harpoon was etched onto the bone. Then a stone point was used to score deep lines into the bone along the etched outline. After A LOT of scoring, the piece could be detached from the rest of the bone. Then it could be sharpened to an incredibly dangerous edge by grinding with sandstone.

Net gauges were often made from shell or wood, but several made of bone have also been discovered. What kind of bone? The average deer leg bone is neither wide enough nor thick enough to make a rectangle of the appropriate sizes. The same goes for antler. Turtle shells did provide a large, fairly flat surface area. These shells would have been etched to outline the size of the net gauge needed, then deeply scored. Once the rectangles were free of the shell, sandstone abraders could make them smooth so they wouldn't catch on the net fibers.



Section of a Softshell Turtle Shell, useful for making net gauges



A native-style net, courtesy of the University Press of Florida

What exactly is a net gauge? When making your own net, you need to ensure that all of the diamond-shaped openings are exactly the same size. The Timucua held the rectangular net gauge within the diamond they were tying, using it to properly gauge where to tie the next knot. This produced a symmetrical net with standard-sized holes. Nets designed to catch larger fish had larger holes. Nets designed to catch small or young fish had very small holes, forming a fine mesh. Even today, modern nets are tied with the same knots.



Shell net gauge, found in Duval County, FL

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We've been talking a lot about sandstone abraders. Where exactly did the Timucua get sandstone anyway? The only rough stone found in Florida is coquina. But the abraders found on Timucua sites are made from sandstone. The closest sandstone outcroppings are in northern Georgia and eastern Alabama. The presence of these sandstone abraders in Timucua territory provides evidence of trade.

Interesting Note: Shark skin is as abrasive as sandpaper. It was probably used for polishing jewelry and hairpins.

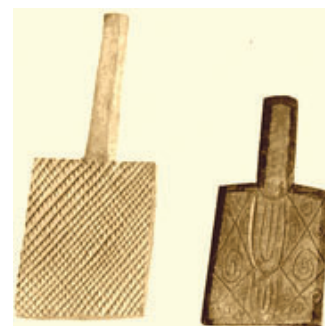
LET'S TALK ABOUT WOODEN TOOLS

What trees did the Timucua use? Pine was the primary wood used to make canoes. Hickory was an excellent material for bows. Cypress was made into a few canoes and plenty of bowls, mortar and pestles, and float pegs for nets. Tool handles were made from a variety of hardwood trees, including Florida Privet, Bumelia, Ash, and Oak. Poles (hut supports) were made from pine. One bird figurine was made from Red Cedar. Woody vines like grapevine were used for weaving baskets and building huts.

How did the Timucua process wood? They manipulated wood in several ways: burning and chipping, chopping and carving, and bending with steam. They also boiled woody vines then peeled them to use in basketry.

Burning and Chipping: The pyrotechnology lesson discusses the burn and chip method. Here's a quick recap. Wood is tough to chip. So, when creating canoes, large wooden bowls, and mortars for pounding plant foods, the Timucua let fire do much of the work. They carefully monitored a low blaze that charred the wood, softening it so they could use a shell chisel to remove the char. Then they would burn a bit more and chip a bit more until they had reached the desired depth. The inside of a bowl could be scoured with sand or a piece of sharkskin to smooth the grain of the wood. The outside could not be burned, so the outsides of these items were chipped into shape with shell tools. A huge number of woodchips were created during these projects. Like the chips left by flint-knapping, these woodchips are called debitage. The "burn and chip" method was also used to fell trees for canoes and house construction.

Chopping and Carving: The Timucua used shell axes to chop tree trunks and branches into useful sizes. Once a length of wood was prepared, the bark was scraped or peeled away with a stone scraper. Stone knives were used to carve these peeled pieces of wood into handles for tools and into pestles for pounding corn. The Timucua chopped tall, narrow pines to serve as levers, very helpful for heavy lifting jobs. Long, narrow canoe paddles were also carved. Short, squat pottery paddles were carved with intricate designs. When pressed onto unfired pottery, the designs transferred to the clay pot. Because wood



*Cherokee Pottery Paddles,
photo by Wikipedia*

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rots away, archaeologists have yet to find one of these pottery paddles in Florida.

However, they have found individual pots – miles apart from each other – which were made with the same paddle (it had a tiny crack in it that transferred to the clay along with the pattern.)

ANCIENT WOODEN TOOLS



Atlatl Thrower,
photo by Wikipedia

Long before the Timucua, about 7,000 years ago, Florida's native people were making a hunting tool called an atlatl (at-lat-el). By using an atlatl (spear-thrower), a skilled hunter could propel a dart 200 times harder and 6 times faster than using a spear alone.

Florida atlatls are compound tools, made of more than one material. The thrower itself is a carved wooden shaft about the length of your arm. The back end had a small carved piece of antler sticking up. This formed a spur that hooked into the back of a six-foot-long flexible dart. Many atlatls had a bannerstone

(weight) added to the middle of the shaft which helped balance the cast. Bannerstones were actually stones in other parts of the country, but in Florida, they're often made from antler!

The atlatl is actually a lever. It increases the length of your throwing arm and gives you an extra elbow joint. Why did the Timucua's ancestors switch to using a bow instead? Atlatls work best in wide open spaces, where it's easy to manage those six to eight foot darts. As Florida became less savannah-like and more forested, the long darts weren't as practical. It also takes more practice to master the atlatl than to master a bow and arrow. Finally, you can shoot a bow from many positions, even sitting or kneeling. Atlatls require you to be standing.

Historical Note: When the Spanish conquistadors invaded Mexico, the Aztecs went back to using atlatls, because they could penetrate Spanish armor.

Archaeology Note: Atlatl spurs made from antler have been found at the 7,000-year-old Windover Site, just south of Timucua territory in Brevard County. They've also been found at the Key Marco Site in southwest Florida, dating to 6,500 years ago.

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WOODEN ARTWORK



Owl Totem,
photo by Wikipedia

Florida's native people carved more than just tools. They produced artwork and ceremonial objects – big ones. A group of pre-Timucua carved an owl totem, which is currently displayed at Fort Caroline National Memorial in Jacksonville. In 1955, this 3.7m (12') structure was found in the St. Johns River muck down in Volusia County. It is the largest pre-Columbian carved object in Florida, and is dated to about 1300 AD. Although the details are not visible in this picture, individual feathers are carved all the way around the sides and back. Shell, stone, and sharks' teeth were used as carving tools. In 1977, two smaller carvings, a pelican and an otter were found together. They are less than three feet tall, but the details and workmanship suggest they were created by the same artist. Very few wooden artifacts are preserved in North Florida because most of the mucky wet sites capable of protecting wooden artifacts are found further South. Who knows what amazing carvings have simply disintegrated?



Key Marco Cat,
photo by Wikipedia



Key Marco Mask,
photo by Wikipedia

ACTIVITY – SOAP CARVING:

BACKGROUND: Florida's native peoples used both carving and abrading to shape wood into useful tools, works of art, and ceremonial objects. North Florida's Owl Totem is an impressive example of their skills. The Key Marco site in southwest Florida also produced impressive carvings, including the panther and mask shown above.

INSTRUCTIONS: Instead of carving wood with stone knives, you will be carving soap with wooden tools. You will start with two tool blanks – popsicle sticks and toothpicks. Either tool, unmodified, will do the job of carving the soap. However, you should modify at least one of the blanks by abrading it on a concrete sidewalk. You can square the edges, sharpen them to a point, grind wavy patterns into the sides, whatever you think will help you carve your bar of soap into something recognizable...within the time constraints set by your teacher.

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ACTIVITY – SOAP CARVING continued:

Your carving can be extremely simple (like a leaf) or extremely complex, like the Key Marco panther. However, it must be something the Timucua would have recognized. No carved IPOD players or cans of Red Bull.

Be careful while you are carving. Even popsicle sticks and toothpicks can cut and tear skin with enough force behind them. You will need to experiment to figure out the best way to remove flakes of soap without digging huge, unwanted gouges through your design. Be sure to keep your debitage under control. If you are carving outside, do not allow soap flakes to fall onto the ground. Rain will wash them into the rivers where the fragrances and antibacterial elements in the soap can damage the environment. **One precaution:** Although the Timucua soaked bone to soften it, soap will soften TOO much if you wet it. Keep your bar of soap dry during this activity.



After you complete your carving, answer the questions below.

- 1) How did you modify your tools? What tool shape(s) did you create?
Sketch it (them) here.

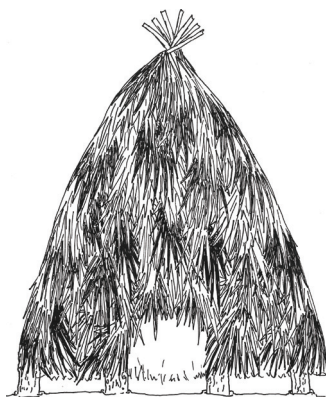
- 2) Which carving processes worked well? Which did not?

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OTHER PLANT-BASED TOOLS

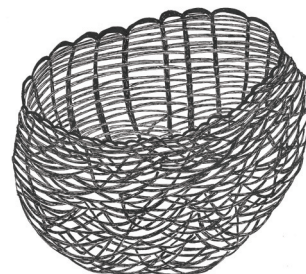
The inner bark of trees was stripped and twined into cord. The cord was used for fishing line, fishing net, and rope needed for hut construction. Rivercane is a tall bamboo-like grass that grows in Florida's freshwater wetlands. The woody stems could be used as arrow or dart shafts. Gourds were dried, emptied of seed, and carved into useful containers.



*Palm-thatched Hut,
courtesy of the University
Press of Florida*

Bending with Steam: Both hunting bows and the short bow used for drilling were first chopped and then carved into shape. Steam was applied to the bow, allowing it to bend under pressure instead of cracking. Once the bow cooled and dried, it held the new shape. This same process may have been applied to the pines poles used as supports in Timucua huts. Straight poles forced together and tied in the center would be under great stress, always straining to spring free. Poles bent by steam would come together naturally. They would not resist being tied together, so the poles would experience very little stress. This vastly extended the life of the structure. Wooden arrows were straightened, instead of bent, using the same method.

Peeling and Weaving: Woody plant parts, including grapevines and sabal palm roots could be boiled (or soaked) and then peeled to make excellent weaving material. Six vines trimmed to the same size, perhaps 60 cm (2'), were laid out criss-cross (like a tic-tac-toe grid). They served as the spokes for a basket that would be about 30 cm (1') wide. Next, the Timucua started weaving a thinner vine over and under the spokes to form a circle. They tucked in the end, then began to gently ease the spokes upward to form the sides of the basket. Additional grapevines were woven in and out of the spokes until the basket reached the desired height. Then the long ends of the spokes themselves became weavers, looping over and under the other spokes until the ends were tucked in. Once all of the spokes were woven in and tucked, the poking edges were trimmed. Voila, a basket!



*Grapevine Basket,
courtesy of the University
Press of Florida*

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LET'S TALK ABOUT CLAY POTTERY

How did the Timucua find clay for their pottery? They dug clay from the edges of rivers and creeks. This clay had to be “plastic” (flexible) enough to pass a few simple tests.

- Could it be rolled into a smooth ball?
- If yes, could the ball be rolled into a finger-length rope without cracking?
- If yes, could that clay rope be wrapped around a finger without cracking?
- Then you’ve got clay that can be made into a pot. Now you lug the basket of wet clay back to the village. If you’re lucky, you were out in your canoe when you found it. Wet clay is heavy.

How did they process the raw clay? Raw clay isn’t like Play-Doh. It’s full of impurities that must be removed – bits of stick and shell, gritty sand, pond slime, etc. The Timucua mixed the clay with lots of water, then let it stand a few days. During this time, the organic impurities floated to the top and were scooped off. The heavier, non-living impurities settled to the bottom. The pure clay particles remained suspended in the water. This clay suspension was poured into shallow containers while the large impurities were left behind. After a few days, the water evaporated out of these shallow pans, leaving dry, powdered clay. Next, the clay powder was pounded (with a shell hammer or wooden pestle) until all the lumps broke apart and it was perfectly smooth. Now, it was time to add a temper.



*Fiber-tempered Orange
Period pottery, found in
Duval County, FL*

What’s a temper? A temper is something you add to the clay to help it resist shrinking and cracking while being fired. Florida’s earliest potters (2,000 BCE) added fibers like Spanish moss. When holding a sherd of fiber-tempered pottery, you can actually see the tiny holes and squiggly lines where the fibers burned away during the firing process.

Sand or grit is another kind of temper. This became commonly used around 500 BCE. Both were used off and on throughout northeast Florida’s history. Sand-tempered pottery has tiny sand particles added as a temper, while grit-tempered has larger particles added.



Far Left: Sand-tempered, incised with an awl
Right: Grit-tempered, stamped with a carved paddle
Both pottery sherds were found in Duval County, FL

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St. Johns pottery uses a different form of temper, one that is unique to the northeastern Timucua area. It became popular around 500 BCE, and uses the silica endoskeletons of freshwater sponges as a temper.

The *endo-what?* Freshwater sponges grow under logs in Florida lakes and streams. They are invertebrates, having no backbone to support their bodies. Instead, their bodies are filled with tiny spiny spicules (pins) made from silica. Because these pins occur inside the sponge's body, it is considered an *ENDO*skeleton. (People have endoskeletons, too. Bugs have exoskeletons.)

These supporting pins are made of silica. Silica is the same material that makes up sand and clay. These tiny pins provide support for the sponge's body. After a sponge dies, its body disintegrates into the water and settles into the soil at the bottom. As a result, these spicules can be found both in the lake soils and in the sponges themselves.



St. Johns Pottery Sherds (pieces)

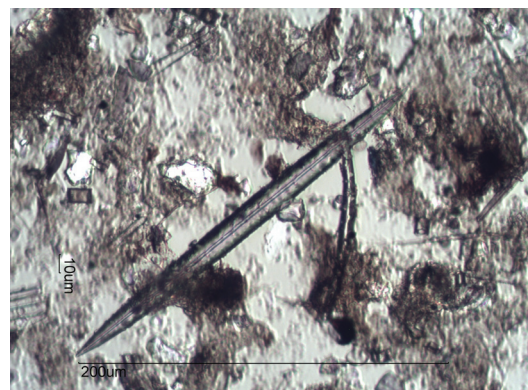
Left: Undecorated / plain sherd (this is the most common St. Johns pottery found in Duval County, FL).

Right: Sherds are stamped with a carved paddle design. Found in NE FL



Freshwater Sponges are often only a few centimeters long.

*Photo courtesy of R. Korth,
UW Extension Office*



*Freshwater Sponge Spicule, courtesy of
Russ Crutcher's MicrolabGallery.com*

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This sherd was decorated with a check-stamp paddle. It has both gritty and chalky traits and includes a repair hole.

St. Johns pottery is easy to identify because it feels and looks very chalky. It also has a “sandwich” appearance. This describes how the outsides are light colored (the bread of the sandwich) while the inside is dark (the jelly in the middle). This pottery is soft enough to scratch with your fingernail, but it still made sturdy vessels for cooking and storage.

Archaeologists sometimes find intermediate forms, which include two different traits. For example, a pottery sherd may be both gritty and chalky. This mixing of traits may indicate a time of cultural change. Why did people change the type of pottery they made? Sometimes a better technology was invented. St. Johns pottery is much lighter than the old fiber-tempered pottery. Other times, a new group of people moved into the area, bringing a different style of pottery. Archaeologists can use changes in pottery types to interpret changes in culture that occurred long ago.

Pottery-making took a lot of time and effort, so pots weren’t thrown away when they developed small cracks. Instead, they were repaired. A hole was drilled on each side of the crack, and a cord was tied through the holes. This reinforced the crack so it wouldn’t split further.

A Pottery Revolution: Archaeologists have long known that St. Johns pottery was made from clay containing lots of sponge spicules. Until about ten years ago, everyone assumed that these spicules were just a natural part of the clay. Native potters in other parts of the state didn’t use this “spiculate” [spi-Q-lut] clay. As a result, other cultures had to trade with the northeastern Timucua to get St. Johns pots.

A few years ago, archaeologists began wondering, “where did the Timucua find those spiculate clays? They tested clays all over Florida. A few clays had small amounts of spicule in them, but nowhere near enough. Some St. Johns pots are composed of 20% spicules. That means that one-fifth of the total pot was made of sponge spicules. That’s a huge amount. None of the researchers could find a natural clay source with such a high percentage of spicules.

Archaeologists began to wonder if St. Johns potters had added the sponge spicules on purpose. Cultures in other parts of the world have collected living sponges from lakes, dried or burned them, and then added the remaining spicules to clay like any other temper. The idea that Timucua potters had processed and added the spicules themselves was new and radical. In fact, it’s still not accepted by many. The best evidence for this hypothesis occurred when an archaeologist found a St. Johns pot with 20% spicules alongside a clay source with no spicules. Chemically, the clay in the pot and the clay in the ground were identical. At some point, between the clay source and the finished pot, St. Johns potters had added spicules. Plenty of research still needs to be done, but the tide is turning towards this new understanding of sponge spicule tempers.

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So, how did the Timucua actually make a pot? First, the clay was processed to remove impurities and add tempers. Next, the clay was wedged or kneaded to get any air bubbles out. Finally, it was time to start coiling. They rolled the clay out into long ropes, perhaps 30 cm long (1'). Sounds easy, right? Wrong. The Timucua had no clean, flat tables to work on. If you roll clay on the ground, it picks up too much sand and starts to crack apart. They did all of their rolling in the air. That takes muscle. Next, they used a basket or pot or even a lined pit in the ground as a mold to help shape their pot. Why not build the pot flat on the ground? Timucua pots were all round-bottomed. This helped them settle into fire ashes or soil when cooking and serving. You can't build a round-bottomed pot on a flat surface. So, they used a form. Some pottery bottoms have been found that still show impressions of the materials they were sitting on.

Timucua women started by coiling a rope of clay in the bottom of the form. They lifted the coil out and gently smoothed all of the lines together, then returned it to the form. Next, they added another clay rope, which stacked up on the outer edge of the base. After each clay rope was added, they smoothed the inside and outside. When the pot was tall enough, they removed it from the mold and worked more on smoothing away all of the lines. Until the pot is fired, it must sit upside-down, to preserve the round bottom. The walls of the pot must be compressed before the firing process begins. The more compressed the walls, the more waterproof the pot will be.

They compressed the walls of the pot using a paddle and anvil. The anvil could be a piece of wood or even a broken piece of an old pot. You hold the anvil against the inner wall of the pot, so when you strike the outer wall with the pottery paddle, it doesn't warp the shape of the pot. The anvil could be rubbed all over the inside of the pot, to smooth and compact it even more. The paddling and rubbing make the pot's walls smooth, sturdy, and thin. If the paddle is carved with a design (like check-stamp or complicated-stamp), these designs will be transferred to the soft clay. Some paddles were wrapped with cord, net, or fabric. Others were left plain. After the Timucua started growing corn, dried corn cobs were sometimes used instead of paddles to compress the pot walls. Each cultural group had its own stamping styles. Archaeologists use these styles to establish a time and place for the manufacture of particular pots.



Replica Pot

Were the pottery paddle designs just there to look nice? They were attractive, but these designs served two other important functions. 1) All of those bumps and ridges made it easier to grip the pots so there was less chance of dropping and breaking them. 2) More importantly, the ridges in the design increased the pot's surface area. More surface exposure allowed the pot to heat more quickly – so the food cooked faster.

What about the firing process? The completed pots were allowed to thoroughly air dry. When many pots were ready to be fired, they were gathered together (still upside-down) and placed on the ground. A ring of firewood was built about 2-2.5 meters (6-8') around the dry pots. That's a lot of firewood.

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The fire was started several feet away from the pots so that they would heat slowly. Gradually, more wood was added closer to the pots. Eventually, much later in the day, a pile of brush was piled right over the pots, and the fire consumed it. The fire needed to get up to 760°C (1400°F). Pottery actually glows red when it's become hot enough, but the Timucua couldn't see that through the blazing wood.

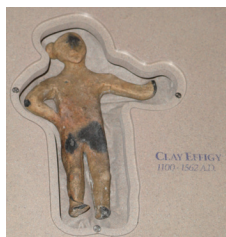
The replica pot to the right exhibits a fire shadow. The parts that are black were heated in the absence of oxygen. Without oxygen, combustion is incomplete, leaving soot behind. This darkens the pot. The lighter parts were heated in the presence of oxygen, so no soot. The amount of oxygen reaching a pot can change as logs shift on the fire. Vessels in the very center of the pile of pots received less oxygen. The Timucua actually tried to limit oxygen to their pottery fires. Why? There are only two ways to produce really hard pottery. One is to use extremely high temperatures. That's not possible in an open fire. The other is to reduce the oxygen available. Towards the end of the firing process, they probably tossed organic matter (like leaf litter) over the fire, and perhaps dirt over that. This blanket of soil and organic matter blocked out most of the airflow.



Replica Pot

After the coals burned out, the pottery was left in the fire pit to cool slowly. This prevented cracking due to temperature shock. Pots that did crack could be recycled, though. One method was to stack the cracked pieces around and over the soft pots before you fired them. Can you guess why?

Oxygen reduction! Pottery sherds could also be reused as grinders. Since sandstone grinders were a trade item, it was helpful to have backups you could find locally. Broken pottery would be like a medium to fine sandpaper. The broken pieces could also be used as anvils when paddling pottery. And even the tiny bits could be crushed and added to raw clay as a temper. This is called grog-tempering. Reduce, Reuse, Recycle.



Human Clay Effigy found in Marion County

Clay Effigies: Can you see the fire shadows on this human effigy to the left?

An effigy is an object made to look like a person or animal. This effigy was found at Lake Kerr (a bit south of Palatka) in the southern part of Timucua territory. It has been tentatively dated to between 1100 and 1562 CE and is on display at the Fort Caroline National Memorial. Very few clay effigies have been found in Florida. Are these effigies an

example of pure artwork, or did they have spiritual significance? Effigy pots are a bit more common than effigies. Because they are found only with human burials, they are considered to have spiritual significance. This turkey vulture effigy pot was discovered in a mound along the Aucilla River, the northwestern boundary of Timucua territory. It was crafted by the Weeden Island culture, a group that lived well before the Timucua (from 200-700 CE).



Turkey Vulture Effigy pot, Collections of the Anthropology Division of the Florida Museum of Natural History, FLMNH Cat. No. A20086

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ACTIVITY – POTTERY COILING:

BACKGROUND: Like all subsistence activities, making pottery took time, effort, and patience. If a Timucua potter did shoddy work, she wasn't just stuck with a shoddy pot. She was stuck with broken pieces of a shoddy pot. Then she had to start all over again. As you coil your own pot, work slowly and carefully. Air-drying clay usually comes already mixed and ready to go. You will not have to dig, soak, separate, dry, pound, add tempers, or wedge the clay before you coil. You will not have to gather firewood, reduce oxygen levels, or wonder if your pot will crack and splinter during firing.

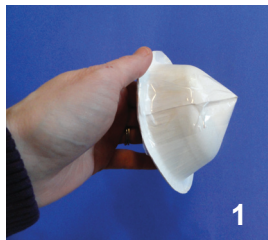
INSTRUCTIONS:

STEP 1: Construct A Form. Before starting to work with your clay, you'll need to construct a form. This will allow you to coil a round-bottomed pot. Take a paper bowl and cut it from edge to center. Slide the sides across each other to decrease the size of the bowl and give it convex base. Tape it well. Place your form into a small plastic bowl so that it will sit upright.

STEP 2: Make Your Clay Flexible. Tear your clay into manageable-sized chunks. Choose one and begin to squeeze it between your hands. Tossing quickly from hand to hand (with a squeeze on each catch) also works to get it flexible. You will need to soften all of your clay in this way.

STEP 3: Roll Clay Ropes. Squeeze one ball into a cylinder, then use your hands to roll it out. Stop when it's as thick as a child's pencil (1-1.5 cm). The clay rope should be uniform, with no thin spots. If it gets too thin, break it there and use it as two separate pieces, or squash and re-roll.

STEP 4: Start Coiling. Bend one end of the clay rope, and start coiling inside your form. The form will give your pot a convex bottom.



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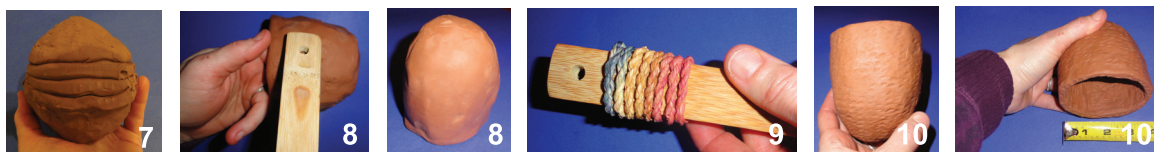
ACTIVITY – POTTERY COILING continued:

STEP 5: Blend the Coils. Use a Popsicle stick to gently blend the inner coils together. Too much pressure can destroy the pot. After the inside is smooth, pick up your pot base and smooth the outside. Whenever you put pressure on the outer wall, your fingers must apply equal pressure to the inside.

STEP 6: Repeat. Repeat steps 4 and 5 (smoothing as you go) until your pot is finished. If you can't get your pot out of the mold to smooth the outer coils, just smooth what you can reach for now.



STEP 7: Remove Pot From the Form. Gently pry the pot out of the form using a Popsicle stick. OR cut the form away from the pot. Smooth any outside coils you couldn't reach earlier.



STEP 8: Smooth the Surface. Use a plain pottery paddle to firmly pat the outside of the pot WHILE firmly supporting the inside with your fingers. Continue patting, including the bottom, until the outside is completely smooth. Re-smooth the inside, using fingers and stick. Cracks will probably have opened from the stress of the paddle. When you are done, set the pot upside-down to protect the round base.

STEP 9: Compress the Clay. Use a cord-wrapped paddle to further compress the outside of the pot. Be sure you exert equal finger pressure from the inside. This will add the characteristic cord marks to the pot.

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TOOL-MAKING TECHNOLOGY

ACTIVITY – POTTERY COILING continued:

STEP 10: Allow Your Pot to Dry. Set your pot in a safe location (upside-down) and permit it to dry as directed. After it is completely dry, it can be stored upright. Ultimately, you should create a nest for it out of natural materials or fabric, so it won't tip over and break. While impractical for us, the round base had many advantages for native people. It balanced well on natural, uneven surfaces. It made for easier stirring (no corners for food to get stuck in) and caused more uniform heating of the pot. It also spread the shock of impact, so the pot was less likely to crack if dropped.

SAFETY TIP: Because the Timucua did not use a glaze on their pottery, none of their pots were truly waterproof. Air-dried clay is also unglazed; you should not use this pot for food or drink.

1) What did you find most challenging about coiling your pot?



2) What modern repetitive activity do you participate in that is most like pottery coiling?