

HANDS-ON CLAY

An exploration of mankind's unique relationship with clay.



CHAPTER 1

INTRODUCTION TO CERAMICS

INTRO TO CERAMICS

What exactly is ceramics? Ceramics are clay objects that permanently hold their shape after being fired at high temperatures. Man has been using clay since prehistoric times. As one of the most abundant of all natural resources, this material has changed the way humans live in many ways. The substance has been used all around the world, with artists using many of the same techniques for thousands of years. How is it that people separated by oceans, time, and language barriers all learned to process, shape and fire clay in similar fashion? Clay served early man's needs by

providing a versatile material that could be tailored to suit many different needs. Charles Fiske, historian and writer of The Emergence of American Clay Art, said, "Clay is capable of the wildest, materially substantial poetry. It comes very close to being a sacred medium; on the other hand, it comes close to being one of the most vulgar mediums man uses. It is at once eternal and absolutely momentary. Things have survived that are 5000, 6000, 7000 years and older and they can all be smashed to nothing with one hammer."



Pottery Dating between 1000 and 1700 B.C. Found along the Mississippi

Today modern man still uses clay for a myriad of different purposes.

Ceramics are used in applications like the tiles in kitchens and bathrooms that are found all across the globe. Glazed tiles are durable, yet easy to clean and do well with repeated exposure to moisture. Obviously, cookware and dinnerware has been made using clay for thousands of years. With the advent of the Industrial Revolution, modern man has continued this tradition with the use of technology and more advanced processes. The oldest discovered bricks date to 7500 B.C. and were found at Tell Aswad, in the upper Tigris region and in southeast Anatolia, close to Diyarbakir. It has been estimated that a trillion bricks are made each year world wide. Bricks are a critical



ingredient in architecture all around the world. Clay has provided a sturdy, sanitary and cost effective way to make toilets that are found all throughout the developed world.

Clay has several more unexpected applications as well. Ceramic panels have been used since the beginning of the space program. These panels provide protection from the heat generated on entering and exiting earth's atmosphere. Automobiles use ceramic components in catalytic converters to

convert harmful emissions into non-toxic gases. Modern medicine has also benefited from ceramic applications; ceramic materials are used to stimulate bone growth around artificial joints. Also, if you have ever had a tooth colored crown at your dentist, chances are pretty good that the material used is ceramic. Ceramic components are used every day in high-tech technology like televisions, computers, and electric motors like vacuums and blenders. So it should be pretty obvious that man has a very intimate understanding of clay. We have a great history of using clay to suit our needs. The question then arises, what is clay and how does it form? Is it just mud, or is there something more to it?

Clay is formed by the erosion and decomposition of the earth's surface (igneous rock) over thousands of years. The constant breaking down of igneous rock by wind and rain relocates particles of silica and alumina by streams and rivers that cut and shape our lands. These newly relocated particles become the seeds that will ultimately become clay. The addition of decomposed plant and animal matter and various other natural amendments make a menagerie of different clay bodies all over the world. The formula for

clay can be seen here. There is one molecule of alumina, two molecules of silica, and two water molecules.

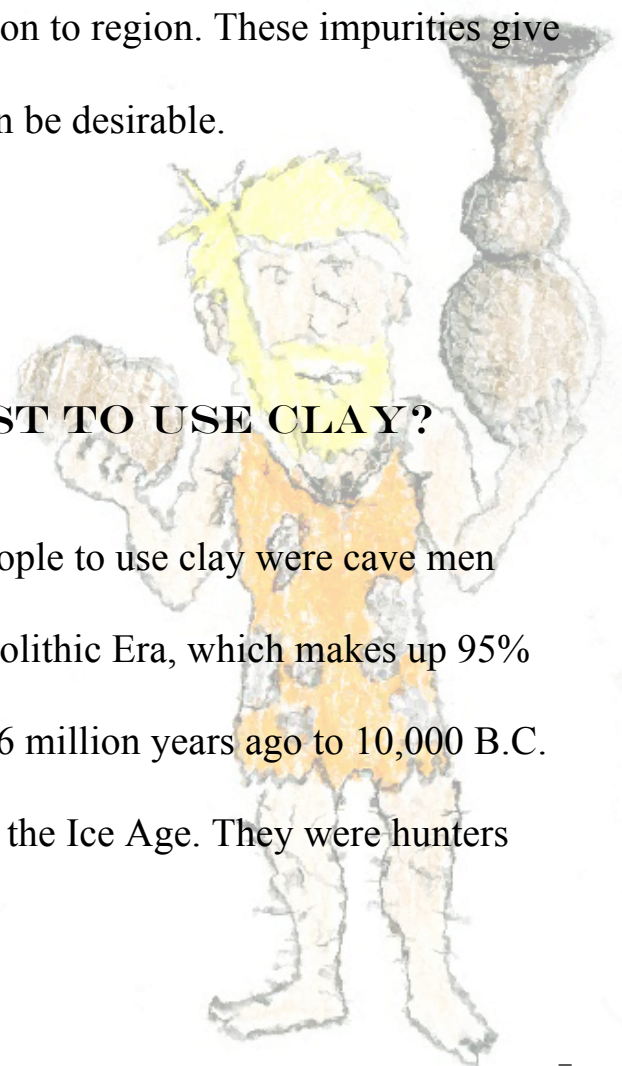


Clay is broadly classified in order of its evolution. The first classification is the newer or purer clay, and then the older clays that have more additives are listed last. The process of decomposition of igneous rock is a constant happening. It is a continual process. Another interesting consideration in the formation of clay is that, generally speaking, the further clay is from its parent source or site of initial erosion, the smaller the particle size. This varying particle size factors heavily in the plasticity or flexibility and its ability to be manipulated. Clay begins its journey at the parent source. By weathering through wind and precipitation, small particles begin to drift away in rivers and streams. The first major category of clay is called stoneware. Stoneware is a grey to buff, non-translucent clay body which

vittrifies or crystalizes between 2150- 2383 degrees. Stoneware is fairly plastic but does have some limitations. Potters have often used stoneware to throw pieces on the wheel but commonly mix it with another clay that might offer more plasticity or a desired color. The next category of clay is known as earthenware. Unlike stoneware that are more sparsely located, earthenware is found all over in the world. People have often called this clay “common clay”. Some people call it common clay because of it being found all over. Whatever you call it, it is more plastic than its parent clay stoneware. It is also full of impurities that differ from region to region. These impurities give earthenware unique characteristics that can be desirable.

WHO WERE THE FIRST TO USE CLAY?

Historians speculate that the first people to use clay were cave men living during the Paleolithic Era. The Paleolithic Era, which makes up 95% of mankind’s time on earth, spans from 2.6 million years ago to 10,000 B.C. The earliest of these people were living in the Ice Age. They were hunters



that survived by moving with herds of animals, preying on the animals when they were in need of a meal.

They probably lived in caves or whatever natural shelters that their environments gave them. As a curiosity, and to fight boredom, early man probably played with naturally found clay that lay in the cave floors. Being experienced with building fires, they made fires regularly for warmth. For whatever reason, they are said to have thrown clay figurines into fires.

When wet clay is heated rapidly, the water in the outer clay quickly evaporates, causing the clay to shrink in size. Unfortunately, if the piece is not very thin, the moisture in the interior of the clay begins to turn to steam. This vapor is trapped and, as a result, there is a small violent explosion that releases the water vapor. When this occurred from being heated too rapidly, these early cave artists thought that they had stumbled on some sort of magical power. This then became ritualistic entertainment for them. At some point a piece dried out too long before being tossed into the fire. The boom they were looking for never happened. The next day after the fire had died the primitive people woke to discovered that their clay had become hard like

stone. This was the birth of ceramics. The word ceramics simply means fired clay.

The piece pictured is known as Venus of Dolni Vestonice. The small sculpture was found in 1925 at the base of Devin Mountain in the Czech Republic. Historians believe that this nude female form might



have represented a goddess of fertility. The sculpture was found in two pieces. Standing at only 4.4 inches tall, this sculpture carbon dates back 29,000 – 25,000 B.C., making it the oldest known intact piece of fired clay to ever be found.



Early man began to use this process in a multitude of ways. Archeologists have found containers to cook with and eat out of as well as preserve food and carry water. In ancient Mesopotamia, cuneiform script was first developed to inventory grains and other foods that were kept in ceramic

vessels. This system of writing is the first written

Burial Jar (Guan) Period:
Neolithic period, Majiayao
culture

records that has been discovered. Ceramic funerary

vessels have also been discovered that held ashes and other human remains.

As they discovered more and more about the importance of their new technology, they begin to pass their discoveries on to future generations. They sought out the best locations to dig clay, often preparing clay that would be saved for years to come. They learned the best methods to remove impurities and blend in additives to make the clay stronger. Methods for decorating, drying, and firing also had to be perfected through trial and error. Paleolithic man added ceramics to their growing arsenal of tools and processes that begin to pave the way for early man to be settlers instead of nomads.

OUT OF THE GROUND & THEN WHAT?

Although clay is one of the most abundant resources at our disposal, it does require some thoughtful preparation. Clay, in its natural state, usually has many impurities that could hinder easy production of ceramic forms. Early artists who pulled clay right out of the ground would often first dry it out. They would then crush it up into smaller pieces that could be sorted out. They would take out sticks, rocks, and other impurities that could be removed

by hand. They would then slowly reintroduce water to the clay until they achieved the moisture content they were after. This process was very labor intensive, so many sought for an easier solution. Levigation was the answer to many. With this process, the clay was collected and then immediately immersed in a large container of water. The muddy mixture was stirred up into a thin slurry. The heavy contaminants like rocks, coarse sand, and bones would sink to the bottom. The lighter contaminants like leaves and other vegetation would float to the top. The top would then be poured off. The clay would be left for some time to thicken and then the clay would be removed off the top until the potter reached the heavy contaminants at the bottom.

HOW TO SHAPE AND FORM

The process of becoming a skilled craftsmen working with clay takes years to perfect. However, the basic methods of manipulating clay are fairly easy to utilize. These methods will later be subjects of more



in-depth study. For now, we will briefly present them. The basic methods that most potters have used and still use today are as follows:

- Pinching
- Coiling
- Slab building
- Molding
- Wheel throwing

Pinching

The most primitive method is pinching. A potter takes a ball of clay in their



Pinch Vase by Barbra Walsh

hand and then opens up the ball usually by pressing their thumb into it. They then rotate and pinch the piece until it has the shape they desire. The more the piece is pinched, the thinner the pot becomes. This process is very intuitive and has served potters for thousands of years. Small figurines and other non-vessel forms can be pinched out as well. An additive

or subtractive method can be utilized in conjunction with the pinch process. In the

additive method, pieces of wet clay can be added onto a larger mass to form the desired results. Subtractive is the exact opposite. Clay is slowly removed in desired areas to get desired results. Pinching generally only involves the hands and the clay.

Coiling

Coiling is believed to be next in the evolution of processes. This process involves the potter rolling out long ropelike cords of clay that can then be made into rings, that can then be stacked - one on top of each other. The coils are then blended together, often on the outside and inside but usually at least on the inside of the vessel. The



This Nigerian piece features coils and pinched clay.

blending of the coils helps hold the vessel together and makes it less

porous. The coiling method made larger and taller vessels much easier to



Jomon Potters from ancient Japan used coils as a decorative feature in this piece.

make. Pieces have been made exclusively using coils to create vessels. A potter can even have a coil spiraled around itself to create the bottom of the vessel. Many pieces have been created utilizing pinch as a starting point and the coils added afterwards to achieve more height. Most early food storage and preparation containers utilized these two methods to create beautiful but utilitarian forms.

Slab Building

Slab building is a bit more complex. With this method, the potter flattens out large sheets of clay. Modern potters use slab rollers or rolling pins to accomplish this task. Clay can also be thrown down on a flat surface at a



slight angle, forcing the clay to spread out. This is much like the way you might have seen someone working pizza dough at a restaurant. These pieces will be cut to shape and then pieced together to form ceramic forms. Often, the slabs of clay are left to stiffen up before being joined together. Scoring and



slipping may be needed to butt these pieces together. Scoring is simply scratching up pieces of clay to be joined together. The concept is that the clay platelets from each slide will marry a bit more. After the sides are scored, slip is usually

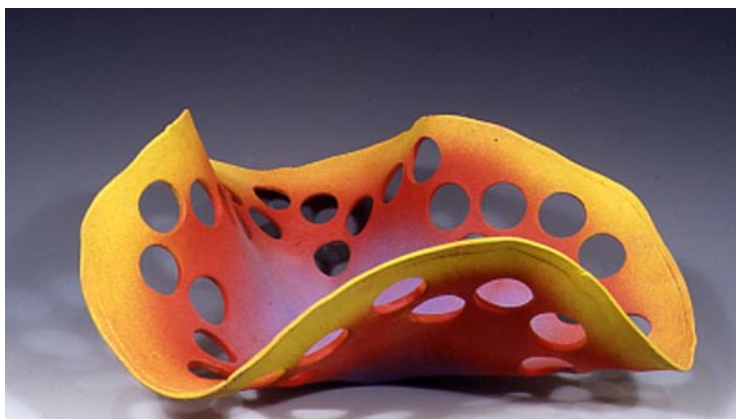


added to further aid in this connective process. Slip is made by mixing clay with water. Slip is a fine, liquid form of clay used with scoring to cement together parts that have been formed separately. It is very common to score and slip pieces when working with any method. Although, it's probably most common with working with slabs since slabs often have to stiffen up a bit to be strong enough to hold their own weight up. Slab pottery has a distinctive look. It is often more angular than pinch and coil pots which generally have an organic, rounded look.

The work of Scott Dooley is made of slabs that have been rolled into tubes and then pieced together.

Molding

Molding is made possible by the use of another form that the clay will be pressed in or on. Most likely, in the past, clay was pressed into woven baskets. After the clay dried, the loss of moisture would cause the shape to shrink and separate from the sides of the basket. The clay, now shaped like a pot, was removed, and, when dried in the sun on hot sand, it retained the basket pattern. Early potters also used objects like gourds or rocks to drape clay on just long enough to stiffen a little. Modern ceramics use commercial molds to pour clay slips into making all kinds of forms. With this



process, the entire cavity of the mold is filled with slip. After just a few moments, the plaster in the mold begins to

dry out the slip that is in contact with the mold. The slip that is not in contact with the mold is simply poured out to form the void in the inside of the form. The whole piece is given more time to stiffen. After some time, the vessel can be removed from the form.

Drape Mold Bowl by Susan Goldstein

The Wheel

Many think of the potter's wheel when they hear the words



pottery or ceramics. Often we joke about the movie Ghost's scene that depicts a couple at a wheel sensually making a piece.



So when and where did the potter's wheel get its start? The story probably begins in the Middle East around 4000 BC (6000 BP). The village settlements were growing in size and prosperity. A new phase in man's development was happening. In what is today southern Iraq, or ancient Mesopotamia, the first urban civilization was being created; villages grew into towns and then towns into the great city states: Ur, Uruk, Ubaid, Eridu, Lagesh etc. By 3000 BC, the people of these

Potter's wheel of Early Indus Valley Potters.

cities, the Sumerians, had already established a sophisticated trading

commercial culture. This was the first town and city based civilization on this planet. New crafts and occupations evolved. More skills and tools were invented to keep up with growing demands. Occupational specialization was

a new concept. Instead of everyone doing the same tasks, people began to take on specific jobs that they were more suited to do. Most of these changes affected the work and life style of the men much more than women. Most women were already almost fully occupied and specializing in the vital task of bearing and rearing children. Any other tasks done by the women must therefore have been part-time and close to the home. Women almost certainly developed the techniques of sewing, weaving and basket making in most prehistoric communities.

The women were probably also the first real potters - the makers of bowls, dishes, jugs etc., so it is not surprising that in these early village societies building a basket and coiling a pot had a lot in common. The first potter's wheels were simply turntables to aid potters who were making coiled vessels. With the advent of the potter's wheel, more men seemed to take more of an interest in working with clay. Societies were becoming more advanced and technology was beginning to make jobs more simple, less labor intensive and closer to home. The established division of labor for men and women were changing.

As you grow as an artist, you will begin to become more familiar with different art lingo. Two terms that are often used interchangeably are form and shape. **Shape** is technically the path of a line that delineates itself from the area around it by enclosing a space, the boundaries of which are delineated by other elements of art (i.e.: lines, colors, values, textures). Shape is most always used in reference to a two dimensional piece. On the other hand, **form** refers to shapes that have an actual or implied third dimension giving them the addition or illusion of depth.

SURFACE DECORATION

The vessel form provides its creator with a three dimensional canvas that can be used to further express themselves. Potters often leave their forms unadulterated to bring emphasis to the form itself. However, others prefer to get creative with even the surface of the vessel. There are many different techniques that can render different surface textures to the body of a piece.

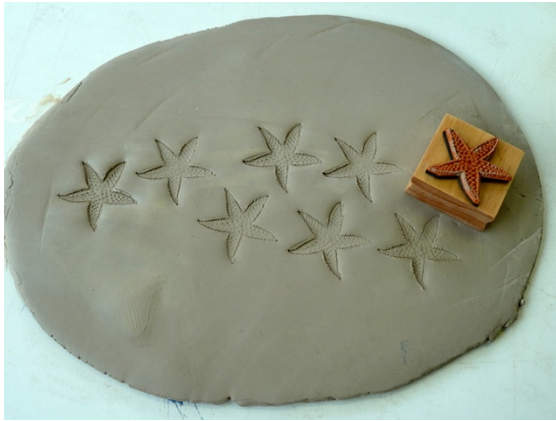
One of the oldest techniques is burnishing. **Burnish** is using a smooth object like a river rock or the back of a spoon to polish the surface of leather-hard clay. The process leaves the clay less porous and more impervious to water. This makes the piece easier to clean by pressing the clay particles closer together. Burnishing makes it less likely to grow bacteria, mold and mildew. Ancient potters found burnishing to be a valuable process.



Incising is another method for adding visual elements to the surface of a piece of ceramics. **Incising** is simply engraving a decoration into unfired clay with the use of a sharp tool. This is still a very common practice with potters all around the world.

There are no limits to the type designs that a potter could do with incising.

Combing is very similar to incising in that you are using an implement to mark the surface. **Combing** marks the surface with uniform lines by dragging a comb or other object across the surface.



Impressing involves the use of a stamp of some sort to press a texture into the surface of clay. The potter presses an object with an interesting texture into the clay and then gently pulls it away to reveal an impression of that shape in the clay.

There are numerous commercial stamps with a wide variety of subject matter made for potters today.



GLAZING

Early potters needed to find a way to make smoother surfaces that were more water tight. Simply firing clay doesn't make it resist water. If you fill a fired container with water it will eventually seep through the vessel. Glaze is a thin coat of glass that fuses to the surface of the clay. It offers a water barrier as well as giving the vessel a color or texture determined by the formulation of the glaze. There are glazes made to fuse to the surface of fired clay at various temperatures. The earliest glazes date back 8000 – 5000 B.C.

Just like any of the other advancements made in ceramics, glazing was a process of trial and error. Many successful glazes were kept secret. Even today, when a potter creates a unique glaze, the recipe is kept secret. Most glazes are simply raw materials, silica, alumina, and various colorants that are crushed to powder, then suspended in water, and then painted on the once fired pottery. The piece is then fired once again to allow the materials to melt and fuse to the surface.



Ancient Egyptian glazed pottery

There are four different glazes that were used in ancient ceramics. Alkaline glazes are first recorded around 4000 BC in the Middle East. **Alkaline glaze** is a simple mixture of sand and ashes from burnt plants. The mixture worked as a simple glaze that would fuse to ceramics surfaces

leaving a smooth, somewhat transparent surface. Potters would use underglazes made with various oxides and pigments prior to glazing.

In Asia, ashes from plants were mixed with feldspar minerals to create ash glazes. These glazes were thin and only slightly altered the texture of the piece. However, the glaze was hard and offered a very good water barrier. This method of firing was only common in China, Japan, Korea, and Thailand. However, this technology was revealed to westerners around the 1700's when the far east began to have more contact with the outside world.



Lead glazes are now considered unsafe because of their carcinogenic effect.

Lead is naturally found in low levels in most clay bodies. In some areas, it is much more prevalent in the clay. In these clay bodies, the clay seems to almost glaze itself. Islamic potters explored this happening and attributed the glazing effect to materials high in lead. They later discovered that by adding tin oxide, the glaze would fire to a nice

Early Islamic Pottery with Lead Glaze

white.

In the twelfth century, German potters were exploring ways to achieve the high temperature firings that Asian potters were achieving with their porcelain firings. For whatever reason, someone, as a curiosity, threw salt into a kiln load of pottery as it was just starting to

have a dull red molten look that happens at about 1000°. As a result, the instantly vaporized salt

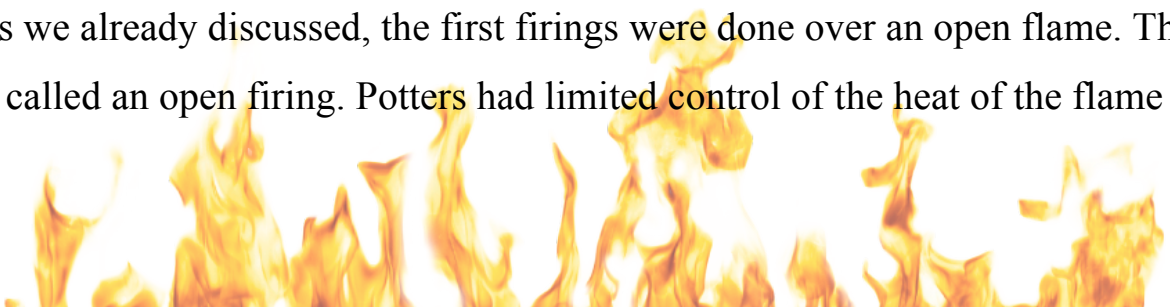
bonded with the silica in the clay to form a hard, durable glaze. This process has been refined and is still used for effect today.



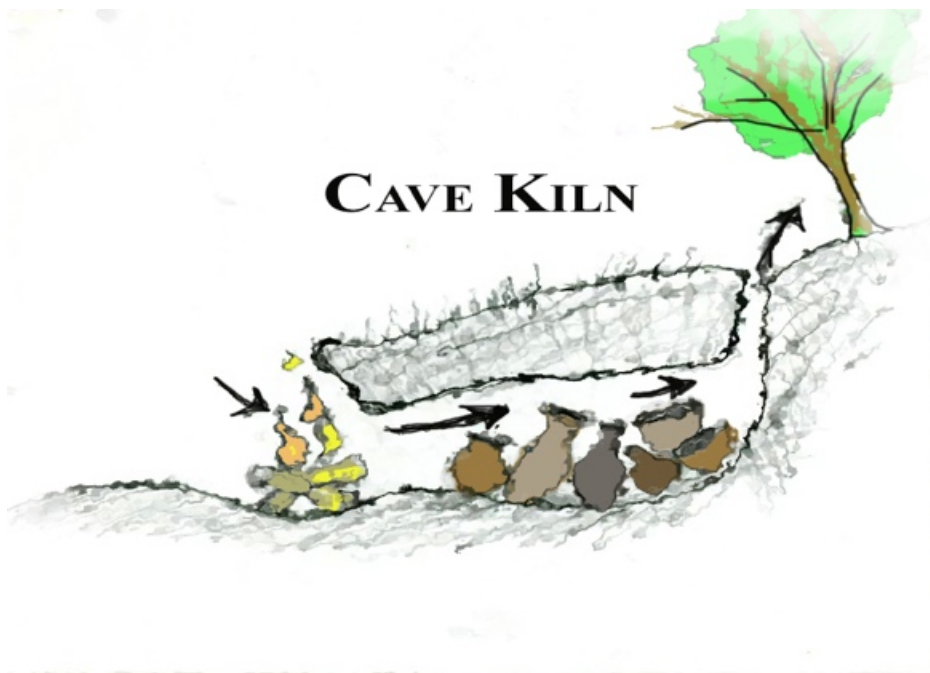
Salt fired pottery by Chris Baskin

FIRING

Even though there are several glaze options out there, the glaze is irrelevant if the piece is not able to be fired. The definition of **ceramics** is products made from fired clay. So the firing of the clay is vital to the process. As we already discussed, the first firings were done over an open flame. This is called an open firing. Potters had limited control of the heat of the flame



and the airflow. Often potters would use different materials that would burn at different temperatures. They would also experiment with different methods for arranging the pieces to optimize airflow and combustion. At most, these pieces were fired to 500° to 800°. This is very low compared to temperatures that modern potters fire their pieces. Potters soon begin to notice pieces with varying characteristics dependent on where in the fire the piece was placed, if the piece had more pieces covering it, and how much airflow it had. It wasn't long before potters begin to attempt to control the amount of airflow that their firings had.



The Kiln

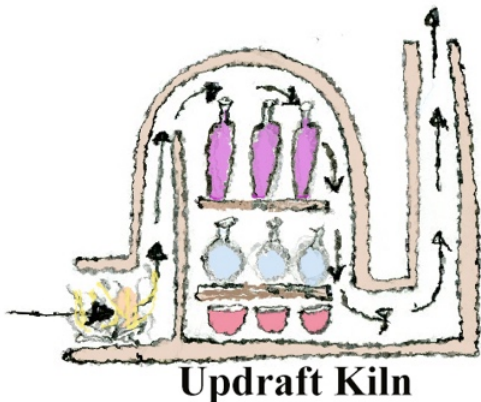
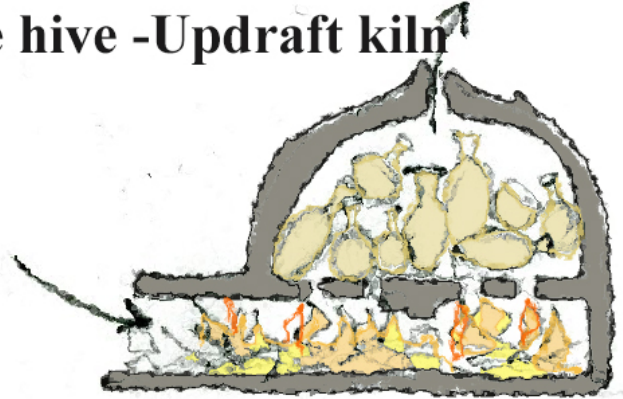
This led to the birth of the kiln. A **kiln** is a furnace designed to fire ceramic products. The earliest kilns were build right out

of the earth. A cave kiln was very common. This type of kiln was simply a small cave dug out of a bank of a river or stream that vented out a hole dug from the top. A fire would be continually fed at its lower opening. Air would be pulled in there by the fire and exit at the top.

Later the beehive style kiln was developed. This design would use a geodesic dome made of clay to cover the pottery. A fire chamber or fire box would be located directly under the pottery. The air flow was similar in this type of kiln except that the size of the opening could be controlled a bit

easier. Early potters learned that if they had better control of the airflow in a firing, they could be more economical with their fuel sources and, at the same

Bee hive -Updraft kiln



Updraft Kiln

time, have better control over the final product. Most of the early kilns in Ancient Greek, Roman, and Mediterranean societies were updraft kilns. This means that the fumes coming off the fire exit upward out of the kiln. This is the simpler and obvious way to

create a kiln since smoke rises upward. Potters in China and Japan were a bit more innovative with their designs. The constructed kilns that forced the airflow in the and out of the bottom. The tops were completely sealed off this made even greater use of the fuel. These new kilns that could be more

precisely fired. These new kilns, coupled with new innovations in glaze technology, allowed for a wider range of colors and textures. Today, there are hundreds of different makers of kilns that are commercially made for potters and ceramic artists. They come in a variety of different sizes and shapes.

Kilns are usually classified by their power source. The three most common kilns are wood burning, gas, and electric. The most common of those would have to be electric. Electric kilns are the most economical and have a much smaller footprint on the environment.



From early man's beginning, we humans have tapped into this incredibly abundant resource. We learned to process it, and then manipulate it into desired forms. Mankind has discovered that different clay bodies have different strengths and characteristics. Mankind has stumbled upon firing clay to harden it into a permanent shape that can serve a multitude of purposes. We have built on the knowledge of our ancestors from all over the world, borrowing from different successes and advancements. Clay has not only served mankind in a utilitarian sense, but it has also served as a vehicle of self expression. It has provided mankind the opportunity to shape and craft something to his/her liking. It has given our minds exercise in materializing a

mental image into a three dimensional material. The relationship that mankind has with this mystical, primitive material is just as timeless as it is momentary and it pierces to the core of who we are and where we have come from.

CHAPTER 1 REVIEW

1. What is ceramics?
2. What are some modern uses for ceramics?
3. When do the oldest discovered bricks date back to? Where were they found?
4. How is clay formed?
5. What is the chemical formula for clay?
6. What are some different types of clay and how are they different from each other?
7. What is the oldest piece of intact fired clay to have ever been found? Where was it found? When does it date back to?
8. How did early artists process naturally found clay to prepare it to work with?

9. What are five basic methods for creating pieces out of clay?
10. Give a brief explanation of Pinching, Coiling, and Slab building.
What do they have in common? How are they different?
11. When and where did the potter's wheel get its start?
12. Were men or women the first potters? Explain your answer.
13. What is the difference in shape and form?
14. What is burnishing?
15. What is Incising?
16. How is incising and combing different?
17. What is a glaze? When do the earliest glazes date back to?
18. Name and briefly describe four different type glazes.
19. What is a kiln?