SURFACE TEXTURES OF UNGLAZED POTTERY

Volume I

Text

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CHAPTER I

INTRODUCTION

The Problem

This study, "Surface Textures of Unglazed Pottery," will record and evaluate a series of experiments performed to investigate the range of satisfactory textures that can be achieved on unglazed ceramic ware.

Scope of the Problem

Texture is the term used to designate the surface quality of an object or a material. Texture may be derived from the inherent qualities of the substance or from the way in which an object or material is formed. The textural effect may be visual, resulting from sensations of sight, or tactile, resulting from sensations of touch. Both visual and tactile textures will be considered in evaluating the experiments.

The problem will be limited to experiments using a red clay from Horatio, Arkansas, a buff clay from Trenton, New Jersey, and a tan clay from Athens, Texas. These clays, 

1Red native clay extracted and refined by the writer in Horatio, Arkansas.
2United Clay Mines, 101 Oaklawn St., Trenton, New Jersey.
3Athens Tile and Pottery Company, Athens, Texas.
all of excellent quality, were chosen because they represent three different colors. The specimens will be fired at the temperature of 1643 degrees Fahrenheit (Cone 010), since at this temperature all of the clays became hard and durable.

Procedure

Experiments performed with the three clays—red, buff, and tan—will fall into three categories: (1) textures resulting from introduction of foreign matter into the clay, (2) textures resulting from surface treatments of green ware, and (3) textures resulting from surface treatments of bisque-fired ware. The experiments will be described and the fired clay specimens—tiles 2"x2"x\(\frac{1}{4}\)"—will be evaluated according to esthetic and practical standards.

Chapter I serves as an introduction to the study.

Chapter II will describe and evaluate the experiments.

Chapter III will summarize the experiments.

Plates showing fired clay tiles resulting from the experiments will accompany the text.
CHAPTER II

DESCRIPTION AND EVALUATION OF EXPERIMENTS

Textures Resulting from Introduction of Foreign Matter into Clay

To investigate textures resulting from the addition of foreign matter to each of the three clays, thirteen experiments were performed: five with combustible materials, seven with non-combustible materials, and one with both combustible and non-combustible materials.

Combustible Materials

Each of the three clays—red, buff, and tan—was combined with each of the following five combustible materials: (1) rice, (2) "Sugar Krinkles," (3) corn flakes, (4) "Alpha-bet" noodles, and (5) broom straw. The combustible materials burned out during the firing, causing various visual and tactile effects.

Rice.—Rice in the amount of 10 per cent by weight was added to each of the three clays. During the firing the surface of the tan clay erupted and flaked when the rice kernels expanded and disintegrated. For that reason it was eliminated. The original colors of the three clays were changed little by the textural effect. The resulting pits and hollows in the red and buff specimens were pleasing to
the eye and not unpleasant to the touch. (See Plate I, Figure a; and Plate II, Figure a.) The texture would not be satisfactory for small pottery and sculpture, since the holes in the clay surface would make the piece weak and likely to break.

Corn flakes.--Corn flakes in the amount of 10 per cent by weight were added to each of the three clays. The original colors of the red and tan clays were not affected by the firing. The corn flakes burned out during the firing, leaving irregular and scarred surfaces of excellent tactile quality. (See Plate I, Figure b; and Plate III, Figure a.) The buff clay changed to an uneven gray in the firing, but the texture was satisfactory. (See Plate II, Figure b.) Further experimentation with different firing temperatures might result in color improvement.

This technique might be used whenever a rough surface is desired.

Broom straw.--Broom straw in the amount of 15 per cent by weight was mixed with each of the three clays. When fired, the surface of the red clay appeared covered with thin lines or fine scratches. (See Plate I, Figure c.) The effect of the broom straw was not easily recognized on the buff and tan clay surfaces, and for that reason nothing was gained by its inclusion. (See Plate II, Figure c; and Plate III, Figure b.) The edges of the clay specimens were
ragged because of the resistance of the tough straw to the knife when the green tile was cut out. This uneven edge would make the technique unsuitable for tiles; however, since the red clay so treated was visually and tangibly attractive, it would be satisfactory for pottery.

This technique was used by the early Egyptians in making bricks because the straw strengthened the clay and minimized shrinkage.¹

"Sugar Krinkles."--A commercial cereal, "Sugar Krinkles," was added to the clay in the amount of 10 per cent by weight. Each of the treated clays, after firing, had an attractive rough texture, with no apparent change in color in the red and tan clays. (See Plate I, Figure d; and Plate III, Figure c.) Faulty placement in the kiln caused the buff specimen to appear an uneven gray, but the texture was agreeable. (See Plate II, Figure d.) The "Sugar Krinkles" texture would be adaptable to extremely thick-walled pottery or to bricks, since the pits are rough and deep in the clay body.

"Alphabet" noodles.--"Alphabet" noodles were combined with the clay in the amount of 10 per cent by weight. The noodles in the buff clay expanded and erupted, leaving the specimen with holes throughout the clay. For that reason the piece was impractical as bisque pottery and was

¹"The Uses of Straw in Egypt's Brick Making," Science News Letter, XXXVI (July 1, 1939), 11-12.
eliminated. The surfaces of the red and tan clays were not adversely affected by the exploding noodles. The resulting sharp, clear depressions were pleasing visually and not unpleasing to the touch. (See Plate I, Figure e; and Plate III, Figure d.)

**Non-combustible Materials**

The three clays were combined separately with each of the following seven non-combustible materials: (1) sand, (2) quartz, (3) steel filings, (4) blue buckeye grog, (5) sand and iron oxide, (6) coarse white grog, and (7) fine white grog.

**Sand.**--White sand in the amount of 10 per cent by weight was mixed with the three clays. The sand in the red and tan clays produced specimens with rough-grained surfaces. During the firing, the sand lightened the color of the red and tan clays, but the change in color was not objectionable in either case since it was uniform and visually pleasing. The color of the buff clay was not affected. (See Plate IV, Figure a; Plate V, Figure a; and Plate VI, Figure a.) In all specimens the sand served also as a strengthening agent.

**Quartz.**--Twenty-mesh quartz was mixed with each of the three clays in the amount of 15 per cent by weight. This produced compact and stronger specimens. The color of the red and tan clays was not affected by the presence of the
quartz. A gray edge on the buff piece may have resulted from faulty placement and uneven temperature in the kiln. The resulting color change was undesirable since it was not uniform. (See Plate V, Figure b.) The quartz, after firing, appeared as minute projections on the surface of the clay, producing an attractive tactile texture. (See Plate IV, Figure b; and Plate VI, Figure b.)

Steel filings.--Steel filings in the amount of 10 per cent by weight were added to each of the three clays. The filings mixed readily with the clay, making it more plastic. After firing, the filings appeared as black flecks in the red clay, giving a pattern as well as a tooth to the surface, and changing the color to brighter red. (See Plate IV, Figure c.) The metal filings appeared as black flecks in the buff and tan clays also, and changed them to a pink color. (See Plate V, Figure c; and Plate VI, Figure c.) As will be seen in the illustrations, the contrasting black flecks in the clay body create a good visual texture. Since the flecks appear in slight relief on the clay surface, they afford an excellent tactile quality.

Blue buckeye grog.--Blue buckeye grog in the amount of 10 per cent by weight was combined with each of the three clays. The addition of the grog to the buff clay resulted in a speckled piece, with the grog retained in the surface. The original textures of the red and tan clays were little
affected by the addition of the grog, since most of it sank below the surface of the clay. (See Plate IV, Figure d; Plate VI, Figure d; and Plate V, Figure d.) Although the blue buckeye produced a negligible textural effect when mixed with the red or tan clay, its addition might be justified since it proved to be an admirable strengthening material.

Sand and iron oxide.--Sand in the amount of 15 per cent by weight and iron oxide in the amount of 5 per cent by weight were combined and added to each of the three clays. The addition of the iron oxide changed the color of the red clay to bright red, the buff clay to light pink, and the tan clay to dull gray, but made no tactile change in the surfaces. The resulting color of the red clay was an improvement, but the color change in the buff and tan clays was undesirable. The sand produced a fine-grained visual and tactile texture on all three clays and afforded additional strength. (See Plate IV, Figure e; Plate V, Figure e; and Plate VI, Figure e.)

Coarse white grog.--Coarse white grog was combined in the amount of 15 per cent by weight with each of the three clays. The non-combustible grog, after firing, appeared as coarse white flecks distributed over the surfaces of the clays. There was considerably more visual contrast between the white grog and the red clay than between the white grog
and the buff and tan clays. The coarse grog in the three clays produced an agreeable tactile quality. (See Plate XII, Figures a, b, and c.)

**Fine white grog.**—Fine white grog in the amount of 15 per cent by weight was mixed with each of the three clays. The color of the clay was lightened in every specimen when the grog was added, but the change in the red clay was the most obvious. There was also a strong contrast between the flecks of white grog and the red clay, with lesser contrast in the buff and tan specimens. This mixture produced strong durable tiles with pleasing visual as well as tactile qualities. (See Plate VIII, Figures a, b, and c.

**Combustible and Non-combustible Materials**

Each of the three clays—red, buff, and tan—was mixed with a combination of a combustible material (sawdust) and a non-combustible material (wood ashes).

**Sawdust and wood ashes.**—Sawdust and wood ashes, each in the amount of 10 per cent by weight, were combined and mixed with each of the three clays. During the firing, the ashes changed the color of the red clay to lighter red, and the buff clay to gray. The color of the tan clay was not affected. In the firing, the sawdust burned out, leaving the surfaces of all specimens pitted with minute holes. The addition of the ashes made all the clays lighter in weight—
and therefore more fragile—and caused the surfaces of the red and tan specimens to rub off. (See Plate IX, Figures a, b, and c.) For that reason the mixture was totally unsatisfactory with the red and tan clays and only partially satisfactory with the buff clay.

Textures Resulting from Surface Treatments of Green Ware

In order to discover satisfactory textural effects that could be achieved by surface treatments of a clay object in the green state, thirteen experiments were performed: three on soft green ware and ten on leather-hard green ware. Only one color of clay was used in each experiment. Since nothing was added to the clay body, each technique would work equally well on all three clays.

Textural Effects on Soft Green Ware

The following experiments were performed on tiles in the soft, green state: (1) gouging on red clay, (2) scratching on buff clay, and (3) stippling on tan clay.

Gouging.—Red clay was used in this textural experiment. The index finger was pressed into the soft clay to produce a rhythmical pattern of rather deep indentations. (See Plate X, Figure a.) Because of its scale the gouging texture illustrated in the figure would be suitable for the surface of a large object. Many sizes of indentations could be achieved
on the clay by pressing with other parts of the hand or
gouging with tools, such as sticks, bones, quills, or peb-
bles. By changing the depth as well as the size of the in-
dentations, the technique could be made suitable to variously-
sized objects. It would be satisfactory as an outside sur-
face treatment only, since the deep indentations on an in-
side surface would be difficult to clean if filled with
foreign material. An exterior surface so treated would af-
ford good traction for lifting the piece. This texture was
suggested by examples of classical Greek wine bottles that
exhibited a similar treatment on the handles. Apparently
the Greeks' reason for using the texturing was that stated
above.

Scratching.—Buff clay was used in this experiment.
The surface of the tile was scratched with the nail of the
index finger to produce a series of thin shallow indenta-
tions. (See Plate X, Figure b.) Variations of this tech-
nique would be possible by using different implements; for
example, sharp bones, orange sticks, pencils, or wire. The
scratched texture applied laterally to a clay pot would
make it easier to grasp and thus reduce breakage. Concen-
tric scratches would be easily applied mechanically to

2Don Schreckengost, "Don Schreckengost Discusses the
Decoration of Ceramics," American Artist, VIII (May, 1944),
18-19.

3H. B. Walters, Vol. 1 of History of Ancient Pottery
wheel-thrown ware. This technique was suggested by the native pottery of British New Guinea in the Cottingwood Bay area.  

**Stippling.**—Tan clay was used in this experiment. The surface of the specimen tile was stippled with a thick-bristle scrubbing brush. The bristles pressed into the clay resulted in a pleasing, porous surface effect—a visual texture similar to suede and a smooth tactile texture. The original color of the clay was not changed by the addition of the texture to the surface. (See Plate X, Figure c.)

This technique would be appropriate for the outside surface of a bowl or vessel, since the tactile quality would make the piece easy to hold and inviting to the touch. The texture could be used on a small object without being out of scale and without destroying the simplicity of the contour. A coarser stippling could be achieved with implements such as combs or wire.

This stippling texture would be suitable for application to any piece of pottery in the soft green state, regardless of the method used for building the form. The stippling experiment was suggested by the stippled jars produced by pre-Conquest Indians during the Chimu period.

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4Henry and Denise Wren, *Pottery: the Finger-Built Method* (London, 1932), Fig. 19.

Textural Effects on Leather-Hard Green Ware

The following experiments were performed on tiles in the leather-hard state: (1) polishing on red clay, (2) wax-resist on red clay, (3) carving on red clay, (4) stenciling on red clay, (5) pitting on buff clay, (6) spattering on buff clay, (7) slip trailing on buff clay, (8) slip painting on tan clay, (9) sgraffito on tan clay, and (10) layering on red and tan clays.

Polishing.--Red clay was used in this textural experiment. The tile in the leather-hard state was polished in a circular motion with a small round stone, which was rubbed intermittently on the worker's nose to pick up facial oils. (See Plate XI, Figure a.) This method of producing a satin-like surface was suggested by the technique used to produce the polished wares of the Santa Clara and San Ildefonso Indians of the Southwest.6 The burnishing of the piece could be done with any round, hard tool; for example, a bone, a steel bearing, or the back of a spoon. The facial oils could be replaced by fat or grease applied with a cloth.

Wax resist.--Red clay was used in this experiment. A design was painted on the leather-hard clay with melted beeswax; then, buff slip was painted over the surface of the tile. During the firing, the wax burned out, exposing the portions of the red clay body untouched by the finishing

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6 Franz Boaz and others, General Anthropology (Dallas, 1938), p. 569.
layer of buff slip. A strong visual contrast of red and buff and a slight tactile texture, little changed from the texture of the original red clay, resulted. (See Plate XI, Figure b.) This wax experiment was suggested by examples of contemporary pottery by Voulkos and Prieto.  

**Carving.** Red clay was used in this experiment. The leather-hard clay surface was carved with a sharp-pointed knife. The clay in this state was easily cut away without crumbling. The textural effect was enhanced when oblique lighting produced a pattern of light and shade. (See Plate XI, Figure c.) Carved bowls of the Sung Dynasty suggested this technique. The textural effect might be used on pottery of any size, the depth of the carving being adjusted to the proper scale for a given piece.

**Stenciling.** Red clay was used in this experiment. A stencil cut from paper and dampened was pressed against the leather-hard tile, and buff slip of a brushing consistency was painted over the exposed clay surface. When the slip had set, the stencil was peeled away, leaving the slip design with clear, sharp edges. The tactile quality of the tile was little changed from the original texture of the clay body. (See Plate XI, Figure d.) The clay slip could be

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8Albert Willem Rudolf Thiel, *Chinese Pottery and Stone Ware* (Los Angeles, 1953), Plate 40.
sprayed instead of brushed if a more evenly applied coating were desired. This texture would be especially suitable for flat and slowly-curving surfaces, since the stencil would be difficult to bond to the planes of sharply-rounded surfaces.

**Pitting.**--Buff clay was used in this experiment. Small pits were made in the surface of the leather-hard clay with a sharpened wooden stick. The basic color of the clay was not changed during the firing; however, as the illustration shows, one side of each minute pit, when observed under raking light, appears pale buff, and the opposite side dark buff. This gives a textural color contrast similar to that of pigskin. (See Plate XII, Figure a.) The pitting could be enlarged by using other tools, such as wooden dowels, wire, or iron rods. Its scale would determine its suitability to any given object.

**Spattering.**--Buff clay was used in this experiment. The smooth surface of the leather-hard tile was spattered with a contrasting red clay slip from a height of fifteen inches. The droplets hit the surface and spattered into irregular shapes, producing a pattern with strong contrast in color. The tactile quality of the surface was little affected. (See Plate XII, Figure b.) This texture would be

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suitable for any bisque piece if a strong visual contrast were desired.

**Slip-trailing.**—Buff clay was used in this experiment. The same kind of clay was made into a thick slip of the consistency of cake frosting and trailed from an ear syringe over the leather-hard surface. When the trailed slip was leather-hard, thin pink slip was brushed over the entire surface of the tile and allowed to dry; then, the pink slip was polished away from the top surface of the trailed lines, exposing the original buff clay. (See Plate XII, Figure c.) Kenny uses a glass rod instead of an ear syringe for slip trailing.\(^{10}\) The crossing of the trailed lines and the resulting depth between the lines make this texture, as illustrated, unsuitable in scale for small pieces of pottery; however, the technique could be adjusted in scale to suit it to specimens of any size.

**Slip painting.**—Tan clay was used in this experiment. A design was painted with pink engobe on the leather-hard clay surface in order to introduce a contrasting color. The slip flowed from the brush with ease and bonded with the tan clay surface without flaking. After firing, the design appeared in slight relief. The visual quality of this texture is more impressive than the tactile quality. (See Plate XIII, Figure a.) This experiment was suggested by

\(^{10}\text{Ibid.}, \text{p. 216.}\)
slip-painted pottery of the Indians of Acoma Pueblo, New Mexico, and fifteenth century pots from Korea.

**Sgraffito.**—Tan clay was used in this textural experiment. Red slip was brushed over the surface of the tile, forming a thin layer. Texture resulted from incising through the slip to the base color. The tactile quality of this specimen was not so impressive as the visual texture. (See Plate XIII, Figure b.) One advantage of this technique would be that the surface of a rounded pot might be incised mechanically as the object turned on the wheel.

The process would be suitable for all kinds of pottery and tiles. This technique was suggested by the decorated pottery of German settlers in Pennsylvania.

**Layering.**—Red and tan clays were used in this textural experiment. Each clay was rolled out to equal thickness and cut into strips of the same width. The contrasting strips were welded together alternately with slip. After drying, the clay surface was scraped clean and brushed smooth, leaving a pattern of alternating stripes of red and tan. The firing was completely successful.

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14John Spargo, Early American Pottery and China (New York, 1948), Plate 17.
This technique would be suitable for flat objects only, since bending the welded clay would weaken the surface. (See Plate XIII, Figure c.)

Textures Resulting from Surface Treatments of Bisque-Fired Ware

In order to discover satisfactory textural effects that could be achieved by surface treatments of a clay object in the bisque state, three experiments were performed on bisque ware. Only one color of clay was used in each experiment. Since nothing was added to the clay body, each technique would work equally well on all three clays.

Textural Effects on Bisque-Fired Ware

The following experiments were performed on bisque-fired tiles: (1) grinding on red and buff clays, and (2) scraping on tan clay.

Grinding.—Red bisque-fired clay was used in one experiment. A tile was constructed and fired. The surface of the bisque-fired tile was ground by intermittent contact with a coarse-grit abrasive wheel, producing a series of elongated bites in the clay surface. The areas most deeply bitten were rough to the touch and gave the tile an interesting tactile quality. (See Plate XIV, Figure a.)

Buff bisque-fired clay was used in another experiment, substituting a medium-grit abrasive wheel for the coarse-grit wheel used on the red tile. Slight impressions with
raised edges were left on the surface as the wheel bit the clay. This resulted in a pleasing tactile texture, and the play of light on the surface created an interesting visual texture of lights and shadows. (See Plate XIV, Figure b.)

This technique would be suitable only for pieces of pottery large enough to be easily held and controlled during grinding.

Scraping.--Tan bisque-fired clay was used in this experiment. Scratches were made in the surface of the tile with the sharp point of a knife. (See Plate XIV, Figure c.) Although the resulting texture was satisfactory, the bisque-fired ware was hard to scratch. It seems, therefore, that a similar texture could be more easily applied to the clay in the green state.
CHAPTER III

CONCLUSION

Summary

This series of experiments has proved informative in several respects. It has shown that many techniques will produce pleasing visual and tactile surfaces on the three clays--red, buff, and tan--chosen for study. Satisfactory textural effects resulted from mixtures of foreign matter with the clay body or from surface treatments applied to green or bisque-fired ware.

Combustible materials mixed with the clays caused the surfaces to be rather soft and porous, and if used in pottery, would require a thickening of the walls for additional strength. Part of the visual effectiveness resulting from the techniques using combustible materials depends upon the play of light and shadow in the surface depressions. A raking light seemed to emphasize the visual textures considerably more than a direct light.

Mixture of non-combustible materials with the clays resulted in excellent tactile textures. The visual effectiveness was determined by the color contrast of the foreign matter with the clay, or by the mesh size of the added ingredient. The non-combustible materials proved valuable
for strengthening the clay bodies. The more finely ground non-combustible ingredients resulted in very strong products; the coarser ingredients produced slightly more fragile pieces. The former group of mixtures would be especially suitable for large clay sculpture where strength of walls would be of utmost importance.

Mixture of a combustible and a non-combustible material produced specimens of acceptable strength but light in weight. Wood ashes—the non-combustible material—caused the surfaces of the red and tan specimens to rub off. For that reason the mixture was only satisfactory with the buff clay.

Experiments with surface treatments on soft, green wares produced excellent tactile textures, with visual textures improved by oblique lighting. These techniques could be applied to ceramic wares, regardless of the construction method used.

Satisfactory visual textures were produced by all the surface treatments used on leather-hard clays, those involving contrastingly colored slips being especially effective. These techniques proved generally practical for flat tiles and gradually curving surfaces of pottery. The exception was the layering technique, which would be suitable for flat objects only, since bending the welded clay weakened the surface. Unusually good tactile textures were
produced on leather-hard green ware with the techniques of carving, pitting, and slip trailing. By regulating the scale, these textures could be used on ceramic pieces of any size.

In spite of the successful outcome of the experiments on bisque-fired clays, it was concluded that similar effects could be more easily obtained on green ware; therefore, texturing of bisque ware is not recommended.

Recommendations for Further Study

Since in this study only three clays were used in fifty-three experiments, further experimentation should be undertaken. By recording the experiments on curved tiles, which would simulate the curved surface of a piece of pottery, the textural effects as they would appear on pottery could be better judged. This form was not used in the specimens presented herewith since they had to be contained in a portfolio.
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