Portland State University

PDXScholar

Dissertations and Theses

Dissertations and Theses

1984

Overgrown geometry

Connie Earnshaw

Portland State University

Follow this and additional works at: https://pdxscholar.library.pdx.edu/open_access_etds

Part of the [Art Practice Commons](#), and the [Ceramic Arts Commons](#)

Let us know how access to this document benefits you.

Recommended Citation

Earnshaw, Connie, "Overgrown geometry" (1984). *Dissertations and Theses*. Paper 3497.

<https://doi.org/10.15760/etd.5380>

This Thesis is brought to you for free and open access. It has been accepted for inclusion in Dissertations and Theses by an authorized administrator of PDXScholar. Please contact us if we can make this document more accessible: pdxscholar@pdx.edu.

OVERGROWN GEOMETRY

by

CONNIE EARNSHAW

A thesis report submitted in partial fulfillment of the
requirements for the degree of

MASTER OF FINE ARTS
in
CERAMICS

Portland State University

1984

TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH
PORTLAND STATE UNIVERSITY:

The members of the Committee approve the terminal
project of Connie Earnshaw presented on November 13, 1984.

Ray Grimm, Chairman

Robert Kasal

Claire Kelly

Mary Constans

Trygve P. Steen

APPROVED:

Robert Kasal, Head, Department of Art - Portland State University

TABLE OF CONTENTS

	PAGE
LIST OF FIGURES	iii
CHAPTER	
I. INTRODUCTION	1
II. MY WORK IN RELATIONSHIP TO HISTORICAL AND CONTEMPORARY IDEAS	7
III. THE WORK	12
IV. CONCLUSION	36
TECHNICAL APPENDIX	38
Introduction	38
Basic Testing Methods	39
Clay Bodies	40
Adding of Granular White Sugar to a Clay Body	41
Using Metal in Clay	47
Terra Sigellatas	49
Developing a Palette of Color in Egyptian Paste	52
END NOTES	67
BIBLIOGRAPHY	68

LIST OF FIGURES

FIGURE	PAGE
1. 16" High	12
2. 20" High	15
3. 28" High	16
4. 3" High	19
5. 4" High	19
6. 5 1/2" High	20
7. 8" High	20
8. 8" High	21
9. 18" Tall	23
10. 26" Tall	24
11. 24" Tall	25
12. 22" High	26
13. 24" High	27
14. 28' Wide	28
15. 18" Wide	29
16. 38" High	30
17. 32" Wide	31
18. 22" High	32
19. 22" High	33
20. 24" High	34
21. 24" High	35
22. Test Samples	66

CHAPTER I

INTRODUCTION

My creative work in the MFA program combines new concepts and techniques with ideas and images that have deep and long-standing meaning for me. Through this body of work I have developed a stronger sense of what is important to me aesthetically, philosophically, and technically.

I have become capable of handling more chaos. Blackberry vines used to frustrate me visually with their crazy wildness. How could I contain them in images without freezing their passionate outreaching between borders? My mind formed this question wordlessly as I looked at blackberry patches. At the same time, I felt vital excitement, as though I were the plants extending bright green shoots, and enclosing worlds of insects and berries in leaf-protected niches.

Through my MFA work I have evolved pieces that integrate increasingly more complex ideas forms and techniques. Beginning with surface-decorated functional forms, I have made a transition to ceramic sculpture intended to stimulate the senses and the imagination. I have kept my original interest in color, detail, and plant forms.

Before I started the program, my work focused on usable ceramic objects, including plates, bowls, tiles, and boxes. Surfaces were emphasized with such images as plant forms, female nudes in natural

settings, and pictures of food. Many of my pieces were designed to serve food, and I wanted people to think about food's sources in nature and society. I did a grocery store series which I considered both serious and humorous. These works were intended to mean something to people, and to be a part of their lives. This interest in meaning and communication has been maintained in my thesis work.

Formally and technically in my previous work, I focused on color, spontaneity, and intricate craftsmanship. I used color expressively and descriptively. Folded and draped construction with soft clay slabs offered me spontaneous involvement with clay's plasticity. Modelled details, appliqued coils, and incised surface design demanded patient craftsmanship. I used complex combinations of oxides, glazes, and underglazes at high and low temperatures. I went beyond these techniques in my MFA work, exploring new methods and materials, which I present in a technical appendix.

I think of form and content as inseparable in my work. Even the most abstract qualities of my forms have inherent meaning. For example, my juxtaposition of curves and angles creates a sense of contrast. The idea of contrast itself has meaning to me because I think that contrast or duality is one of life's basic structures, and that transcendence of duality is part of life's magic. Furthermore, I can spend a long time thinking about the curves and angles themselves. I can associate them with particulars such as plants and buildings. Or I can contemplate them more abstractly as symbolizing movement, cycles of nature, and crystalline patterns. I can experience different feelings in my body as I look at the curved and angular shapes

in my work, as though I am the forms themselves, moving through time and space.

In my work I make many connections. Abstract symbols, specific images, and my own intellect and emotions are joined in a network of shapes. Connection is a theme. It naturally follows that the work is also about making connection with other people. I want others to look at it and to share with me their responses, which enlarge my world view. I feel that I and my work are enriched by the dialogue it stimulates with other people.

Historical inspirations for me include traditional and folk arts ranging from Mexican tree-of-life candelabras to Byzantine mosaics and Celtic manuscript painting. Traditional textile arts such as Chinese embroideries, Middle-Eastern rugs, and American quilts also fascinate me. All of these art forms use rich color, complex detail, and intricate craftsmanship to create visual intensity. For me, these elements produce a sensuous emotional, and intellectual excitement I call beauty. In addition, these art forms share meanings defined by the cultures which produced them. They relate to ceremonies and common experiences, as well as myths and metaphysical views that are real to the people who share them. In a sense they are created by groups, not individuals. They connect the individual to the physical and metaphysical world, and to the group.

As a contemporary artist-craftsperson, I take individual responsibility for my works in a way different than artisans who consciously served tradition, church, or myth. I see myself sharing a widespread contemporary artistic interest in the historical and primitive societies that produced such artists. Much of the imagery in my

work reflects personal experiences of nature, shared with other people. Years ago, a friend and I were clearing a lushly brambled area to build a kiln on a farm outside of Portland. With machetes in bare hands we cut and removed the sturdy vines, handling them lightly to avoid thorns. Gradually we saw the results of our labor emerge as empty space carved from the green tangle. We joked about the inevitable return of the bramble, sharing a profound sense of gratitude that the environment would rebound from our assaults. We lightheartedly named this indomitable regenerative force "the secret agent of the blackberry." Beyond our ultimate control and definition, the secret agent would root and sprout and spread. We couldn't predict where the new green shoots would emerge, but we knew that they would. After this fantasy, my friend embroidered a "secret agent of the blackberry" badge, and I sewed and embroidered a blackberry tunic, which took me two years to complete.

Since I moved to Oregon years ago, the blackberries have fascinated me. They are a wilderness intertwined with the urban environment. Their unboundaried abundance represents a kind of freedom to me. One can lose oneself in them. The arching vines form secret interior spaces. They cover and protect the earth. For years I've harvested blackberries to make wine, jam, syrup, and pies. Multiple meanings arise from the blackberry plants as symbols. These plants are generous, beautiful, protective, destructive, frightening, adversarial, or paradoxical, depending on one's view of them.

The wasps, bees, and butterflies in my work represent to me the intelligence that interweaves "all things great and small," as well as

forces of evolution. Contemporary theories of evolution talk about self-organizing systems and group intelligence more than the competition between individuals often associated with Darwinism. Swarms of bees are self-organizing systems, as are human societies. Insects have evolved very differently from humans, with their own modes of perception and communication. Bees can perceive and project mathematical patterns, in ways we humans do not understand. Many insects evolve very quickly to adapt to the environment created by humans, changing coloration and body chemistry. I feel connected to the life force when I contemplate the beauty and intelligence of these creatures.

Insects also bring to mind the creative and destructive paradox of life; they are small and fragile, yet strong. In our lifetimes, they are transient, living for very short spans. They are also threatening to us, as agricultural pests and as self-protective individuals armed with stings and poisons like bees and wasps. I am comforted by their strength, even when they inconvenience me. They manifest the strength of the life force.

When I was a child I spent much time watching insects, looking at their rich beauty of color, pattern, and form. To me, they were hypnotic jewels, and fellow beings. I fed sugar water to pet butterflies. One of my nicknames was "Bug." I knew which flowers certain butterflies preferred, and which butterflies certain caterpillars would become when they metamorphosed. I remember striped Tiger Swallowtails sailing on slow wingbeats, landing only quickly and cautiously. They were hard to sneak up on, but when I could, I was thrilled by the subtle intricacies of their coloration, with small

spots of red and blue on their hindwings that could only be seen up close. I still see them on summer days, floating above the blackberries.

Velvety white and yellow spiders that mimicked the flowers they lived in, rose peach underwings of moths revealed when bark-gray forewings opened, and caterpillars striped emerald and yellow, which created metallic gold cases shaped like spiraling seashells in which to become orange and black butterflies, gave me a sensuous and emotional feeling of beauty. Surrounded and hidden by the small, cross-shaped yellow, purple, and white flowers of wild mustard, I would crouch to watch a mourning cloak butterfly unfold its wet, crumpled wings as it struggled out of a chrysalis that hung from a thin green stem like a miniature lantern. In rapt concentration I saw shrunken wings expand into taut sails rich with a mosaic of velvety scales colored blue, yellow and dark brown.

In experiencing and contemplating blackberries and insects, I have shared the basic human activity of creating symbols, reinforcing their meaning through communication with other. I see this experience as a microcosm of the symbol-making process reflected in folk and traditional arts.

CHAPTER II

MY WORK IN RELATIONSHIP TO HISTORICAL AND CONTEMPORARY IDEAS

At a 1981 symposium on crafts scholarship, in Washington, D.C., speakers emphasized communication and search for universal meaning in contemporary arts and crafts. Philosophical connections were made with other cultures, and with science and technology. An authority on Eskimo art told the conference that the Eskimos have no word for art except a word for small object made with the hand. The Eskimos, he said, like the Hopi and Ainu, believe that the artisan creates for the material a soul which outlasts the object crafted from it.¹

Cyril Smith, professor of materials science and engineering at M.I.T., discussed the connection between the artist and the world in terms of structure. He said, "Principles of structure in the mind follow principles of structure in the world."²

One principle of structure that interests me is the growth of self-generating forms in nature, such as crystals and plant forms. In my MFA thesis proposal I wrote, "I want to create strong sculptural forms that can be viewed on many levels of detail, constructing details from groups of smaller details to build a coherent whole in analogy to the growth of plants." A way of describing such forms in nature is fractal mathematics, the focus of current research at I.B.M. Research Center.

Fractals are detailed patterns, sometimes random looking, which can develop through fitting shapes onto boundaries of similar shapes. Large forms echoing smaller component form can evolve this way. The principle of fractals relates to the way I build organic structure of arched clay coils, fitting forms onto boundaries of similar forms. Fractal mathematics trace order in irregular formations that were formerly seen as chaotic or random. Cloud formations and cracks in drying mud are natural structures determined by fractals. "Just as a twig resembles a branch, and a branch resembles a tree, each part of a fractal is like the whole," wrote Jeanne McDermott in *Smithsonian Magazine*.³

I relate the idea of fractals to Medieval and Eastern concepts of the macrocosm and the microcosm, which reflect each other's structural principles. In Eastern and Medieval Western thinking, the human individual contains a map of the universe. Some of the artforms that interest me most, such as Oriental tribal carpets, Mexican trees of life, and Hiberno-Saxon manuscript illumination, to me represent pictures of the universe. Describing Celtic manuscripts, Carl Nordenfalk writes "Another characteristic of Hiberno-Saxon ornament is its inherent power of expansion. This is particularly evident in the scrollwork, where one curve gives birth to another, in a sort of self-generating process."⁴ A rich sense of movement and self-generating form is also seen in Persian carpets. The angular geometry of Bakhti-yari rugs and the rich curvilinear forms of Kerman carpets create for me a sense of rhythmic infinity. I see them as visual metaphors for basic patterns of life and being such as creation, proliferation, transformation, disintegration, and integration. Visually symbolized

through fluent geometry, these processes make reference to nature and human experience on many levels.

In 1980 I visited the Museo de Arte Popular in the city of Puebla, Mexico. There I saw several ceremonial tree-of-life candelabras, expansive clay structures four to five feet tall, elaborately detailed with colorful leaves and flowers, birds and animals, abstract geometrical symbols, and human figures. They impressed me very much. To me they also are pictures of the universe.

Art critic and historian Lucy Lippard discusses an obsessive desire to integrate art and social life, a desire she shares with many contemporary artists. She speaks poignantly of the gap between the contemporary artist and the ancient maker of "primitive" images, who contributed to a collective life. Writes Lippard, "...modern art and primal art are ideologically opposed. Primal art is integrated with daily life and modern art is set totally outside daily life."⁵ She states that many artists today want art to become useful again and to function as a source of insight about the world. I identify with this desire to integrate art and life. To me the image of blackberry vines bearing fruit, flowers, and thorns is a metaphor for basic life processes, with universal as well as personal meaning.

My works reflect my own picture of the universe, using familiar imagery and abstract forms. I see the universe as a rich complex of relationships interfusing into an underlying harmony. Everything in the universe is alive and intelligent, in my view. Like the blackberries and geometric forms in my pieces, everything is interconnected. I see the universe as evolving. There is unity in being,

a rich harmonious peace and presence which I experience as the warmth and color of life. At the same time, movement, change, and evolution are ceaseless.

My work is composed of contrasting shapes and colors which can be seen as opposites. I see these oppositions as creating each other, and fusing into something that transcends duality. To me opposites (light and dark, hard and soft, straight and curved, positive and negative) are ways we organize our experience and language, and also reflections of patterns we observe in the physical world. Opposition is a dynamic principle that "keeps things moving" in the universe, creating evolution and change. But nothing is really opposite or separate in its most basic nature. I am not relying on logic here, because I believe logic is just a transient tool, which cannot capture reality. I believe that paradox is the ultimate outcome of trying to fit life into logic, and that paradoxes reveal wordless truth, like the Zen koan about one hand clapping.

When I experience blackberries as both benevolent and ominous, I find this kind of paradox. The protective and threatening demeanor of my ceramic dogs also can be experienced as paradoxical, like the profound creative and destructive aspects of the universe. I relate this kind of profound "contradiction" to the humorous Mexican figures of skeletal musicians and newsboys made for the Day of the Dead, as well as to the protective yet fear some Tibetan deity Mahakala, who is a flaming blue monster surrounded by piles of skulls.

Paradox, as I experience it, is a cerebral and gut level sense of dissonance and discomfort which pushes me to switch gears, to let go of one thought pattern and open up to another one, perhaps more

visual and poetic, certainly more mystical. I am reminded of the fourfold proposition presented to Buddha by some seekers of truth, who sought to describe the universe as infinite, as not infinite, as both infinite and not infinite, and as neither infinite nor not infinite. Buddha replied that none of these formulas were true. I often think of the fourfold proposition and laugh; in fact, I wrote a song about it. Humor has been described as a way we deal with contradictions and conflicts in our experience. I use humor this way in my ceramic dogs, which I have generically titled Bitch Goddesses, arousing associations of interpersonal conflict, and peals of laughter from many people.

CHAPTER III

THE WORK

Figure 1. 16" high.

The first important piece in my MFA studio work (Figure 1, 16" tall) combined a simple temple shape with stairs, and a surmounting tower of thorned arches branching into leaves and blackberries,

individually hand modelled. Using wire to connect fragile clay shapes allowed me to make the ceramic brambles I had envisioned for years. I enjoyed the delicate work demanded by the vines, bee, and butterfly. I kept the piece in its bisqued whiteness for months before finishing it. I liked the way the whiteness of clay unified the piece and enhanced its fragility. Finally, I chose representational colors for the vines and insects, using glossy glazes with matt underglaze colors. To color the base structure, I used terra sigellata, a satiny slip, in white and pale blue. As I painted the inner walls blue, I imagined bringing the sky inside that space.

Shiny glaze was used only on the blackberries, to emphasize them. I considered using glossy polychrome glazes over the entire piece, but found matt surfaces more effectively enhanced the delicacy. Matt areas were sealed after firing with acrylic matt varnish to give a subtle sheen, as well as protection.

My next major piece (Figure 2, 20" high) took months to complete. Initially, the tree branches were tipped with short wires. After bisquing and coloring the piece, I slipped Egyptian paste leaves, fired separately onto the wires. I chose a simple, strongly contrasting group of colors--black and white, pink-purple, and turquoise blue. Originally I planned to surmount the tree with an arch crowned by a butterfly. I made this section, but did not add it, because I did not like its frontal quality.

After keeping this piece in my studio for over a year, I decided to retouch much of the surface, and refired it twice. Still unsatisfied, I redid some of the underglazed areas with acrylic paint. I replaced some of the turquoise blue leaves with cobalt blue ones to

increase color richness and contrast. To finish the piece, I added a painted wood base. Completing a ceramic work over such a long time span was a new experience for me.

Figure 2. 20" high.

Figure 3. 28" high.

My third important piece, and one of my most ambitious, was finished over one and a half years. Here, I layered handbuilt rock shapes in tiers to suggest steps. I constructed this piece in sections because it was so large and heavy. Stiff clay slabs were used to build the enclosure and rectangular base. They were carefully

measured and cut, using a pattern for the arched sides. To make the rock tiers, I handled the clay quite differently. I freely cut shapes from plastic clay slabs, texturing them with the side of a ruler to suggest strata. I assembled them quickly, paddling and texturing them further with a stick.

I wanted the rocks to suggest tidal outcroppings. I began the piece after visiting a Southern California beach familiar from childhood, now dramatically changed by an intense storm whose powerful waves washed away most of the sand to expose layers of rock.

For a year the piece sat bisqued in my studio, waiting to be resolved. I made and added ceramic seashells and waves, then took them away, dissatisfied. Finally, I added blackberry vines, with which I had become technically fluent. I fitted them to this piece, and fired them separately, to be attached after glazing. The piece changed character. The flowing plant forms, detailed with insects and blossoms, balanced the static angular shapes.

Adding color to the piece required considerable thought. I combined playful color and pattern with the warm peach of bisqued stoneware, which I duplicated in tinted terra sigellata (see appendix). The result pleased me very much. Choosing color felt very risky and very satisfying in resolving all my MFA work. This piece culminated an especially complex process of combining clay forms over time.

I made five ceramic dogs (Figures 4-8, 3-8" high) over the course of a year, to express my feelings and states of mind. Each piece in the series is larger and more complex than the previous one, reflecting my growing technical confidence. They were made as re-

spites from work on my larger pieces, and sprang into being very spontaneously. While they required painstaking, detailed work, I felt very free doing this work. This sense of freedom and spontaneity in all my work grew as I neared completion of my MFA.

The dogs are very personal expressions, and many other people relate to them because they speak of commonly experienced feelings through the familiar, sometimes humorous, form of the dog. Dogs often become legends among groups of friends, and my dog, with whom I identify, is a good example. Simple as my stylized dog is, she captures the stance, physique, and personality of her living prototype.

Figure 4. 3" high.

Figure 5. 4" high.

Figure 6. 5 1/2" high.

Figure 7. 8" high.

Figure 8. 8" high.

People's responses to these images surprised me at first, as I had not considered them serious aesthetic experiments. Receiving these responses, I especially identify the pieces with folk art.

They are a microcosm of folk art because they express the experience of a small group of people, where folk art expresses the collective experience of a culture through aesthetic tradition. Human identification with animals is a common theme of folk and primitive art. While my own experience is my first source, I value the relationship of these images to folk images of other cultures.

As I started the second year of the program. I wanted to further develop the imagery of plantforms. I was still attracted to geometric enclosing forms through, over, and around which plantforms

could grow. I wanted a shape more dynamic than the simple square or rectangle I had been using.

I had been impressed by shapes I saw the previous summer as I walked through industrial yards near the railroad tracks in Southeast Portland. There I was struck by a pile of sharply angular steel sheets, softened with rust and overgrown with blackberry vines. This interplay of forms was in my mind as I constructed my first rhomboid or double triangle shape, which became the base for a series of pieces (Figures 9-13, 16"-36" tall).

Skill I had gained in working with stiff clay slabs enabled me to convey dynamic geometry. Using wire to join leaves to clay coils allowed me to balance this geometry with organic overgrowth. Both rigid and flowing shapes were possible with the strong, plastic clay body I used (see appendix).

The first of these pieces (Figure 9, 18" tall) incorporates morning glory vines growing around blackberry vines. The complex linear movement of this vegetative intertwining, so characteristic of Western Oregon, has always fascinated me. In this piece I piled arching stems on top of each other, creating a network more complex and three-dimensional than the blackberry tower of Figure 1. Using press molds to make blackberry leaves more quickly allowed me greater elaboration and scale. The morning glory leaves were still individually cut and textured from thin slabs. I made and fired leaves ahead of time, and attached them to the stems as I worked on the piece. This technique allowed me greater spontaneity.

Figure 9. 18" tall.

I thought about different ways I could mass the plantforms in relation to the abstract base. In Figure 9, I heaped the vines at the apex of the piece, emphasizing its directional movement. Also, I found that the original base shape looked interesting upside down or placed on its side. The way vines met the base was another formal aspect I played with. I attached the vines to exterior flat surfaces at first (see Figure 9). Later in this series, vines pierced the walls and emerged from the enclosed interior. They twined around and between the clay bars that extended from the base triangle.

Figure 10. 36" tall.

I realized I could stack these forms as modules, and increase the scale of my work. Figure 10, 36" tall, was made with emphasis on overall form rather than particular detail. Thorns and leaves identify the blackberry vines, which have no fruit or blossoms.

Figure 11. 24".

Figure 11, 24" tall, was made with terra cotta, which I left mostly unglazed, to unify the piece. I found the rich red orange color very satisfying, and felt it added a dreamlike surreality to the plantforms. In this piece I experimented with a different vine form based on the cascading quality of honeysuckle, which makes straight descending lines. I found I preferred the blackberry arches, because they allowed me more freedom to expand forms upward and outward.

Figure 12. 22" high.

As I finished forming each piece, I thought about how I would glaze and color it, although my decisions were often made much later. I was committed to using fired ceramic slips, glazes and stains rather than paint, with the exception of touch-up work. Fusing color with clay through high temperature felt right to me. Wanting to maintain the subtlety of pink or white bisque fired clay, I chose tinted and white terra sigillata as the basis for coloring many of the works. Pale colors allowed me to play with effects of light and shade on the pieces, which cast wonderfully shaped shadows on themselves. I used pale purples, greens, and blues to capture the colors of shadows. Figures 9, 10, and 12 show some of these shadow patterns.

Figure 13. 24" high.

Figure 13 shows the last piece of this series. In this work, I refocused on naturalistic details after a period of investigating the abstract qualities of my work. This piece displays a great number of bees and blackberries, as well as a crowning butterfly. I found I wanted to use deep and varied color in this piece, after a period of exploring pastels.

The triangular bases of my wall pieces were suggested by my recollection of the angular steel plates overgrown with blackberries. I was attracted to their dynamic severity, and their simplicity invited me to build up layers of interesting detail.

In some of the pieces I used nails, which fire matt black, to create rhythmic textures of three-dimensional lines. I relate the nails to rhythmic intervals or beats in music. I have played a guitar for many years, and I especially enjoy making up melodies with constantly changing rhythmic structures in which frequency and placement of beats shift in surprising ways, as the nails in clay are surprising.

Figure 14. 28' wide

The abstract architectural forms in the center of Figure 14 are based on an exploratory drawing. This was the first of a series of wall pieces. I like its suggestion of cities overgrown by blackberries, and its textures.

Figure 15. 18" wide

Figures 15-17 deal with different problems, while sharing a layered structure. This includes a triangular base with incised and polychrome geometrical designs, a geometrical relief based on an arch and two triangles, and a counterpoint of vines. Surface design is a major focus in each of these pieces, and echoes the relief forms. Unpredictable movement and countermovement, which I associate with musical improvisation, is an effect I sought to achieve. For me this happens successfully in Figure 15, with an interplay of surface and relief forms crossed by a meandering band of vine. The nails suggest rotary motion of the triangle. Arrangement of nails in strong defined intervals rhythmically contrasts with the flowing vine like a bassline counterbalances a lyrical melodic line on the guitar, which can play both simultaneously.

Figure 16. 38" high.

Originally, Figure 16 was made as two separate units. Because of their shared palette and patchwork designs, I worked them into one composition. This happened as they were hung. I made 15, 16, and 17 so they could be hung at any angle, and their orientation on a wall could be easily changed.

Figure 17. 32" wide.

Figure 17, the triptych with purple leaves, was first intended to be a single abstract unit. I felt it looked incomplete, harsh, and austere. It was interesting, but seemed like someone else had made it. After looking at the piece for months, I framed it with vines attached to small triangular bases. I felt I had supplied what was missing.

Figure 18. 22" high.

The constructed quality of Figure 18, sets it apart from my other pieces. Unlike the sealed joins of my other structures, the joins here are open and emphasized with black edges. Metal pins rather than clay joints hold this piece together. Nails emphasize its construction and echo the black edges. They reiterate the effect of penetration begun by the bars inserted between the triangle's sides. I used color here to emphasize the constituent parts of the structure. My reaction to green as the interior color of this structure points out to me how strongly I associate that color with vegetation. This color placement feels surreal to me. Green inside suggests to me that I am simultaneously indoors and out in nature, as though I were in a room dreaming of hiding in a blackberry thicket.

Figure 19. 22" high.

My last three pieces (figures 19, 20, and 21) were made with a sense of confidence and freedom, during the final summer of my MFA work. The equilateral triangle of Figure 18 was a transition to the symmetrical isosceles triangular base I designed for these three pieces. With the triangle's sides extended above the apex to make an "X", this form creates two enclosed spaces: one inside the base, and one above it in the heart of the vines.

I began this series with a meditative period of making leaves, berries, and flowers. Once I started building a piece, I worked with a clear concept of what I wanted, and with confidence in my technical ability. I focused on the massing and linear rhythm of the vegetation as I worked.

Figure 20. 24" high.

In two of these pieces, figures 19 and 20, I invited the viewer into the foliage by placing a rectangular tile there. I thought of this tile as a table or shelf which invite placement of a small precious object, such as a found feather or stone, into the intimate space it created. The geometric designs on these tiles are intense concentrations of pattern and color that relate to the entire piece. They are meant to reinforce the structure's effect of drawing one into the center of the piece. The tiles can be picked up and removed from their supports; they are separate objects. I feel this enhances their intensity.

Figure 21. 24" high.

The roses flamboyantly proclaim themselves (figure 21). Traditionally roses symbolize love. I was not thinking of this when I made them, but the joyous sense of celebration I wanted them to display fits well with their traditional meaning. It is important to me that roses, with their thorny expansiveness and tendency to ramble, are botanically related to blackberries. These sensuous showy roses are outbursts of energy among ethereally frosty foliage, opening up and saying "I'm beautiful."

I was very pleased with the expressiveness and craftsmanship I achieved in these three pieces. These works combined the visual excitement and open-ended symbolic quality that I wanted.

CHAPTER IV

CONCLUSION

My development throughout this two year program has been very satisfying. After years of making production pottery and commissions, I have had the opportunity here to concentrate on new ideas and techniques that build on my own views of art and the world. Greater awareness of my own aesthetic and philosophical preferences has accompanied my technical development.

A sense of artistic continuity has grown for me. Important aspects of this body of work reflect images that have fascinated me for a long time. During my final five months of work, my explorations of two years were resolved into a sense of direction I feel very good about. What had seemed divergent concerns became integrated. Connections with my own artistic past became clear.

Before I began this program, I had never spent such lengths of time considering individual pieces. Even large wall pieces were clearly conceptualized in drawn designs, and technically resolved in a few months. Now I am accustomed to extensive technical testing, and to alteration of pieces over periods as long as a year.

I allowed myself long periods of uncertainty about my work. I set bisque fired pieces aside without the final step of adding color. Not knowing how the works would be resolved, I thought about my options. This lack of finality was very uncomfortable at times. When

I finished my pieces, I experienced great excitement. I could see my long term thinking process revealed in them. Color, with its sensual and emotional power, was the final resolving element in each piece.

I am very pleased that my work is evocative for other people. I do not want to limit my images to specific interpretation, so I did not title them. They are open-ended symbols, which have room to contain all the meanings that people bring to them. In my consciousness they are infused with personal and with universal meanings. While I feel completely sufficient in solitary communion with my works, I know that among its deep sources are experiences I have shared with others.

APPENDIX

TECHNICAL STUDIES

INTRODUCTION

My documentation of technical studies covers materials and methods I used extensively in my MFA studio work, in addition to a research project on Egyptian pastes. Selection of a clay body, use of sugar as a binder, use of metal in clay, and formulation of terra sigillatas are aspects of my technical development that I will present.

In working with Egyptian pastes, I focused on producing a full ranging palette of color, using a variety of pigments. I tested several Egyptian paste formulas to select one appropriate for color development.

My technical studies are related to my aesthetic development. My interest in fragile branching forms and detailed natural shapes pushed me to develop clay bodies and ways of using wire in a clay that would allow me to achieve these forms. My interest in rich colors and pastels led me to explore tinted terra sigillatas, Egyptian pastes, and underglaze colors. As I gained technical confidence, my visual ideas became more elaborate and detailed.

I found myself synthesizing many techniques in my pieces, just as I integrated curved and angular forms, abstract and representational images. I worked with plastic clay and leather-hard clay to

build my pieces, using wire to join small clay shapes. I mixed sugar with clay to increase its plasticity and dry strength. Satiny terra sigillatas, glossy low-fire glazes, and matt underglaze colors provided me several ways to achieve color and texture.

After much testing work with Egyptian paste, I began to achieve the range of colors I wanted to use in my pieces. It was toward the end of my MFA work that I obtained successful colors other than bright turquoise and royal blue. This is why Egyptian paste was not extensively incorporated into my work. There are still many possibilities for me to investigate in use of this technique.

BASIC TESTING METHODS

All tests were oxidation fired in a Skutt electric kiln, unless reduction is specifically mentioned.

Tests on Clay Bodies for Shrinkage, Green Strength, and Absorption: Shrinkage and absorption were determined as described in Clay and Glazes for the Artist Potter by Daniel Rhodes.⁶ Tests for green strength were done as described in my section on Clay Bodies. All test bars used were approximately 14 by 4 by 1 centimeter.

Metal in Clay: For wire and nails, tests were prepared as follows. For each test, a clay ring about 3" in diameter was mounted vertically on a small base. The upright ring was studded with nails or short lengths of wire, to some of which were attached small clay shapes. In test for rigidity, each length of wire was strung with clay beads 1/2 to 1" in diameter, and bent into a self-supporting loop, the ends of which were sunk into a solid clay base.

Terra Sigillata: Clay bars approximately 4" by 1 1/2" by 1/4"

were bent at right angles. These were brushed or dipped with terra sigellata, while either green or bisqued, and labelled.

Egyptian Paste: 100 gram batches (dry weight) were mixed for initial tests of surface quality. Twenty gram test samples were weighed out and mixed to plasticity with about one teaspoon of water. Each sample was shaped in a bisqued ceramic press mold to make a stylized, ribbed leaf approximately 2" tall by 1 1/2" wide. Test samples were mounted on individual standing bases made by cutting a one inch wide coil into 1" lengths, which were rolled into cones. Cones were hollowed in the bottom to facilitate drying. A 1 1/4" finish nail was set into the apex of each cone, head anchored in the clay and point up to hold the sample. These mounts were fired to cone 06.

For color test made after the initial samples had been tested, 20 gram samples were weighed into sandwich bags from a 500 gram batch. Bags were labelled with Egyptian paste type, weight of sample, and percent and type of colorant. Colorants were then weighed into the bags, which were shaken to dry mix. Each sample was moistened with one teaspoon of water, and kneaded in the bag. The paste was removed with a spoon, pressed into the mold, and mounted on a labelled base. I wore examining gloves to handle the colored samples because of the toxicity of colorants.

CLAY BODIES

For my thesis work I used the following clay body. It is a strong, plastic handbuilding clay with low warpage and shrinkage. I added .5% white granulated sugar and a pinch of nylon fiber to each 100 lb. batch, to increase green strength and decrease warping. It

was very satisfactory for my complex and fragile pieces. I fired it at cone 06 oxidation.

CLAY D

Missouri Fireclay	55%
OM 4 Ball Clay	10%
Custer Feldspar	10%
Flint	10%
Columbia Fireclay, screened	10%
Ione Grain Grog	5%

Test results for Clay D as follows: green strength 460 gm., dry shrinkage - 4%, warping - none, and minimum diameter of a 1/4" coil ring - 3/4 - 1". Warpage and shrinkage exceptionally low. Additions of sugar and nylon fiber improved the green strength.

I also experimented in my pieces with ArtPak Navajo Wheel--a plastic terra cotta, Westwood Hagi Porcelain--a smooth white body, and George Wright's red tag stoneware. The terra cotta and stoneware were more plastic than the porcelain. All three warped and cracked considerably more than Clay D.

I used the Hagi porcelain for making flower details. Its fine grain worked quite satisfactorily for thin petals. George Wright's stoneware also worked well for this.

Additional Clay Bodies

I tested several clay bodies before selecting Clay D. I was looking for a strong, plastic clay that would fire white or cream at cone 06 oxidation. Initially, I wanted a clay that would vitrify at a

low temperature, but I decided that this was not necessary or even desirable. The shrinkage that accompanies vitrification can increase warping and cracking problems. The first three clay bodies I tried, clays A, B, and C, have the following formulas:

	<u>Clay A</u>	<u>Clay B</u>	<u>Clay C</u>
Missouri fireclay	13.3%	13.3%	25.0%
Greenstripe fireclay	26.7%	26.7%	
Troy Idaho fireclay, screened			10.0%
OM 4 ball clay	26.7%	26.7%	20.0%
Kona F 4 feldspar		20.0%	
Talc	20.0%		20.0%
Nepheline Syenite			15.0%
Flint			10.0%
Ione Grain grog	13.3%	13.3%	

I tested all three clays for shrinkage, and tested clays A and B for absorption, with the following results:

	<u>Clay A</u>	<u>Clay B</u>	<u>Clay C</u>
Dry Shrinkage	5.5%	5.0%	6.0%
Fired Shrinkage cone 08	2.0%	1.0%	
Fired Shrinkage cone 06	2.0%	2.0%	2.0%
Fired Shrinkage cone 04	2.0%	2.5%	
Fired Shrinkage cone 01	6.5%	4.5%	5.0%

	<u>Absorption Clay A</u>	<u>Absorption Clay B</u>
Cone 08	14.5%	18.0%
Cone 06	14.0%	16.0%
Cone 04	13.2%	13.8%

Clays A and C have higher fired shrinkage at cone 01 than Clay B. Clay A has lower absorption than Clay B at all temperatures tested. These differences correspond to the low-fire fluxing power of talc, present only in clays A and C, which shrink the most.

Of these three clays, B was the most satisfactory to work with. Clay C did not have enough tooth. Pieces made with Clay A developed hairline cracks at cone 06.

I tested five more clay bodies, designed to vitrify at low temperatures. They all contained one or both of the low-fire fluxes talc and Ferro frit 3134. These clays have the following formulas:

	<u>C 1</u>	<u>C 2</u>	<u>C 3</u>	<u>C 4</u>	<u>C 5</u>
Missouri Fireclay	25.0%	25.0%	25.0%	20.0%	25.0%
Troy Idaho Fireclay, screened	10.0%	10.0%	10.0%	10.0%	10.0%
OM 4 Ball Clay	20.0%	20.0%	20.0%	20.0%	20.0%
Nepheline Syenite	15.0%	5.0%			25.0%
Talc	20.0%	20.0%	25.0%	30.0%	
Frit 3134		10.0%	10.0%	10.0%	10.0%
Ione Grain Grog	10.0%	10.0%	10.0%	10.0%	10.0%

Test results were as follows:

	<u>C 1</u>	<u>C 2</u>	<u>C 3</u>	<u>C 4</u>	<u>C 5</u>
Dry Shrinkage	6.0%	5.0%	4.5%	4.0%	5.0%
Dry Warpage	none	mod.	none	slight	mod.
Fired Shrinkage cone 04	3.0%	3.0%	3.5%	3.5%	3.0%
Fired Shrinkage cone 02	4.0%	4.5%	4.5%	4.5%	5.0%
Absorption cone 04	13.0%	8.0%	7.0%	7.6%	7.8%
Absorption cone 02	11.6%	3.8%	3.6%	4.6%	6.8%
Color cone 02 & 04	cream	buff	buff	buff	buff

Summary and Conclusions

All of the last five clay bodies had enough plasticity and tooth to appear workable. The four bodies with frit 3134 show considerable vitrification at cone 02, as indicated by the low absorption figures. Comparing C 1 and C 5 indicates that frit 3134 is a stronger low fire flux than talc. Ten percent frit 3134 in C 5 gives lower absorption (greater vitrification) than does 20 percent talc in C 1.

I did not use these clays enough to determine their working properties. Only small batches were tested. They have interesting possibilities as low-fire sculptural clays.

Clay D, which I used for most of my MFA work, is an open body when fired to low temperatures, which do not vitrify and tighten it. I selected it because of its low dry shrinkage and low warpage. It worked well as a sculpture body.

ADDING GRANULAR WHITE SUGAR TO A CLAY BODY

Small additions of sugar dramatically increased green strength and improved plasticity. Sugar also reduced warpage. It may reduce linear dry shrinkage.

C & H brand granular white sugar was added to the following clay body in the dry mix:

CLAY A	
	% by weight
Greenstripe	26.7
OM 4 Ball Clay	26.7
Talc	20.0
Troy Idaho, milled, screened	13.3
Ione Grain	13.3

I did two series of tests, which gave the following results:

<u>% Sugar by Weight</u>	<u>% Dry Shrinkage</u>	<u>Green Strength</u>	<u>Dry Warpage</u>
Test Series 1			
.1%	6-7%	1720 g.	bad to moderate
.2%	6-8%	3800 g.	moderate
.4%	6%	3860 g.	moderate
.6%	4%	3750 g.	slight
.8%	4-5%	5250 g.	none
1%	5%	5500 g.	none
Test Series 2			
0	6-7%	1107 g.	bad
.1	5-6%	4000 g.	moderate
.25	3-4%	4500 g.	moderate
.5	3-4%	6000 g.	none

Warpage was measured visually. More exact measurements of warpage could be done with a pair of parallel boards gapped at a variable calibrated distance. Test bars of a standardized thickness would be used.

Green strength was measured as follows: the test bar was placed between two bricks with half its length protruding to support weights. Fired clay bars were rested on it at right angles. Styrofoam cups of sand and 500 gram weights were placed on the support until the test bar broke. Total added weight was determined, giving the gram figure for green strength.

Dry shrinkage was measured as described in "Basic Testing Methods." Dry or green shrinkage seemed to be reduced by small amounts of sugar. But in a previous test of 5% sugar added to Lincoln 60 fireclay, shrinkage was slightly greater than without sugar. Perhaps shrinkage increases as sugar additions increase past a certain point.

Summary and Conclusions

Sugar toughens greenware. When 1% or more sugar was added to a body, greenware could barely be scratched with a knife. Sugar, like gum or bentonite, increases plasticity and workability of clay. It reduces warpage. If it can also reduce dry shrinkage, sugar should help reduce cracking of greenware. I found sugar additions of .5% helpful in my work with fragile clay forms.

Rhodes' Clay and Glazes refers to use of sugar or molasses in glazes to toughen the coating. He also mentions adding a few drops of formaldehyde to a glaze to retard the spoilage that occurs when gum is added.⁷

Spoilage did occur with sugar additions. Some samples developed a strong organic odor. This disappeared as the clay aged over several months. In addition, micro-organisms formed gas pockets in freshly made moist clay containing 1% sugar. Aged clay did not have this problem. Bubbles were worse in slabs of fresh clay rolled with a rolling pin and left to stiffen under plastic. Slabs made with a Brent slab roller had less bloating. The textured, slightly cracked surface left by the Brent slab roller may have allowed more gas to escape than the sealed surface left by the rolling pin.

To examine the relationship of spoilage to sugar concentration, I checked test samples aged three weeks. With .1% sugar, the odor was not present. With .25%, it was barely noticeable. With .5%, the odor was strong.

USING METAL IN CLAY

I experimented with several kinds of wire, nails and other hardware, and metal found objects. I fired these into clay, using them structurally and expressively. Nichrome wire (9 and 16 gauge), kanthal wire (15 gauge), stainless steel wire (14 gauge), and galvanized steel wire (9 gauge) were used to support and connect clay shapes. Nails were used to connect shapes, and as decorative and expressive visual elements. Screw eyes and street sweeper bristles were used as connective and visual elements.

Tests at cone 06 gave the following results:

	Kanthal 15g.	Nichrome 16g.	Stainless 14g.	Galv. 9g.	Nails
Rigidity of 10" with clay beads	sags badly	sags badly	not tested	rigid	n/a
Joining small shapes	good	good	good	too thick	good
Color	dull gray	dull gray	black	black	black

I tested common finishing nails to see the maximum temperatures they could withstand, with the following results:

cone 06	Nail intact, with layer of loose scale
cone 01	Nail intact, with layer of loose scale
cone 1	Slight bubbling
cone 3	Pronounced bubbling and bloating

I tested 15 gauge kanthal wire at cone 10 reduction, using short lengths to join beads to small test rings. It held up well, and looked the same as it did at cone 06.

Nails are not as strong as kanthal, nichrome, or stainless wire at cone 06. They are more useful for visual effects than for structural strength. At all temperatures tested, they formed an oxide layer which could be flaked off. Hardware such as hooks and screw eyes also formed a layer of scale, as did galvanized wire. Nine gauge galvanized wire was thick enough to be structurally strong even after losing a surface layer.

Cracking of clay around the metal was not a problem, although I had anticipated its possibility. I used a variety of clay bodies with kanthal wire, stainless steel wire, and nails at cone 06 oxidation, and had very little cracking occur.

In my studio work I made extensive use of kanthal wire (15 gauge) and stainless steel wire to join leaves, berries, and flowers to clay coils. I also used wire to reinforce joints. For both purposes I used 1 to 1 1/2" lengths of wire. Clay D was my primary clay body, which I fired at cone 06 oxidation. Kanthal wire was prefer-

able, as its flexibility allowed me to slightly reposition attached details after firing.

The ceramic tree in Figure 2 of my thesis report was extensively reinforced with kanthal wire. I ran a wire through the core of each coil branch as I built the tree. When one branch cracked through during firing, the wire held it together and allowed me to repair it easily.

TERRA SIGELLATAS

I worked with three terra sigellatas, which were successful for different purposes. One of these, T.S. 8, was used extensively in my MFA studio work. I experimented with using terra sigellata under and over underglaze colors, and with adding color to the terra sigellata.

	<u>TS 4</u>	<u>TS 5</u>	<u>TS 8</u>
OM 4 Ball Clay	135 gm.	800 gm.	800 gm.
EPK Kaolin	585 gm.		
Bentonite	30 gm.		
Calgon	4 gm.	4 gm.	4 gm.
Water	2000 cc.	2000 cc.	2000 cc.
Ball milling procedure	after decanting	after decanting	before decanting

Fired results at cone 06:

	<u>Color</u>	<u>Texture</u>	<u>Fit on Bisque</u>
TS 4	White	Smooth to crackle Burnishes to shine	Fits when applied to bisque or green
TS 5	White	Smooth Burnishes to shine	Fits only when applied to greenware
TS 8	White	Smooth Burnishes to shine	Fits when applied to bisque or green

All three terra sigellatas are white slips which burnish satiny to glossy when rubbed with a finger or a chamois. They were kept as close as possible to a specific gravity of 1225. Greatest gloss was achieved when slip was applied with medium thinness to a smooth clay body, burnished, and fired at cone 08 to 06. Burnishing worked best when done while the sigellata was still dark with dampness, shortly after it was applied. Without burnishing, some gloss was achieved, particularly with TS 5, but this was not consistent.

Ball milling was not necessary to get a polished surface, but it did improve the gloss. I milled the slips for 24 hours approximately. When I milled the basic ball clay formula before decanting, I got a slip that could be applied to bisque without flaking or crazing. When I milled it after decanting (TS 5), the slip was glossier, but did not fit bisque.

TS 5 and TS 8 attained greater gloss when put through an 80 mesh sieve. There appeared to be some relatively large particles, perhaps mica, light enough to float in the terra sigellata. These seemed to scratch the surface when it was burnished. Sieving helped remove these particles.

I mixed the terra sigellatas by adding water, Calgon as defloculant, then dry clay, to gallon jars. TS 4 and TS 5 were allowed to stand two to three days before decanting. With a turkey baster, I first drew off the layer of clear water on top. Then I drew off and reserved the sigellata itself, which constituted about 1/2 to 2/3 of the mixture. I discarded the remaining sludge, which contained the heavier particles.

TS 4 and TS 5 were ball milled after decanting. TS 8 was milled immediately upon mixing, then allowed to settle, and decanted. It yielded a greater proportion of terra sigellata than the others, leaving a smaller layer of sludge. The resulting sigellata had a darker gray color when wet than did TS 5, which has an identical formula.

TS 4 formed an interesting crackle pattern when a medium thin layer was applied. Like the other terra sigellatas, it tended to crack and chip if applied too thickly. Stains or oxides brushed on then wiped off emphasized the stains.

Use of Terra Sigellata with Underglazes

I experimented with using TS 4 over Duncan EZ Stroke underglaze colors. I sought the effect of color showing through the crackle, like layers of paint on an old wall. Success was achieved with two techniques. Applying TS 4 to fired underglazed surfaces (cone 06) worked well. Also, I painted gum tragacanth over underglazed greenware, then applied TS 4. In some cases I also primed the greenware with gum before underglazing it. This use of gum caused the terra sigellata to adhere to the raw underglaze. It worked well, giving a slightly different crackle pattern than the first technique. Terra sigellata applied directly over unfired underglaze peeled off at cone 06. It adhered at cone 02, a higher temperature at which the sigellata lost its gloss.

Painting underglazes over fired (cone 06) or unfired TS 8 did not work well. Severe peeling and chipping was a problem.

Coloring Terra Sigellatas

I made extensive use of colored terra sigellata in my MFA studio work. I achieved this color in a variety of ways. Using a plastic ice cube tray as a palette, I mixed Duncan EZ Stroke underglaze colors with TS 8 as I worked on a piece. I used TS 8 because I bisqued my fragile, complex pieces before applying color. This tinted terra sigellata took a good burnish when rubbed with a chamois or a finger.

In addition, I ball milled stains, carbonates, and oxides with TS 8 for 12 to 24 hours. This was done after the first ball milling and decanting. Quite a bit of colorant was needed to get a strong color, possible due to the opacity of terra sigellata. Chrome oxide and cobalt carbonate worked well, as did glaze stains. Some colorants seemed to affect the burnish more than others. Cobalt seemed to dull the burnish somewhat. The more colorant was added, the more difficult the slip was to burnish. All the colored sigellatas achieved some degree of burnish. I had no problems with pigment settling out.

Approximately 15% cobalt carbonate (in proportion to dry weight of clay) gave a strong, slightly grayed blue.

Approximately 25% chrome oxide gave a strong green.

Fifteen percent to 25% additions of glaze stains gave medium to light colors.

DEVELOPING A PALETTE OF COLOR IN EGYPTIAN PASTE

Introduction

Egyptian paste is a self glazing ceramic body which is thought to be one of the earliest forms of glazed siliceous ware, used in

Egypt as early as 2700 B.C.⁸ Extensive research and speculation has been done on ancient glazing techniques, which have been thought to include the application of glaze to carved steatite, as well as the formation of objects from powdered quartz fluxed with sodium salts. In 1932 Charles Binns rediscovered the idea of a self-glazing body in his study of ancient Egyptian wares, and ran successful test using water soluble soda salts, which "effloresce" or wick out to the surface of a body.⁹ This alkaline layer fluxed the silica at the surface, forming a glaze.

While controversy may exist about the earliest date and exact composition of original Egyptian paste, its basic principle is established, and can be explored with many possibilities for color and surface texture.

Egyptian paste seemed an appropriate medium for the technique of joining small clay shapes with wire. It can be press molded into the leaf shapes I use in my work, as well as extruded and modelled. Its self-glazing property appeared especially advantageous for intricate, multicolored pieces consisting of small joined shapes.

I tested twelve Egyptian paste formulas for texture and surface quality, selecting for a smooth gloss surface at cone 06. To develop a usable set of colors, I added oxides, carbonates, and underglaze stains to these formulas. Sources of stains used were Standard Ceramic Supply, Pittsburgh, Pennsylvania, and Robbins Clay Company, Chicago, Illinois. From these samples I chose one Egyptian paste for final color testing, EP 12. Oxides, carbonates, and Standard Ceramic Supply underglaze stains were the colorants I used with EP 12 to develop a palette.

Following are the 12 Egyptian paste formulas I tested. Formulas 1 and 4 are based on the formula given by Daniel Rhodes in Clay and Glazes for the Artist Potter. The Potter's Complete Book of Clay and Glaze by James Chappel is the source of formulas 2, 3, and 5.¹¹ I based EP 6 and EP 7 on the article "Egyptian Paste" by Dick Studley in Ceramics Monthly, October, 1982.¹² Modifications of formula 4 resulted in formulas 8, 9, 10, 11 and 12.

	<u>EP 1</u>	<u>EP 2</u>	<u>EP 3</u>	<u>EP 4</u>	<u>EP 5</u>	<u>EP 6</u>
Borax		4			3	
Sodium Bicarbonate	8	4	4.5	6		1
Soda Ash	8	4	4.5	6	4	1
Ferro Frit 3134					20	5
Ferro Frit 3419						
Custer Feldspar						
Kona F 4 Feldspar		9	32.5	38		15
Nepheline Syenite	38				20	
Whiting	5		3.5	5		4
Dolomite						4
OM 4 Ball Clay	5	16	10.5	5	25	25
EPK Kaolin	14	38	22	14		
Flint	16	19	17	19	20	40
Mullite, sieved 40 mesh						2
Bentonite					3	2
Macaloid						2
Silica sand, 70 mesh		6	5.5	7	5	
Ione Grain	6					

	<u>EP 7</u>	<u>EP 8</u>	<u>EP 9</u>	<u>EP 10</u>	<u>EP 11</u>	<u>EP 12</u>
Borax						
Sodium Bicarbonate	1	4	2		4	4
Soda Ash	2	4	2	8	4	4
Ferro Frit 3134						
Ferro Frit 3419	4	4	8	4	4	8
Custer Feldspar	15	34	34	34	34	32
Kona F 4 Feldspar						
Nepheline Syenite						
Whiting	4	5	5	5	5	5
Dolomite	4					
OM 4 Ball Clay	25	11	11	11	22	10
EPK Kaolin		11	11	11		10
Flint	40	19	19	19	19	19
Mullite, sieved 40 mesh	2					
Bentonite	2	1	1	1	1	1
Macaloid	1	1	1	1	1	1
Silica sand, 70 mesh		6	6	6	6	6
Ione Grain						

All of the above formulas are made up of parts per hundred, or percentages.

I did several series of tests. Formula 12, an Egyptian paste containing soda ash, sodium bicarbonate, and a lead frit as low-fire fluxes, was my final choice for developing a palette. With oxides, carbonates, and Standard stains I obtained a fairly complete range of

reds, yellows, greens, blues, and purples. The reds and oranges I achieved were soft shades, obtained with chrome, tin, and vanadium. To get bright reds and oranges, further testing would need to be done with cadmium selenium stains.

In addition to the basic palette, I found some very interesting metallic effects in various formulas with copper and manganese pigments. There were also interesting surfaces in different Egyptian paste formulas, in addition to the high gloss EP 12 I chose for the palette.

Test Series #1

<u>Test</u>	<u>Pigment</u>	<u>Cone 08</u> <u>Color & Texture</u>	<u>Cone 06</u> <u>Color & Texture</u>	<u>Cone 04</u> <u>Color & Texture</u>
1 A	Vanadium Pentox. 2%	greenish white dry, rough	greenish white dull gloss	greenish white gloss, bloated
1 B	Vanadium Pentox. 5%	chalky white dry, rough	greenish white dry, rough	greenish white dull gloss
1 C	Red Iron Oxide 5%	salmon to gold dull gloss	salmon to gold gloss	salmon to gold gloss, bloated
1 D	Cobalt Carb. .4%	bright blue dull gloss	bright blue gloss	bright blue gloss, bloated
1 E	Cobalt Carb. 1%	deep blue dull gloss	deep blue gloss	deep blue gloss, bloated
1 F	Copper Carb. 2%	turquoise dull gloss	turquoise gloss	turquoise gloss, bloated
1 G	Copper Carb. 5%	dk. turquoise dull gloss	dk. turquoise gloss	dk. turquoise gloss, bloated
1 H	Manganese Diox. 3%	deep purple dull gloss	deep purple gloss	deep purple gloss, bloated

This formula used Ione Grain grog, which gave a rough texture. Sharp, coarse grains were visible in the surface as white specks. In

later tests, I replaced the grog with 70 mesh silica sand, a fine white sand.

Cobalt and copper yielded the best colors. Manganese dioxide gave a very intense, almost black purple. It could be used in a smaller proportion.

Vanadium pentoxide did not give yellow as I expected. It yielded whitish green chalky surfaces.

Test Series #2

I tested five different Egyptian paste formulas with 2% copper carbonate to check surface texture and color response. In this test, I substituted silica sand for the Ione Grain grog in EP 1, resulting in a much smoother gloss.

<u>EP</u>	<u>Color</u>	<u>Texture</u>	<u>Firing Temp.</u>
1	turquoise	gloss	cone 06
2	green to black	pitted matt	cone 06
3	turquoise to black	satin matt	cone 06
4	turquoise	gloss	cone 06
5	greenish turquoise	gloss	cone 010

Formula 4 had a smaller percentage of soda ash and sodium bicarbonate than formula 1, but was otherwise identical. Comparing the two, EP 1 appeared to have a thicker gloss than EP 4. Formula 2 gave an interesting textured surface and color, and EP 3 gave a beautiful satin matt.

Note: After doing this test, I stored a sample of EP 4 containing 2% copper for several weeks in a plastic bag. Over this

period of time, the batch, which remained moist, appeared to separate into pigmented crystals and unpigmented paste. Remixing did not totally homogenize it. I fired a sample to cone 06, and got a gloss white surface with irregular turquoise speckles.

Note: I raku'd and heavily smoked a pre-fired sample of EP 4 containing 2% copper. The glossy turquoise changed to bright metallic copper. The copper began to reoxidize in a few days, developing green spots. I sprayed it with fixative, which seemed to stop or slow the reoxidation process.

Test Series #3

To explore the potential of additional glaze stains and oxides, I made up some uncolored tests using EP formula 1. I then brushed thick and thin layers of colorant on the wet surfaces of the paste. This procedure was intended to roughly indicate how the colorants would interact with the paste.

Results at Cone 06

<u>Colorant</u>	<u>Thick Application Color & Texture</u>	<u>Thin Application Color & Texture</u>
Robbins Vanadium Yellow 6404	mustard yellow dry	sparse yellow smooth, dry
Robbins Purple 6385	blue smooth, dry	blotchy blue smooth, dry
Robbins Lavender 6319	blue purple crusty, dry	blue lavender smooth, dry
Robbins Orange 6121	salmon crusty, dry	yellow orange smooth, dry
Robbins Black 6650	yellow to black dry	bright yellow dry, smooth
Red Iron Oxide	yellow brown traces light gloss	yellow traces light gloss

These stains were obtained from the Robbins Clay Company, UPS Zone 2, 1021 West Lill, Chicago, Illinois, 60614.

The stains appeared to require more flux to give the gloss surface I was seeking in an Egyptian paste, although they gave some interesting dry effects. The iron oxide gave traces of beautiful transparent color, but appeared insufficiently concentrated.

Test Series #4

I tested formula 3 (matt) and formula 4 (gloss) with ten different colorants and combinations of colorants to obtain yellows, greens, blues, and purples. I used commonly available oxides and carbonates, and underglaze stains purchased from Standard Ceramic Supply Co., P.O. Box 4435, Pittsburgh, Pennsylvania, 15205. Tests were fired at cone 06.

<u>Colorant</u>	<u>EP 3 Color & Texture</u>	<u>EP 4 Color & Texture</u>
Stain K-20, 8% (Vanadium)	bright yellow slight gloss	bright yellow gloss
Stain E-2, 4% (Zr-Pr)	light yellow satin gloss	light yellow gloss
Chrome Oxide, 4%	chartreuse dry smooth matt	chartreuse frosty matt*
Stain E-31-A, 4% (Zr-V-Si)	light green satin gloss	light green gloss
Copper Carb., 3% Stain K-20, 8%	silver green satin matt*	bright green gloss
Stain E-23, 4% (Co-Cr-Fe-Al-Si)	bright green dry matt	dark green dry shiny matt
Cobalt Carb., .5% Manganese Diox., 1%	purple silver metallic matt*	purple black metallic gloss*

<u>Colorant</u>	<u>EP 3</u> <u>Color & Texture</u>	<u>EP 4</u> <u>Color & Texture</u>
Cobalt Carb., .5% Copper Carb., 1%	turquoise to dk. blue satin matt*	bright royal blue gloss
Stain E-39, 2% (Co-Zn-Al)	light blue smooth matt	medium blue gloss
Copper Carb., 2%	turquoise to black satin matt*	turquoise gloss

All test gave usable results. I marked several with asterisks because these were interesting effects not reproduced in the final gloss palette. The metallic and bicolor effects were especially striking.

Test Series #5

EP 6 and EP 7 were based on formula guidelines in Dick Studley's article "Egyptian Pastes" in Ceramics Monthly, October, 1982. Thirteen tests were fired to cone 03.

<u>Colorant</u>	<u>EP 6</u> <u>Color & Texture</u>	<u>EP 7</u> <u>Color & Texture</u>
Stain K-20, 8% (Vanadium)	yellow dry	bright yellow slight gloss
Stain E-2, 4% (Zr-Pr)	light yellow dry	light yellow dry, glossy edges
Chrome Oxide, 4%	deep warm green dry	medium warm green dry, gloss
Stain 31-A, 4% (Zr-V-Si)	pale green dry	pale green dry, gloss edges
Copper Carb., 3% Stain K-20, 8%	olive brown dry, gloss edges	
Stain E-23, 4% (Co-Cr-Fe-Al-Si)	dark green dry	dark green dry, gloss edges

<u>Colorant</u>	<u>EP 6</u> <u>Color & Texture</u>	<u>EP 7</u> <u>Color & Texture</u>
Cobalt Carb., .5% Manganese Diox., 1%	purple black dry	purple black dry, gloss edges
Cobalt Carb., .5% Copper Carb., 1%	green black dry, gloss edges	metallic black* smooth sheen
Stain E-39, 2% (Co-Zn-Al)	light blue dry	light blue dry, gloss edges
Copper Carb., 2%	olive green dry, gloss edges	metallic black green* smooth sheen
Stain E-83, 4% (Co-Cr-Fe)		black gray dry, gloss edges
Red Iron Oxide, 2%		dull brown matt, gloss edges
Stain E-59, 4% (Cr-Fe-Zn-al)		red brown dry, gloss edges
Stain E-78, 4% (Co-Al-Cr-Sn)		light purple dry, gloss edges
Stain E-66, 4% (Cr-Sn-Fe-Zn-Al)		pale pink dry, gloss edges
Stain E-80, 4% (Co-Al-Cr-Sn)		red purple slight gloss
Stain E-73, 4% (Cr-Sn)		medium pink dry, gloss edges
Stain E-69, 4% (Cr-Sn)		medium pink dry, gloss edges

Notes: Test series #5 resulted almost entirely in rough, dry surfaces. This could be a desirable effect for some kinds of work, but I was looking for sensuously pleasing surfaces, particularly glossy smoothness.

EP 6 and EP 7 were underfluxed at cone 03, containing seven percent low fire flux to 40 percent silica. The formulas could be fired higher, or adjusted for better melt at a lower cone.

Copper seemed to act as a flux in these Egyptian pastes. Tests with copper were glossier than those without it. Two samples, marked with asterisks, were beautiful metallic satin matts. Both contained copper.

Studley suggests that plasticizers, such as the bentonite and macaloid in formulas 6 and 7, may inhibit glaze formation. However, formulas 8 through 12 contained comparable percentages of these materials, and all matured to a gloss at cone 06. In comparison to EP 6 EP 7, these five formulas contained proportionately more low fire flux and less flint or silica.

Test Series #6

I chose formulas 9 and 12 for color testing because of their good gloss at cone 06, and their high proportion of lead bearing frit 3419, which I expected to enhance red and purple colors.

Formulas 8, 9, 10, 11, and 12 were based on formulas 1 and 4. To maximize color response to stains, I used a potash feldspar, Custer, and added Ferro lead frit 3419 as part of the low fire flux as suggested by Dick Studley¹⁴ I varied the proportions of soda ash, sodium bicarbonate, and frit. In addition, I substituted OM 4 for EPK in EP 11, and found that using only ball clay in the plastic portion of the formula gave satisfactory workability and color. One percent each of bentonite and macaloid were included as plasticizers.

In preliminary tests without colorant, all five formulas gave good gloss at cone 06. EP 12 had the thickest gloss.

<u>Colorant</u>	EP 9	EP 12
	<u>Color & Texture</u>	<u>Color & Texture</u>
Stain E-78, 4% (Co-Al-Cr-Sn)	medium blue violet light gloss	deep purple blue thick gloss
Stain E-80, 4% (Co-Al-Cr-Sn)	light red purple light gloss	medium purple thick gloss
Stain E-69, 4% (Cr-Sn)	dark pink light gloss	salmon thick gloss
Stain E-73, 4% (Cr-Sn)	dark pink light gloss	dark pink to red thick gloss

Notes: Test series #6 provided comparison of the color response of soda and lead fluxes. EP 12 had a higher ratio of soda to lead than does EP 9. EP 12 yielded bluer purples and yellower reds and pinks than EP 9. Colors in EP 12 were deeper and richer than those in EP 9. The total batch proportion of low fire fluxes (including both lead and soda fluxes) is larger in EP 12 (16%) than in EP 9 (12%). This difference seems more likely to affect color intensity than hue (blue or yellow tinging), which seems clearly affected by the lead/soda ratio.

After examining results of test series #6, I decided to use EP 12 as basis for a palette because of its rich color response and high gloss. I studied series #4, #5 and #6 to determine colorant additions, varying proportions and combining pigments. Series #7 was fired to cone 06.

Test Series #7

<u>Colorant</u>	<u>Result</u>	<u>Colorant</u>	<u>Result</u>
Red Iron Oxide 2%	light brown	Stain E-66 4%	medium coral
Chrome Oxide 4%	chartreuse*	Stain E-83 8%	jet black
Copper Carb. 2%	dk. turquoise	Stain E-31-A 4%	light green
Stain K-20, 8%	green to	Stain K-20 8%	rich yellow
Copper Carb., 3%	silver black*		
Mang. Diox., 1%	warm purple	Stain K-20, 8%	golden orange
		Stain E-73, 4%	
Cobalt Carb., .5%	deep blue purple	Stain K-20, 4%	orange
Mang. Diox., 1%		Stain E-73, 2%	
Cobalt Carb., .5%	blue purple	Stain K-20, 6%	salmon
Mang. Diox., .5%		Stain E-73, 6%	
Cobalt Carb., .25%	blue lavender	Stain K-20, 4%	red orange
Mang. Diox., .5%		Stain E-73, 8%	
Cobalt Carb., .1%	light blue	Stain E-73, 16%	soft red
Cobalt Carb., .5%	bright blue	Stain E-73, 8%	deep rose
Cobalt Carb., .5%	turquoise to	Stain E-69, 16%	deep maroon
Copper Carb., 2%	dk. blue, silver*		yellow tint
Cobalt Carb., .25%	turquoise to	Stain E-69, 8%	deep pink
Copper Carb., 2%	blue, silver*		yellow tint

This test series resulted in a full range of colors, from reds, yellows, and oranges to greens, blues, and purples. A good black, and interesting metallic blues and greens were also obtained. Reds and oranges were soft shades achieved with chrome, tin and vanadium stains. Brilliant reds and oranges require cadmium-selenium stains, which would need to be tested for compatibility with this EP formula.

This palette has further potential for variations of color value and hue through combining colorants and adjusting colorant propor-

tions. It could be supplemented with colors from other tests and formulas. Standard stains E-2 (Zr-Pr) and E-23 (Co-Cr-Fe-Al-Si) could be used to provide a dark green and a cool yellow.

All tests appeared to mature well at cone 06, with the exception of those marked with asterisks, which began to effloresce within a few weeks of firing. Three of these contained copper, and one contained chrome. Throughout all my tests with Egyptian paste, I have observed one previous occurrence of efflorescence, which is the formation of powdery white areas on the glazed surface. This happened in test series 1, with samples colored with cobalt and copper carbonates, and fired to cone 08. Refiring these tests to cone 06 restored the glazed surface and eliminated further efflorescence.

Figure 22. Test Samples.

Above is a palette based on Egyptian paste formula #12, including results from test series #6 and #7. Formula #12 contained both lead and sodium as low-fire fluxes. Oxides, carbonates, and underglaze stains from Standard Ceramics Supply were used as colorants. Tests were oxidation fired to cone 06 in an electric kiln.

END NOTES

1. Susan Peterson, "Comment: Scholarship and Language in Modern Craft," Ceramics Monthly 29:6 (1981): pp. 29-30.
2. Ibid., pp. 29-30.
3. Jeanne McDermott, "Geometrical Forms Known as Fractals Find Sense in Chaos," Smithsonian 14:9 (1983): p. 112.
4. Carl Nordenfalk, Celtic and Anglo-Saxon Painting (New York: Braziller, 1977) p. 18.
5. Lucy L. Lippard, Overlay: Contemporary Art and the Art of Prehistory (New York: Pantheon, 1983) p. 10.
6. Daniel Rhodes, Clay and Glazes for the Potter (New York: Chilton, 1971) p. 200.
7. Ibid., p. 144.
8. Janna Longacre, "The Siliceous Wares of Ancient Egypt," Diss. (Rhode Island School of Design, 1973) p. 9.
9. Ibid., p. 7.
10. Ghodes, op. cit., p. 191.
11. James Chappel, The Potter's Complete Book of Clay and Glaze (New York: Watson-Guptill, 1977) p. 38-75.
12. Dick Studley, "Egyptian Paste," Ceramics Monthly 30:8 (1982) p. 47.
13. Ibid., p. 47.
14. Ibid., p. 47.

BIBLIOGRAPHY

Chappel, James. The Potter's Complete Book of Clay and Glazes. New York: Watson-Guptill, 1977.

Lippard, Lucy L. Overlay: Contemporary Art and the Art of Pre-history. New York: Pantheon, 1983.

Longacre, Janna. "The Siliceous Wares of Ancient Egypt." Diss. Rhode Island School of Design, 1973.

McDermott, Jeanne. "Geometrical Forms Known as Fractals Find Sense in Chaos." Smithsonian 14:9 (1983) 110-116.

Nordenfalk, Carl. Celtic and Anglo-Saxon Painting. New York: Braziller, 1977.

Peterson, Susan. "Comment: Scholarship and Language in Modern Craft." Ceramics Monthly 29.6 (1981) 29-30.

Rhodes, Daniel. Clay and Glazes for the Potter. New York: Chilton, 1971.

Studley Dick. "Egyptian Paste." Ceramics Monthly 30.8 (1982) 47-49.