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Graphic Image and Ceramic Form

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GRAPHIC IMAGE AND CERAMIC FORM

by

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It is the purpose of this thesis to investigate the combining of graphic image and three-dimensional form. I became interested in this problem when I first saw the work of Ron Engle who had silkscreened photographic images of famous people on cylindrical pots. I recognized this as a respectable technical accomplishment but felt that there was a great deal more that could be done with this idea of pictures and pots. It seemed that the artist was not taking full advantage of the forms he was using and that the images would be more expressive if the form was carefully manipulated to work with the image. At this time I had been working in the area of contained forms that demonstrated a co-function of the interior and exterior form. I felt that this was a good beginning toward the problems that would be found in the combining of the image with the form.

For some time I had also been interested in the use of ceramic decals. I had found that the use of commercially prepared decals was very limiting as the choice of images was restricted to decorative designs and motifs of a very popular type. I felt that this type of decoration would lend itself to a pop-art style of work but this was already being done by a number of people who seemed to be handling it in a satisfactory manner.

Thus previous experiences seemed to have set the direction for the move toward the combining of image and form.

PHOTOGRAPHY

The type of work I expected to become engaged in required that I know something about the processes of photography. I enrolled in a photographic workshop during the summer and proceeded to learn all I could about the production of a photographic image.

I was most concerned with learning how to combine a realistic, photographic image with form rather than a more painterly type of decoration. The best process for the transfer of this kind of image to the ceramic ware appeared to be photo-silkscreen printing. The photo-silkscreen process allows the image used to be crisp and to a certain extent, detailed and easily recognizable.

I quickly discovered that a good negative usually resulted in a good silkscreen. The negative that is too thin, ie., underexposed and with a light, thin appearance, presents problems in transferring the image to the kodalith. This is also true of an over-exposed negative. As my ability to judge shutter speed and F-stop combinations accurately is limited, I made use of the poly-contrast papers and filtering systems to allow for variance in the quality of the negatives.

Either a black and white negative or a color transparency may be used for the original image. Since anything which can be photographed will produce an image, the range of subjects for the imagery is unlimited. Looking through my file of negatives, I selected what I thought at that time would be the most useful images.

SILKSCREEN PRODUCTION

The first process I used, transferred the image from the negative directly to the high-contrast orthofilm or kodalith. I used Dupont graphics arts film (CronarOrtho-S-Litho). The negative was then placed in the film carrier of the enlarger, the lens set and focused. The size of the image having been determined, the ortho film was placed in an easle and exposed from 10 to 40 seconds, depending on the density of the negative. The ortho film was then developed in a strictly controlled routine to ensure accurate production of other kodaliths.

KODAK A AND B KODALITH DEVELOPER.....1 minute 30 seconds
ACETIC ACID 28% WITH WATER 1/9 SOLUTION.....30 seconds
KODAK HYPO (FIX).....3 minutes
WATER RINSE.....20 minutes
KODAK FOTO-FLO (ELECTROLITE).....2-3 seconds
WATER RINSE UNDER RUNNING WATER.....5 seconds
DRY 100°F-MOVING AIR.....5-10 minutes

This process produces a positive image on the ortho film. The film is a light sensitive emulsion on a plastic backing. The image on the film consists of black and clear areas, unlike the usual print with paper backing which produces an image with black and white areas.[1] If a negative kodalith is needed the kodalith (dried) is contact printed with a new sheet of ortho film. This is developed in the same manner as the original.

The second process I used required a series of high-contrast, black-and-white prints. In most cases I used poly-contrast paper and #3, #3½ and #4 filters which produced more contrasty prints. In this case I used a Saunders easle which enabled me to print four or six exposures on one full-sized sheet of 8 x 10 paper. After the size and focus of the image were determined, a test strip of different exposures

was made. From this strip the proper exposure time was chosen and the final exposures completed. The print was then developed in the following manner:

KODAK D-72 DEVELOPER.....2 minutes
ACETIC ACID 28% WITH WATER-1/28 RATIO.....30 seconds
KODAK HYPO (FIX).....5 minutes
WATER RINSE.....20 minutes
KODAK HYPO-CLEAR.....10 seconds
WATER BATH TANK UPPER.....20 minutes
LOWER.....10 minutes
DRYER.....

The resulting prints were then cut and pasted to either a white or black background sheet of paper. The white and black areas were touched up with the corresponding inks to blot out unwanted areas and details.[2] The paste-up was then placed in a ROBERTS COPY CAMERA (Media Center: Communication Design Studio) and an ortho film exposed and developed in the manner described above.

A kodalith was then selected for a silkscreen and placed in a piece of equipment that I found to be very helpful and time-saving: a NU-ARC FLIP TOP. This apparatus combines a vacuum, glass-top chamber and carbon arc lamp. The vacuum chamber and glass top remove all air from between the kodalith and the light sensitive, plastic-backed emulsion that forms the silkscreen as the two are contact printed. In this case I used HI-FI GREEN, by ULANO, although the HI-FI RED was also available. The HI-FI GREEN is a water soluble emulsion with little resistance to hot water until it is exposed to light. I used the green because it was readily available and less expensive than the other types of emulsion. I found that with care and gentle handling the emulsion would last long enough for my purpose. By the time the

screen began to wear thin I was usually ready to go on to another image. In most cases the HI-FI GREEN was exposed by the carbon arc for three minutes. The emulsion can be exposed by a 3200 kelvin lamp but the time averages about 18 minutes or 45 minutes in sun light. For me the use of the arc lamp reduced the time greatly and the vacuum system eliminated the problem of air bubbles obscuring the image.

The emulsion is light sensitive, as is the developing solution, and must be used under amber, safelight conditions. The emulsion is developed in HI-FI DEVELOPER manufactured by ULANO. Like the kodalith developer, the HI-FI developer rapidly decomposes. It comes in A and B parts and must be mixed just before use. The formula for the developer is:

5 TABLESPOONS A DEVELOPER
5 TABLESPOONS B DEVELOPER
16 OUNCES OF VERY COLD WATER
AGITATE UNTIL DEVELOPER DISSOLVES

The exposed HI-FI GREEN is then immersed in the developer and agitated for 90 seconds. At this time the emulsion is removed and washed with a stream of water at 90^0-95^0F. The emulsion adheres to the plastic backing, i.e., has become more resistant to water, where the kodalith had allowed light to strike the HI-FI GREEN. When the water has washed the emulsion clear of all the areas that were dark in the kodalith, the HI-FI GREEN is laid on newspaper and a screen that has been previously stretched on a frame is laid over it. With more paper on the screen the emulsion, still rather soft and wet, is pressed into the screen. The screen is dried for about a half hour and the plastic backing from the HI-FI GREEN carefully pulled away. This leaves the screen blocked in some areas and left clear in others. [3]

PRINTING ON WET CLAY

The first experiments were done with a sample screen used by graphic design students. This screen was of the conventional type that is used when printing with inks on paper. I feared that the particle size of the ceramic stain used would not be fine enough to go through the screen. The stain consisted of:

ALBANY SLIP.....50 grams
RUTILE.....50 grams
RED IRON OXIDE..... 4%
MANGANESE DIOXIDE..... 2%
NICKLE OXIDE..... 2%

and produced a green/brown color upon firing.

This stain was first squeezed through the screen onto wet slabs of clay. These were then formed into box-like containers. In the second experiment I attempted to screen the slip onto the flat surfaces of already constructed and dried but unfired pieces. This experiment was not as successful. The dry clay appeared to pull the water through the screen and from between the particles of the stain. This left partially dried stain between the fibers of the screen and only water on the form. I then concluded that silkscreening could be done most successfully on damp clay. The stain, if allowed to stand on the clay before handling, adhered to the clay without any problems and became sufficiently durable to allow the clay to be handled in the process of carefully forming the pieces.

The next step was to produce a screen with an image of my own choice. This was done in the manner described above and in this case I used organdy for the screen rather than the finer meshed silk. What followed was a series of experiments dealing with strength of solution, thickness of mixture and type of stain used.

WAX PRINTING

One technique of getting an image onto the clay was taken from the ancient method of making Egyptian paste beads. A soluble salt was mixed into the clay and then printed with a wax-like solution instead of a stain or glaze. As the piece dried, the water migrated to the surface for evaporation and carried the soluble salt in solution. Where the surface of the clay was sealed with the wax, the water was unable to evaporate and was forced to migrate to another area, thus leaving the areas of wax without the sulphate that colored the clay. The piece was then bisque fired and glazed with a transparent or semi-transparent glaze. This produced a white image on a darker background, the color of which could be determined by the particular type of soluble salt used.

COBALT SULPHATE.....BLUE
IRON SULPHATE.....YELLOW/BROWN
CHROMIUM SULPHATE.....GREEN
MANGANESE SULPHATE.....BROWN

The advantage of this method of attaining an image was that the movement of the glaze on the surface of the pot during the firing did not disturb the image.

One of the disadvantages of this technique was the lack of feed-back while the work was in progress; the image did not appear until the piece was completed and fired. Thus the whole concept of the piece had to be in the mind and did not allow for intuitive changes in progress. Because of the length of time between the making of the piece and the fired finish, there was difficulty going on to the next step with a sense of continuity.

Another aspect that had to be worked out was the proportion of sulphate to the amount of clay. The first experiments were only mildly successful because the amount of sulphate in the following formula was incorrect:

20 GRAMS COBALT SULPHATE TO 100cc WATER TO 10 LBS. CLAY

The result of this mixture was a residue of cobalt under the wax, thus giving very little contrast between the clear areas and the waxed areas. By decreasing the amount of sulphate to one half the original quantity and incidentally the water, the residue of cobalt left in the areas of wax was minimized and the contrast increased.[4] The formula then consisted of:

10 GRAMS COBALT SULPHATE TO 50cc WATER TO 10 LBS. CLAY

It was necessary to obtain a thorough mix of the soluble salt with the clay for an even coloration. The clay was mixed in large batches of 100 to 300 pounds at one time and divided into the 10 pound batches for making the pieces. As the batches of clay were rather small it was not practical to mix each batch from the dry clay. The solution of sulphate and water was then mixed into the clay. The more water added to the clay with the sulphate the softer and wetter the clay mixture. This required that the clay be set aside and allowed to stiffen slightly in order to be of the proper consistency for building the pieces.

The consistency of the wax used was also important. I found that the comercially produced wax-resist was too thick to squeegee easily through the screen. Too much water added to the wax created a mixture that did not properly seal the surface of the clay allowing the sulphate to migrate to the surface. The final, successful mixture was eight parts wax to one part water. This seemed to go through the screen well and

still seal the surface of the clay.

MANUFACTURING DECALS

The production of ceramic decals presented more serious and complex problems than any other method of placing an image on a pot. Once the problem of making the silkscreen was solved, I talked with a representative of RUBY DECAL OF ROCHESTER. Ceramic decal was not a part of their production stock, but they were kind enough to give me a number of sheets of simplex decal paper to test. The paper is coated with a water soluble emulsion, the design being printed on this emulsion. The decal is then immersed in water and when the emulsion sufficiently softens, the decal print is slid from the paper and adhered to the desired object. In the making of ceramic decals I discovered that water soluble glazes and stains were not suitable. I also found a design with open areas did not make a decal that was able to hold together in one continuous piece while the decal was removed from the paper to the pot. Thus it was necessary to cover the decal with varnish. Even after the printed glaze was covered with a coat of NAZDAR DECAL VARNISH the paper and emulsion still allowed the water to reach the water base glaze and destroy the image. I then mixed the glaze with NAZDAR SQUEEGEE OIL which dried to a varnish-like surface. This solved the problem of the water damage but created others.

The varnish proved to be too stiff and brittle, not allowing the decal to be placed on the surface of a pot unless the surface intended for the design was very flat. Given flat surfaces, it would have been easier to print directly onto the clay and avoid the difficulties of decaling. Therefore I attempted to use a mixture of varnish and rubber

cement: the varnish added strength and the cement gave a degree of flexibility to the decal. The first decals done in this manner were unsuccessful because the cover-coat was applied too thinly to give the decal enough strength to be slid off the paper. I found, though, that I could reverse the decal and set it upside-down on the pot, peeling the paper away. This seemed to be the solution until I fired the test pieces and found that the cover-coat was now between the pot and the printed glaze and curled in the process of burning out. This caused the glaze to pull up into bubbles much like those which occur on a piece when grease or oil has gotten under the glaze before firing.[5] I then trippled the thickness of the cover-coat and fired another test series. In this case the cover-coat was thick and strong enough to allow the decal to slide off the paper in the usual manner and onto the pot. But this was too thick for firing and in melting, dripped and slid down the pot, pulling the glaze with it and thus distorting the image. I reduced the thickness of the combination cover-coat, used two applications and fired another batch. The results of this test showed that the coat seemed to boil and spatter off the surface of the piece. It was at this time that I decided that although these problems could be eliminated with enough research and experimentation, the intent and time of this thesis did not allow for continued investigation in this single direction.

PRINTING ON URETHANE FOAM

The greatest problem of printing a graphic image on a three dimensional form still remained to be solved: all the most successful methods worked on flat or nearly flat surfaces. I then tried printing

with stains onto the plastic material which is used in the shop to cover wet forms. The image printed easily and remained on the surface of the plastic in a very wet state. I took a recently formed piece and rolled it on the plastic. The clay picked up the stain and absorbed part of it. By setting the piece aside to stiffen, I found that I could later do more to alter the form. Because the plastic was on the surface of a table the original form rolled on the plastic had to be rather smooth-sided and round. This was a step in the desired direction in that it allowed me to get an image all around a form with no really flat sides.

The next step happened almost by accident in what now seems to be a rather logical progression. I placed the plastic on a towel to allow for even more roundness of the form. This was better but not quite good enough. The next printing was on the plastic cover of a foam pad. The plastic did not stretch around the form; instead it wrinkled. If the foam worked and the plastic did not, it seemed reasonable to do away with the plastic and use only the foam. I found a fine grained urethane foam and printed on that. With the proper consistency the glaze and stain went through the screen and into the foam without any excessive amount of bleeding or blurring. Forms were then rolled on the foam, in some cases pulling and folding the foam around the forms. If done with care so as not to blur the image as the foam released from the surface, it gave a clear and consistent image for a number of printings.[6] The critical consideration here was the amount of stain or colorant in the foam. Although there seemed to be a great deal of material in the foam, the amount that did get onto the surface of the piece was less than was expected and less than it first appeared. Even though the colorant

was in the clay and the glaze was perfectly clear, insufficient colorant would not produce a strong image. A super-saturated solution was the answer to this problem.

If the solution of soluble salt was made only with water, the image produced with the urethane foam was blurred and almost unidentifiable. I found that a solution of GUM TRAGACANTH produced a thick jelly-like substance that could be thinned with water to the desired consistency. The gum came as a natural product looking like dried apples and when soaked in water became even more like cooked apples. When this was done and the resulting product strained, the jelly-like material was smooth and easily diluted with water. All the soluble salts, with the exception of iron sulphate, mixed easily with this gum. For some reason that we were unable to ascertain from any of the literature available to us, iron sulphate caused both GUM TRAGACANTH and GUM ARABIC to coagulate. This was true when the gum was added to the already disolved sulphate and when the water was added to the mixture of gum and dry sulphate. Other products used as binders were syrup, sugar solutions, honey and corn syrup. These worked well if the glaze was made in small batches and used quickly or if refrigeration was available, for these products, like the GUM TRAGACANTH do ferment.

CLAY BODIES

In the first year of this study I was still affected by the type of work in which I had been previously involved. I had worked only in the cone 9 reduction atmosphere with a little work later in some low-fire commercial glazes and commercial lusters. I quickly found that cone 9 required very strict adherence to careful construction

methods. Although I was concerned with the construction of the pieces, it was not my most pressing concern. I was not willing to sacrifice the time and damage losses of the cone 9 temperatures on these pieces. I found that the greater time required for the construction of the assembled pieces made them more precious to me. For this reason I turned to the lower cone 5 temperatures.

The very early pieces were mainly thrown on the wheel. For this I used a throwing clay that was familiar to me and had a range of about five cones in temperature: c5 to c10.

THROWING BODY:
KENTUCKY SPECIAL BALL CLAY.....30 lbs.
XX SAGGAR CLAY.....30
A P GREEN FIRE CLAY.....30
REDART CLAY (CEDAR HEIGHTS).....10

When the pieces became more massive and were primarily hand-built, I had to find a clay that was more open and would take the greater thickness. For this I combined the throwing clay with a well aged batch of coarse RAKU clay.

HAND-BUILDING BODY:
½ THROWING CLAY (ABOVE)
½ RAKU CLAY:
AP GREEN FIRE CLAY.....30 lbs.
STONEWARE CLAY.....20
REDART CLAY (CEDAR HEIGHTS.....30
GROG.....20

This produced a clay body that was both open and slightly plastic. It could be thrown for any assembly parts that required this particular method of fabrication and yet would stand the strains of hand-building.

The color of the fired clay depended on the atmosphere of the fire. In an oxidizing fire the body was a very light buff color. This kept any image from being obscured while maintaining a light color under

a transparent glaze and thus giving a high contrast with the image. In a reducing fire the body turned a dark toast brown. With an opaque glaze this gave a very nice warm coloring to the unglazed areas of the piece. In these instances the glaze had to be carefully chosen to keep the characteristic iron spotting from obscuring the image. The only difficulty encountered in the use of this body occurred in the fit of the glaze when some of the pieces were glaze fired at a very low temperature. At cone 06 or 04, crazing developed. I felt that the pieces should be fired to a higher temperature and glost fired for the bright colors. This seemed to solve the problem by maturing the body and thus allowing for a better fit of the bright, low fire glazes.

GLAZES

At this point I felt that the glazes should be of a very simple nature. The first year of this study was involved with the relation between inside and outside. I felt that as a production-oriented potter, I had been concerned with the function of the interior only in terms of use. This concern was limited to attaining an attractive surface and color from which to serve food. This tended to limit my concern for the interior of the non-functional object as well. As I became aware of this, I looked at my work more critically and began a conscious investigation of this aspect. The result was a series of objects that were very quiet and plain on the outside and quite sensuous inside.[7]

The simple and quiet outside remained to a certain extent in the work that followed. White seemed a logical color for the surrounding

areas of the decorated pieces; it did not interfere with the image and created a maximum of contrast for the colored design. The interiors remained important, contrasting with the exterior. Thus the use of the lusters and bright glazes.

As has been stated above, I felt that to fire as high as cone 9 was not only a waste of time but also inappropriate for the type of work I was pursuing. It then became necessary to acquire a stock of cone 5 glazes that I could control and use to my best advantage. The following six basic glazes for this temperature range were used:

"BARBARA'S 3.5" cone 5

FRIT #3191.....29 grams
GERSTLEY BORATE..... 4
DOLOMITE.....10
LITHIUM CARBONATE..... 4
KAOLIN.....16
FLINT.....47

a slightly opalescent glaze that moves slightly during the firing, on vertical surfaces

"BARBARA'S 2.1" cone 5

FRIT #3191.....29.20 grams
KAOLIN.....15.0
FLINT.....11.0
ZINC OXIDE..... 9.0
STRONTIUM CARBONATE..... 6.0

slightly opalescent, matte to transparent with critical temperature variation.

"SAC 20 L" cone 5

FRIT G-23.....83 grams
LITHIUM CARBONATE..... 5
FRIT W-15.....11
KAOLIN.....52
FLINT.....45
TIN OXIDE.....10

apply medium to thin for opaque to transparent

"SATIN MATTE" cone 04-5

WHITE LEAD	1177.5 grams
WHITING	290.4
FELDSPAR	494.7
BALL CLAY	795.3
FLINT	239.1

slightly opaque white

"JOHN'S WHITE"

ELBROOK FELDSPAR	50 grams
SPODUMENE	40
KAOLIN	35
WHITING	20
GERSTLEY BORATE	20
FLINT	20
ZINC OXIDE	15

an opaque, white glaze with smooth surface

"JOHN'S BLACK"

ELBROOK FELDSPAR	25 grams
PETALITE	23
KAOLIN	18
GERSTLEY BORATE	37
FLINT	11
TALC	14
$CuCO_3$	4
$CoCO_3$	8
Fe_2O_3	3

a shiny, opaque black

After the piece was fired with one of the glazes listed above, the decoration was sometimes enhanced or applied over the white glaze with a bright colored low-fire glaze. These were primarily red, blue and yellow. As the pieces were not to be used as eating vessels, I felt no concern in using lead base glazes for the bright decoration.

"SHINY RED" cone 010-7

WHITE LEAD.....40.6 grams
WHITING..... 8.0
KAOLIN..... 7.0
FLINT.....18.0
FRIT #3134.....23.0
TIN OXIDE..... 8.0
RED STAIN GL-41..... 6.0

LOW FIRE COLOR BASE cone 06
(LEAD SAFE)

FRIT #3466.....92 grams
KAOLIN..... 8
TIN OXIDE.....10%
GUM ARABIC..... 1%

LOW FIRE COLOR BASE cone 04

FRIT #3466.....90 grams
KAOLIN.....10
TIN OXIDE.....10%
GUM ARABIC..... 1%

LOW FIRE RED cone 08

THOMPSON RED #1210A.....90 grams
FRIT #G-14 or 3134.....15
WHITING..... 5
BENTONITE..... 3

do not fire with bisque.

for yellow substitute thompson yellow #1310A

#138-0 OPAQUE SHINING GLAZE cone 08-10 OXIDATION

FRIT #G-24.....210 grams
KAOLIN..... 30
LITHARGE..... 16
ZIRCOPAX..... 14
MAGNESIUM ZIRCONIUM SILICATE..... 30

The final process and firing for these pieces often included the application of luster glazes. These are glazes that have a thin film of metallic material on the surface that gives the piece a shiny, lustrous quality. The lusters were unpredictable and difficult to attain. The formation of the thin film was dependent on many factors that were of a critical nature and with any change caused the luster not to form or to be destroyed after formation.

The formulas for these lusters follow:

LUSTER BASE cone 06

SPECIAL FRIT #441.....100 grams

This frit forms a suitable glaze base without additions. It will craze over some bodies and glazes. Because the Ceramic Color and Chemical Company refuses to divulge the ingredients of this frit, the craze is difficult to correct.

COPPER RED

FRIT #441.....100 grams
RED STAIN #3352D..... 7
BISMUTH SUBNITRATE..... 3
CUPRIC NITRATE..... 3

BLUE SILVER

FRIT #441.....100 grams
BLUE STAIN #1513..... 7-10
BISMUTH SUBNITRATE..... 3
SILVER NITRATE..... 1

GOLD

FRIT #441.....100 grams
YELLOW STAIN #3352A..... 7-10
BISMUTH SUBNITRATE..... 3

The process of firing the luster glazes was complex and time consuming. The kiln was loaded and fired to the proper temperature. In this case the temperature was cone 06 or 1830°F.[1] It was important that the firing be as fast as possible, without damaging the ware. An overlong firing caused the stains to be broken down and therefore less intense in color. When the proper firing temperature was reached the kiln was turned off and allowed to cool to 1400°F. At this time the kiln was sealed as tightly as possible. I found that KAOWOOL, a ceramic caulking product by BABCOCK AND WILCOX was most efficient. When the shop ran out of this wool-like fiber I was forced to use clay for caulking the door and found that the shrinking clay left large holes and cracks; thus an insufficient seal. The clay was also difficult to place around the door when the kiln was hot, whereas the KAOWOOL was easier to handle and an all-around better product.

When the kiln had cooled to 1400°F and the door caulked, a fuel was added to the kiln through the spy hole. This caused an oxygen-starved atmosphere that reduced the metallic salt on the surface of the glaze to the metal resulting in a luster. The first fuel I used as a reduction agent was mothballs. When placed in the kiln, the mothballs vaporized, filling the kiln and igniting in an explosive manner, robbing the atmosphere of oxygen. With this initial reduction I needed only to maintain the reduced atmosphere rather than heavily reduce for long periods of time. Through much experimentation I found that the 14" kilns in the shop required six mothballs for the initial reduction and an additional four every fifteen minutes

[1] Glen C. Nelson, Ceramics, a Potter's Handbook. New York: Holt, Rinehart and Winston, Inc., 1966. p 290.

until the kiln cooled to 1250°F (if the kiln was well caulked.) The one drawback to the use of mothballs was not discovered until after the first year of testing: mothballs are made of naphthalene ($C_{10}H_3$) and are highly toxic. Upon this discovery safety precautions were taken; from this time on a gas mask was worn whenever reduction was done with mothballs as fuel.

At about this time it was suggested that sugar ($C_{12}H_{22}O_{11}$) should make an effective reduction fuel. This was tested and did produce lusters. The quality of the lusters was quite different from those produced with the same batch of glaze but using the mothballs for fuel. The mothballs produced a richer, smoother surface and a more uniform color; the sugar left a small pile of carbon where the cubes dropped into the kiln rather than a layer of carbon throughout the kiln. Wood was used as a fuel for reduction, also. This worked with only limited success. The lusters were not at all uniform and did not occur throughout the kiln load. If any of the wood touched or dropped onto the ware, there was no luster in the places where the surface of the glaze had been blocked. The best use for the wood seemed to be in maintaining the reduced atmosphere after the initial reduction with another fuel.

In order to have consistent results with the lusters, all aspects of the process had to be carefully controlled. The aging of the glaze batch changed the quality of the luster and to a point improved it. I found that ball milling the glazes for twenty minutes caused the same advantageous effects as aging the batch for two weeks. The temperature of the ware when reduction began was another factor. Reduction at too high a temperature was ineffective. Reoxidation

before the surface of the glaze had hardened resulted in areas of the surface having lost the luster. Improper fuel caused poor lustering. The size of the kiln and the degree of air leakage also affected the amount of fuel and the frequence of introduction to maintain the atmosphere. When any of these factors changed, the lusters differed from those previously done. As the aging process of the mixed glaze batch could not be controlled, the luster qualities were always changing. I found that a certain amount of variation in the results was an exciting and interesting aspect of the lusters.[8]

USE OF IMAGES

My first images were photographs-pictures of scenes.[9] I quickly discovered that these had a very limited application. This narrow view represented "photographs" to my mind, and it was only after a number of failures that I realized the overly complex nature of the pictures was not suitable for the forms I was using. The complex scene became obscured in the process of reducing it to high-contrast. There was no aerial perspective; all distance relationships became a matter of size relation. As a complex composition usually contained objects of varying size, the space/size relationship became confused. Upon realizing this, I attempted to reduce the composition to one or two objects or figures. The image then became more decorative in its appearance.[10]

FORM AND IMAGE

While discussing my work with a photography student I became aware that even this part of my work had been greatly affected by the training I received in early ceramics. Here again my lack of experience in the field of photography left gaps in the perception of my own work. It was pointed out to me that my work with the two dimensional aspect was centered around a cellular principle. All my photographs were concerned with one subject that was repeated throughout the composition. This, I was informed, is not a common practice for a photographer.

All ceramic objects are built on the unit of the clay particle and in an architectonic manner. When I became involved in photography I automatically transferred this way of working to the use of images. I now think that this is consistent with the building character of ceramics. The use of the cellular image in the photographic part of this investigation was a help to me. This is common ground to the two parts that could serve as a unifying aspect, where both are so different, and trying to be combined.

There are a number of inherent difficulties in the combining of three and two dimensional forms. One of the most ingrained biases is toward the two dimensional character of the photograph. One sees the picture as a surface with an illusion of depth. I believe that this is why the previous work with image and form has dealt with the picture on a flat cylindrical surface. This is the same thing as painting on canvas or printing on paper. The illusion of depth can be maintained on these surfaces but seems to become confused when

placed on a surface that is not flat. I found that the box shape with its six flat sides served best for the "picture", while the image that was more of a decorative design fitted the more complex forms.[12 & 15]

This led me to think first in terms of the form; then to search for images that would function well with this form. My first problem was a lack of familiarity and thus comfort with the processes of producing an image. I felt restricted to the use of a small number of images. As my ability to quickly manufacture a silkscreen increased, I began to experiment with a variety of images.

I began by taking an existing photograph and designing forms to correspond with that image. I realized that we do just the opposite in functional/production work. We design the piece and after the first firing, apply decoration that seems valid to the form. In some cases the decoration is in mind when the piece is in the forming stage, but the decoration may change as the design of the piece changes. In the case of the photographic work the image can change very little. The size, number of repetitions and color can change but even these things are not always possible. Thus the piece must be completely thought out before hand and I found it difficult to reverse the creative process in this manner.

At a later point in the investigation I became interested in embryonic forms.[16] This caused me to look for images after the form had been decided upon. As stated above, I believe this reverting to the more comfortable method of working could only come about when I had become more familiar with the production of the image.

MESSAGE AND MEDIA

Thus combining of three-dimensional form and two-dimensional images is a difficult problem. One tends to see the two-dimensional aspect of the work as a picture, the message contained in the recognizable objects. The form had a message also, but this was of a different kind. When I first began, I felt that there must be an obvious message in the image and also in the form, and that if the message was the same in both, they would work well together. I soon found this not to be the case. The message of the picture used on a form was explicit and easily identifiable. The form tells its story more slowly and can have effect by the very nature of possession and handling.

I had to ask myself if the message of the picture had to be an out and out statement; or could it deal with emotion? I was caught in the trap of the social statement. At this time I had changed the forms from the simple box to covered cylinders. The image I was using at the time was of a crowd of people. I became interested in the problems of over-population. As life tends to affect work, and also the other way around, I attempted to make a statement about "the baby problem". I don't think that these were very successful as statements although a number are successful as art objects.[18] I was attempting to consciously combine the form and the image, using not only the form of the pot, but the shapes added to the piece to alter it. These were lumps and small babies' heads taken from plaster castings of both found objects and formed clay.

By my method of working I made a number of forms and applied

decoration to them as a second step. As the experiments progressed, I had more pots than images and preconceived ideas for the images I had on hand. I wanted to fire the existing forms and so began to decorate them with a painted design. I felt that this came under the heading of graphic image as it was a designed image. I became interested in the idea of the image being not of a photographic nature but rather of a design that causes a particular feeling or association. Here I tried to make the decoration and the feeling evoked by the shape of the form work together. I believe that these were some of the most successfully decorated forms to this time.[19] The previous attempts to get photographic image to work as successful decoration helped me to transfer the learned theories to this other method of decoration.

I began to realize that the message of the piece need not be a statement such as "end the war" or "make fewer babies." The message of the piece can be the feeling of the clay as one holds it in his hands or sees it in an environment. The piece can tell something about the texture of the clay or the quality of a glassy glaze, causing the viewer to be more aware of these qualities. The message can also be about volume and function. I now believe that these are the most valid messages that I can attempt to communicate through my work.

How then does imagery become involved in this type of statement about the object? This became the question in my mind. Is this type of statement helped or hindered by the addition of graphic image? I think that the answer is in the use of the image and the control of the form. Some forms tell all that is needed or desired

without the addition of the image. In other cases the image can increase that statement's power. One ancient work from China that dates back to 500 B.C. is an example of a form that is immensely satisfying in itself.[20] I believe that the addition of any decoration to this beautiful object would make it less rather than more.

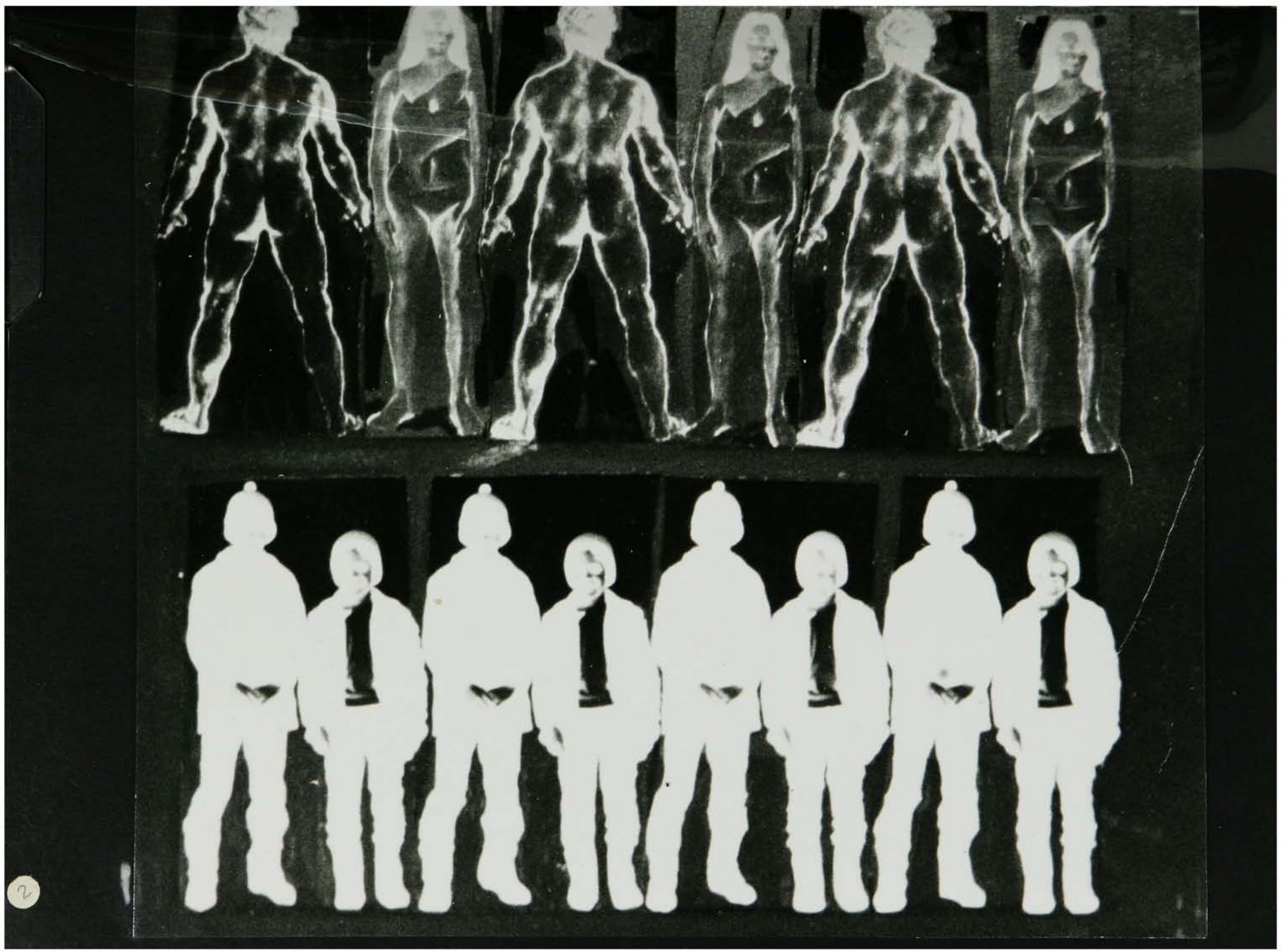
Given this premise, I feel I can state that the application of the decoration depends on the demands of the form to which it is to be applied. In the case of one small piece, the process of making the form suggested the type of decoration that should be added. I was forming a pinch-pot around a roll of newspaper. The softness of the clay caused the clay to thin out and eventually break open in one area. I liked the piece and wanted to save the form. I added a patch of clay to the broken area. This did not work and the area again broke open. One of the graphic designs on the screen at the time was a line of figures that were linked by the hands. I printed this on a slab of clay and cut a "band-aid" to strap the pot together.[21] I think that this is an example of the form and the image working together in an appropriate fashion.

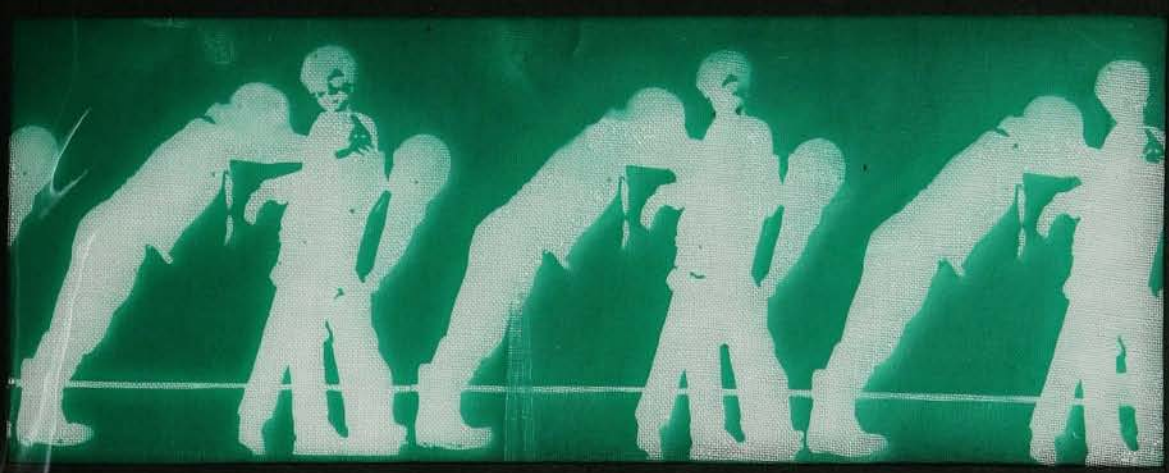
CONCLUSION

The combining of image and form has been a problem to be solved by the potter since men first demanded decoration on their clay vessels. The supremacy of one or the other has changed like the swing of a pendulum. We know that the form of a Sung pot is of primary importance while the image takes precedence in the painted Attic ware of Greece. It is only when the pendulum swing passes the center point between the two ends that the form and the image work together as equal forces.

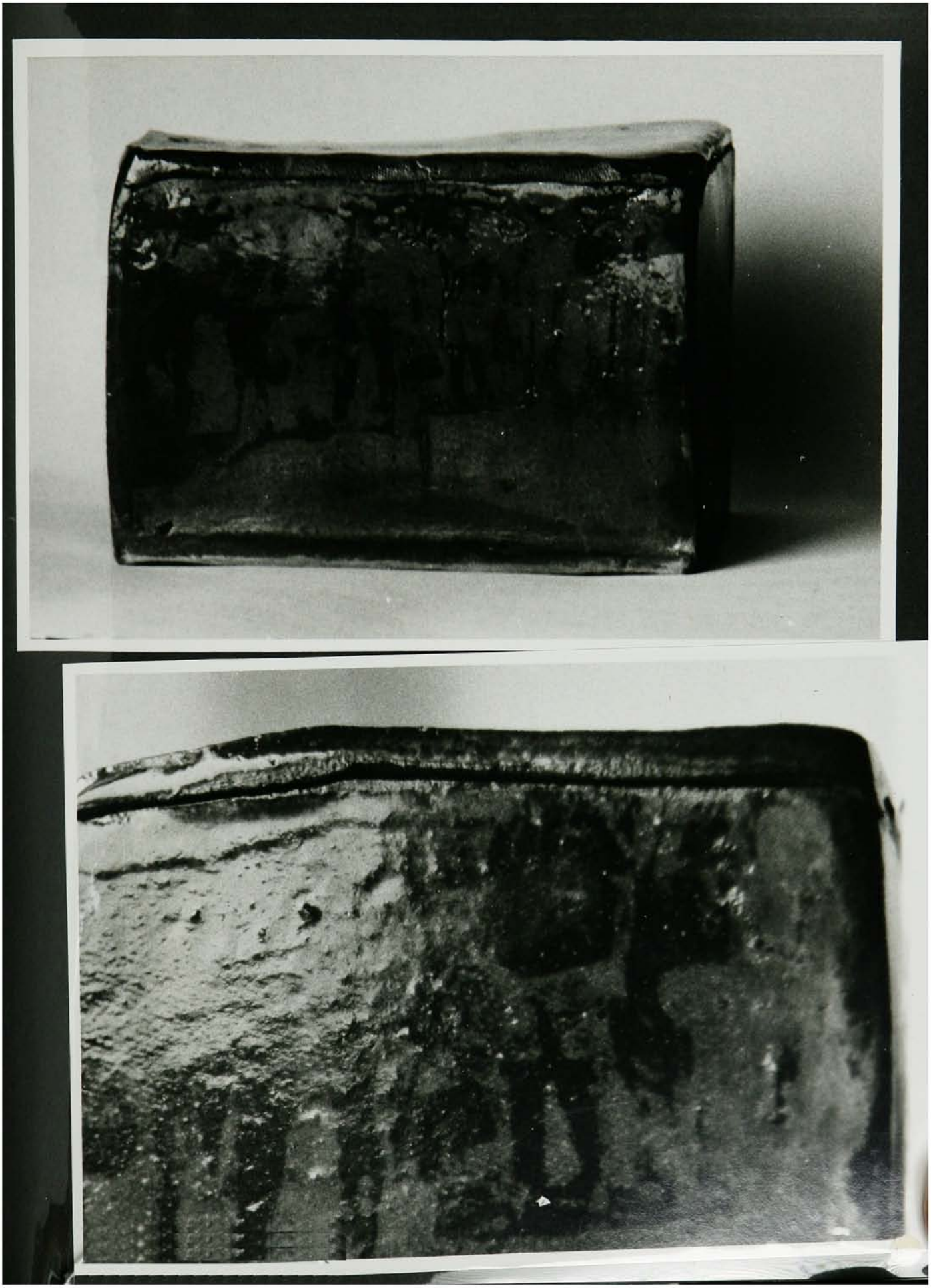
As a result of the work done in this investigation, I now feel that it is the form which dictates the type and manner of imagery used in the decoration. This does not mean that the form supersedes the imagery in the finished product, but that the image, as applied to the form, is the last part which is manipulated to enhance the expressive qualities of the completed object. An object with the proper combining of form and image is comfortable to the viewer in that he feels that the existing imagery is without alternative. Where this is not the case the imagery becomes decoration, with a variety of alternate designs.

Nelson, Glen C. Ceramics; A Potter's Handbook. New York: Holt, Rinehart and Winston, inc., 1966.





WAX PRINTED POT.....8x4x4"

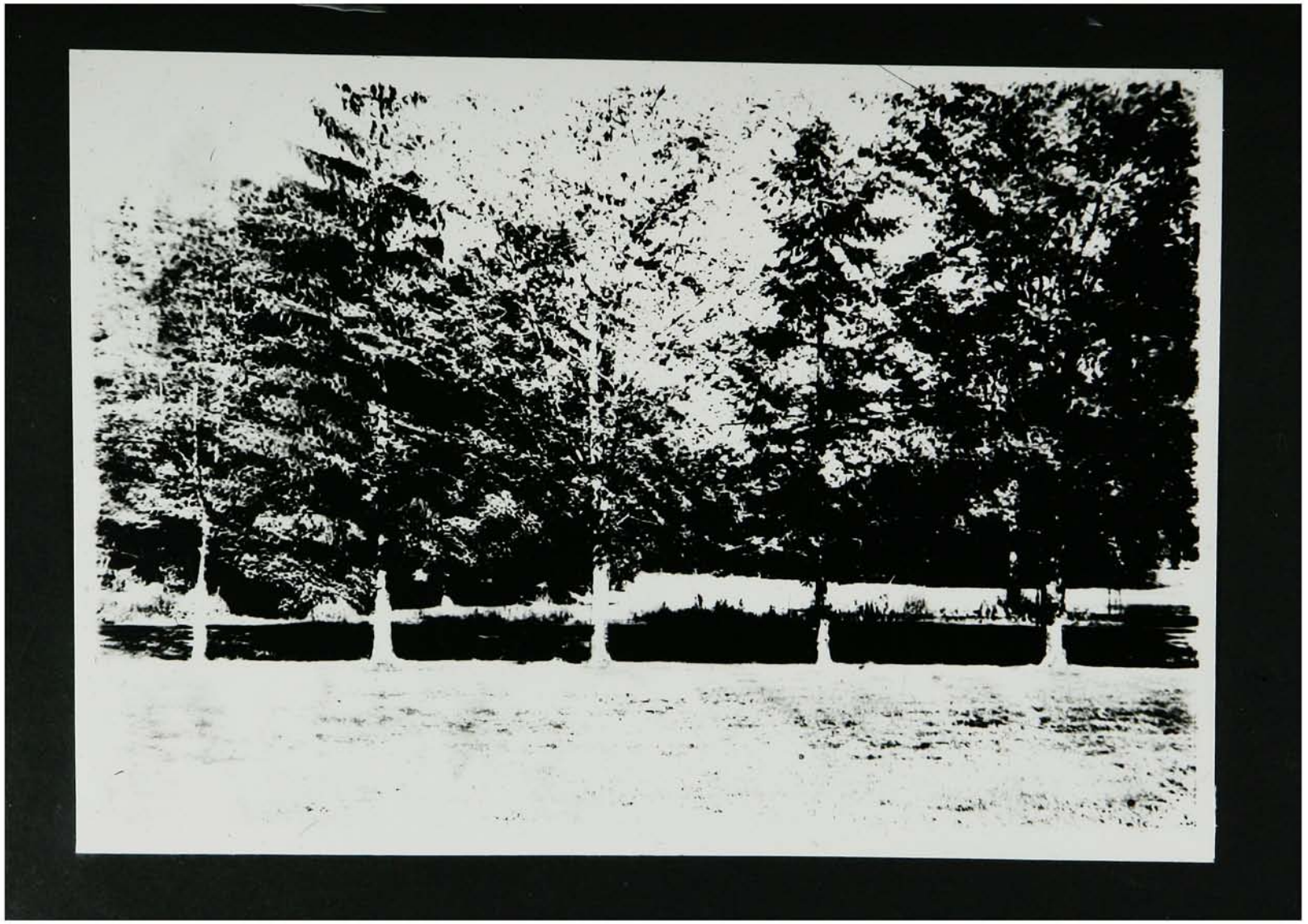


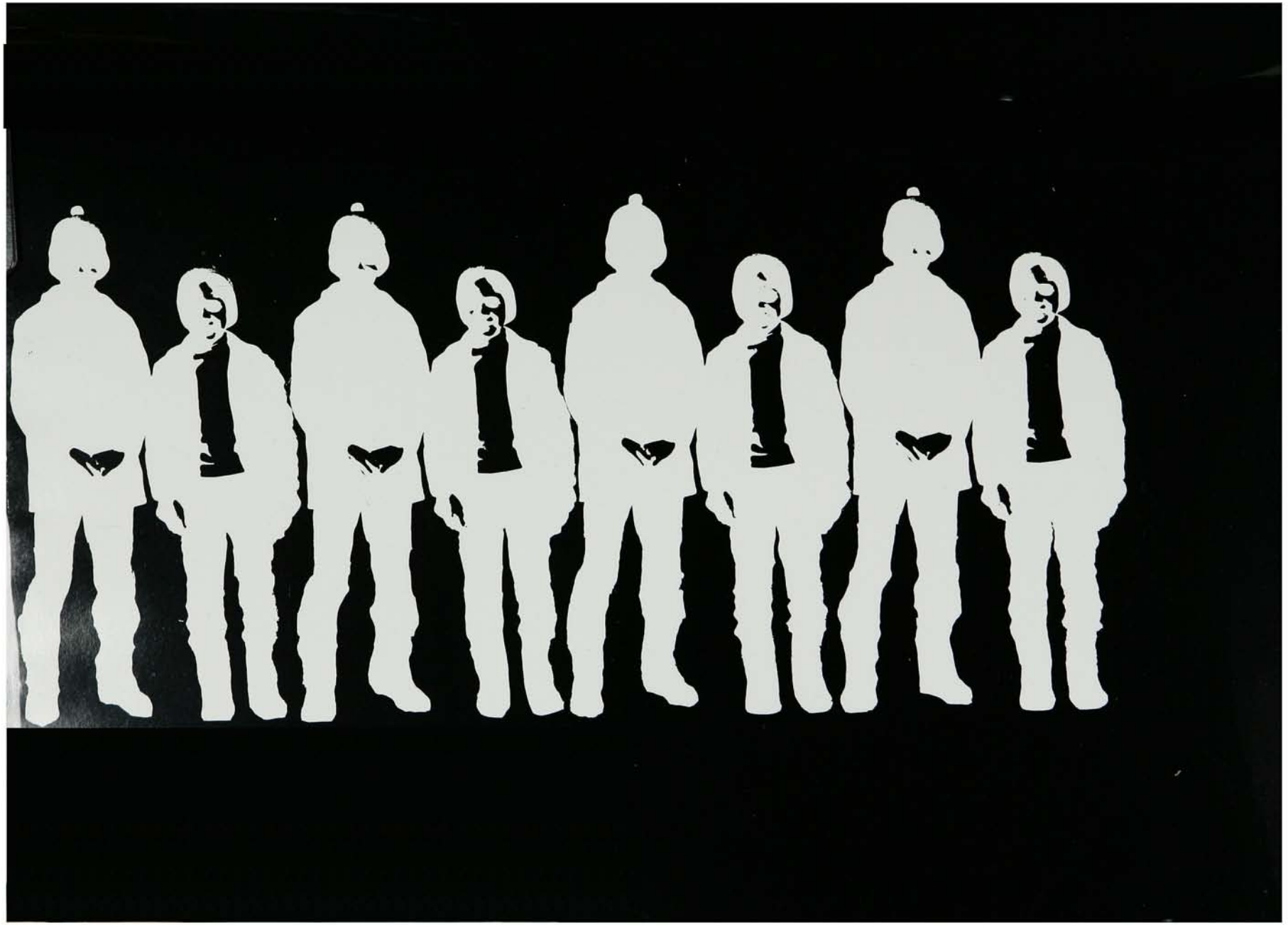
DECALED POT.....6x5x4"

URETHANE FOAM PRINTED POT.....14" TALL

FORM WITH LUSTERED INTERIOR.....6" DIAMETER

GEAR BOX.....51x7x7"





BOX WITH SCENE.....4x4x4"

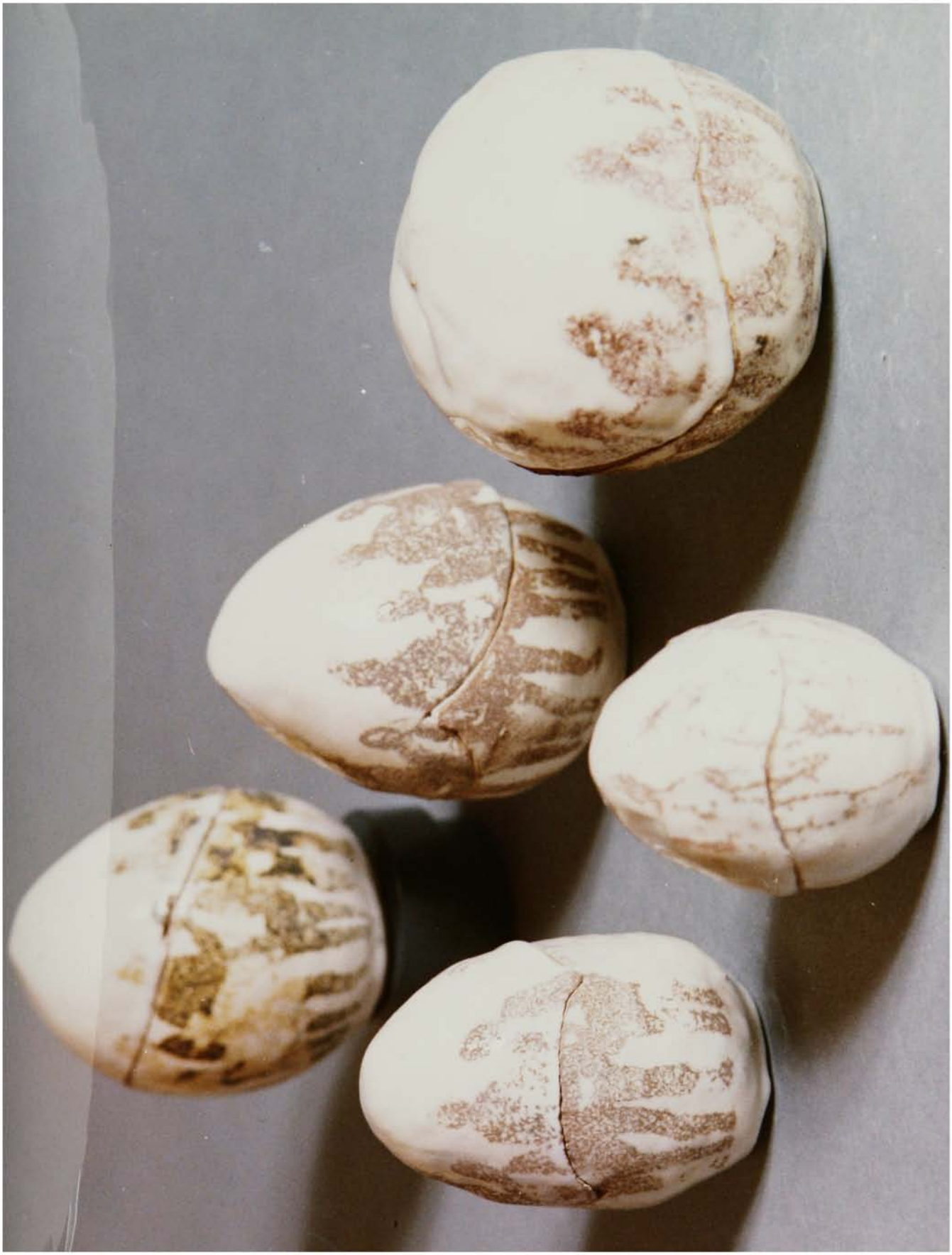
BOX WITH TREES.....8x4x4"

BOX WITH STORM OVER FOREST.....21x4x7

BOX WITH PEOPLE....._18x8x8"

FORM WITH FIGURES.....10"TALL

EGG FORMS WITH PRINTED FIGURES....3-5" TALL



BABY POT.....15" TALL

PAINTED POT.....15" TALL

ANCIENT CHINESE POT.....18x21"

REPAIRED POT.....7"

CONTAINER WITH URETHANE FOAM PRINTED FIGURES

.....7" DIAMETER