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Rochester Institute of Technology

A Thesis Submitted to the Faculty of The College of Fine and Applied Arts in Candidacy for the Degree of MASTER OF FINE ARTS

Energy in Clay Forms

by

Aviva Schneider

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Date: _March 31, 1979_
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PART ONE: AESTHETIC CONSIDERATIONS

The purpose of my thesis has been to create a series of handbuilt forms in an attempt to give clay forms, which are solid and unchanging, a feeling of life, energy, and growth. I have not been trying to imitate specific living forms from nature; rather, I have been attempting in my work to create pieces with a strong feeling of unity to them - a unity of form, design, color, scale, and concept.

Within this general framework, I have narrowed down my choice of forms, designs, and ideas to an exploration of a few specific ones which I have found interesting. Primarily, I have been involved with the idea of a spherical form which is defined by edges of slabs extending from a central core as shown in the photographs. I have limited my choice of forms to ones which may seem very similar. I find that by limiting the variables I am working with over a period of time and by working in a series within these limitations, I am able to gradually clarify my ideas more than if I continually change back and forth from one concept to the next. I have also experienced many technical difficulties in building, drying, and firing these pieces. I find that in order to achieve any successful results I must limit the technical variables I am working with.

While working within this general framework of a series
of spheres, I have chosen a variety of aspects of form and design to focus on different pieces. Control over the forms – building them to look as I envision them – has been extremely difficult for me, and while it improves with each piece, many of the ideas are not expressed as clearly in the pieces as I would have liked. When I began the series, I was intrigued by the importance of the outer edges of the slabs in defining the volume vs. the importance of the more open areas – the gaps – between slabs and the clustering of little points towards the central core. They tend to draw the energy towards the inside of the piece. Thus, a contrast was established; by merely altering the spacing of the slabs and the intensity of the points between them, a shift of the emphasis from the surface to the inner core was established. I built several pieces simply exploring this change of emphasis, progressing gradually from areas where the slabs were close together to more open areas (see photos). Color was used here simply. The slabs were one solid color. On the points, where they were firm and active on top, the color was intense, gradually fading towards the bottom where they were droopy and pale.

I then decided to introduce a new variable, to add a new element to the pieces. I was intrigued by the way the outer edges of each individual slab connected with all the others to form a volume – a sphere. I decided to attempt to re-define that single volume as a combination of other
volumes. I used color to exaggerate and define the concept of two different volumes by using alternating slabs of two different colors. That opened many new possibilities. By cutting the slabs of each color in an orderly fashion, I used the idea of progressions to show a movement around the piece, and by having 2 colors progressing around the same piece there were many possibilities for a great deal of movement. On the one hand, there was simply the movement from the change of the shapes of the slabs. On the other hand, there was also the carryover from one slab to the next of each color which maintained the volumetric quality. The idea of two colored slabs progressing around the same central axis to form two volumes in one space has been very intriguing to me, and I have worked a great deal within this framework, exploring different shapes and different ways of altering the slabs.

I have found the idea of progressions, or any reliance on an order such as numbers, for determining how a piece should be designed and/or built very helpful. For example, defining two extremes of a progression, then separating out steps and figuring out an even progression from one extreme to the other can make the transitions flow smoothly. This sort of reliance on progressions has often been a very helpful way for me to plan and design pieces, both in terms of trying to enter a new idea and trying to clarify one which is in progress. However, I think it is important also to be
able to break from the progression, to be able to respond purely visually to what happens in a piece or in a series of pieces. This is especially true once a series is underway - being able to respond purely intuitively and visually to the work, as far as continuing goes.

In the process of cutting away parts of the slabs, I have cut into the overall spherical form to some degree in a number of pieces. I wanted, after making several pieces, to diverge from the sphere - to break the symmetry and the predictable, even outlines of the forms. I gradually began to cut away more and more of the slabs, each time losing more of the overall sphere. However, I realized that - in my opinion - much of the strength of form was lost, and I have been careful to preserve the overall sense of the sphere in the more recent pieces. My feeling is that, right now, the sphere is an essential aspect of these pieces: with the changes in color, the contrasts in shapes of slabs, and all the activity of the points all over the pieces, I feel that the pieces have become so complex that they are becoming difficult to look at; uncomfortable. In all that complexity, something visually clear and familiar is essential, and for me right now that clarity and familiarity is found in the simplicity and strength of the sphere. Therefore, I have more recently focused on designs which preserve the overall sense of the sphere, which I find is defined mostly by the outer edges of the slabs. I have, therefore, attempted to
incorporate cutting the inner bulk of the slabs away while preserving the outer rounded edges as much as possible.

Another variable which has been of interest to me is scale. When I began building these pieces, I began small, partially because I was interested in the delicacy and almost precious quality of small pieces, but also because that was all I could handle. Gradually the pieces got larger—each time I increased the scale I lost the first piece or two due to cracking until I became more comfortable with the increase in scale. As the pieces became larger, I became excited about the new possibilities of space and overwhelmed at the differences in the impact of the images simply from changing scale. The two largest pieces I built—about 20" tall—both cracked badly, and while I decided to pursue alternate building methods (which I discuss in section 2), I reached a point where I felt forced to produce some smaller pieces in order to have something to show for my thesis other than a bunch of cracked slabs and drawings and technical notes. I was depressed about decreasing the scale until I actually began building a small piece. I found then that I had much more control over the material and that the craftsmanship, the clarity, was much stronger on a small scale than it had been on the larger pieces. The ideas were much clearer and the images much more comprehensible. I also felt that while the larger pieces have a stronger presence—especially on first impression—the smaller ones have a different strength
but one no less valid to me. They are more personal, more intimate. I even built two "one-handers," only about 4" high. These pieces which I built during the last few weeks of my thesis are important to me in that I was able to work out a lot more ideas than I would have if I had chosen to continue on a larger scale because of the time element involved (the larger ones took much longer to build). I may return to a larger scale at some time, but for now it has been very important to keep the pieces small and to get them built with relatively more precision and clarity.
Construction: drying problems, claybodies, glazes, and firing

The most severe technical problem I have had throughout my thesis is cracking during drying. The problem generally appears to be a result of the severe tension which I impose on the clay, primarily due to forms which inherently must dry unevenly. The method I have used of dealing with this problem is that of designing and building a piece even though I suspect it will crack, then seeing if and how it cracks, then evaluating (with a great deal of help from Hobart) whether the cracks could be eliminated by different construction methods, a different claybody, or both, and then trying again. Unfortunately, while cracks are sometimes difficult to explain, they are much more difficult to predict — exactly where the tension will be strongest on a given form and how persistent the problem will be — so this is the only way I can work — making semi-educated guesses and then just hoping for the best and seeing what happens.

The photographs on the following pages illustrate the general building processes I used. Figure 1 shows the central core with the first few slabs attached. The slabs are rolled or poured, then draped over wads of damp paper towel to provide the edges with a feeling of movement. When they are leather hard, they are attached to the piece by
scoring and using slip. A coil is then attached for extra strength. Then the points are assembled and attached to the piece, from bottom to top.

Figure 2 shows the piece with a few more slabs. Note also the thick slab which is essential for counter-weight.

Figure 3 shows the piece just before the thick slab is removed. The piece is on a kiln shelf so it can be placed in the kiln without being touched.

Figure 4 shows the completed piece before drying and firing. Wax painted on each of the points at the top helps them from breaking from the weight of the plastic during drying.

I began my thesis using the following cone 10 porcelain recipe, which worked pretty well for the initial, smaller pieces, presenting only minor cracking problems and becoming strong, vitreous, and translucent when fired:

<table>
<thead>
<tr>
<th>Jean Montalbano's Porcelain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edgar's Plastic Kaolin</td>
</tr>
<tr>
<td>Tennessee #1 Ball Clay</td>
</tr>
<tr>
<td>Flint</td>
</tr>
<tr>
<td>Potash Feldspar</td>
</tr>
<tr>
<td>Nepheline Syenite</td>
</tr>
<tr>
<td>Dolomite</td>
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<tr>
<td></td>
</tr>
</tbody>
</table>

While this body did not present major problems on my initial, small, thesis pieces, I was also using it for some work I was doing at cone 5 and I found the clay to be unsatisfactory for two reasons. First, I was unable to fit a
clear glaze on it without crazing since it was too porous, and second, I was having severe losses due to cracking on some simple handbuilt bowl and plate forms I was making. With help from Angela Fina and Hobart, I adjusted the body to help solve these problems. To decrease the porosity I increased the fluxes. To prevent cracking I reduced the overall clay content (to cut down on shrinkage), cut way back on the ball clay, divided the kaolin content in half to introduce a wider range of clay particle sizes, added bentonite to give it some plasticity, and added pyrophyllite. Thus, we arrived at the following formula which I have since used on my sculptures, bowls, plates and other forms:

<table>
<thead>
<tr>
<th>Cone 5 Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edgar's Plastic Kaolin</td>
</tr>
<tr>
<td>Grolleg</td>
</tr>
<tr>
<td>Tennessee #1 Ball Clay</td>
</tr>
<tr>
<td>Flint</td>
</tr>
<tr>
<td>Custer Feldspar</td>
</tr>
<tr>
<td>Talc</td>
</tr>
<tr>
<td>Bentonite</td>
</tr>
<tr>
<td>Pyrophyllite</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

I find that this clay is much less prone to drying cracks than the former clay. It is not very plastic and people who have tried to throw it say it is very bad (although it improves with age). It does not fire white - it is speckled, but since I generally add colorants to the clay this is not a problem for me. I have found that it is prone
to warp at cone 5 on certain forms, such as large, low platters, and I would advise cutting back on the flux or firing it lower if anyone tries this clay on forms which are prone to warp.

While my thesis pieces have been unglazed, I have been doing other work with this clay with a clear glaze. The following clear glaze works well over this clay:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Val Cushing's Clear Glaze</td>
<td></td>
</tr>
<tr>
<td>Kona F-4 Feldspar</td>
<td>35</td>
</tr>
<tr>
<td>Gerstley Borate</td>
<td>23</td>
</tr>
<tr>
<td>Barium Carbonate</td>
<td>8</td>
</tr>
<tr>
<td>Whiting</td>
<td>8</td>
</tr>
<tr>
<td>Edgar's Plastic Kaolin</td>
<td>8</td>
</tr>
<tr>
<td>Flint</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

I have dipped, poured and sprayed it. I find it works best if it is not applied too thickly. While it is suggested for use up to cone 6 I have had some occasional blistering with it above cone 5. I have not experienced any problems with underfiring it slightly.

I have not yet conquered the technical problems of building larger scale pieces, but I have been working on a series of tests on clays which may enable me eventually to work larger. The tests I have been doing are experiments with slabs poured from casting slips. I tried this because the slipcast slabs may be stronger than the rolled ones and

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1 Studio Potter, Vol. 5 No. 2, p. 77.
more willing to be wet down and assembled even after areas have dried or even when they are completely dry. They are also faster to produce, resulting in less uneven drying due to too much time spent on any given piece. I tested a number of casting slips from recipes from various people and several commercial ones, and so far for my purposes the best one I have found is the casting slip Holly Jones has been using. This is Seeley's "white velvet" casting slip from Seeley's Ceramic Service, Inc. of Oneonta, N.Y. It tested best for me in that it was the only one with which none of my tests cracked and with which I could take two bone-dry pieces and attach them and have them bond. It is sold commercially as a lowfire earthenware slip, but I have found that by overfiring it, it becomes stronger and more vitreous. I am still experimenting with its firing range - the uncolored samples I fired to cone 5 were still quite porous, at cone 9 they were very vitreous. I fired one very small piece I made using this slip to a flat cone 10 and it completely melted into a puddle. I have built another piece with this slip and so far I have not had any problems building with it or drying it. I just have to find the right temperature. Hobart suggested when I began testing this slip that the flux in it was probably talc, and that magnesia has a "sudden and strong" fluxing action, usually somewhere around cone 8. My guess - judging from the puddle on the kiln shelf at cone 10 - is that he is correct.
I have fired almost all my pieces to cone 5-10 in an oxidation atmosphere with no glaze. The reason I have done this is that all the color variation I want in the pieces is built in with colored clay – I am not looking for any surprises or variations from the firing process for these pieces, as they are already complicated enough. All I want from the firing is to make the clay strong and vitreous and to bring out the colors, with consistency from firing to firing. This need is easily satisfied with oxidation firing in an electric kiln.

Colored Clays – Introductory Discussion

During the past 5 years I have been involved in testing and using colored clays, and while I have chosen a relatively restricted assortment of colors to use in my thesis sculptures, I have been actively involved in using a wider assortment of colored clays for other purposes – such as my handbuilt functional pieces and my "creatures" which are very colorful. I have been trying for a long time to increase my range of color understanding and to develop a mini-library for myself of color samples, so that when I need a certain color I know how to achieve it. Rather than attempting to review here all the testing I have done, I have chosen to generally discuss some of the colors I have used in a manner which may help other people who are interested in working with colored clays.
In general, I have found that coloring my clay enables me to incorporate color into the structure of my pieces in a manner that no other method of using color would allow. In my own work, I have found that this enables me to integrate the color in with the design of a piece to achieve a greater unity than I would have if color were applied afterwards in any manner.

The oxides which are commonly used in glazes for color can be added directly to a claybody to produce colored clays. This is a relatively inexpensive and satisfactory way of achieving color contrasts, and I frequently use these oxides. However, there are some specific problems or side effects with some of them - such as fluxing the clay or uneven coloring - which have led me to use commercially prepared stains. These stains have been extremely helpful to me and I use them frequently and recommend many of them highly, but it should be remembered that they are expensive and sometimes, I feel, unnecessary. The rule of thumb I follow is to try the oxides first whenever possible and to rely on stains when the oxides present problems.

In the following discussion of specific colors, I am referring to colorant additions in a white claybody because this is what I usually use. For dark colors, an iron body is fine and I realize it is in a way pointless to start with a white body and add dark colorants. The reason I do this, however, is that I use both light and dark colors, and since a white base clay is necessary for the light and bright
colors, I do all my color additions to the same color body - this is easier for me than having several base claybodies and having to worry about fitting them together. However, if anyone is interested in exclusively or primarily darker colors, I recommend starting with an iron-bearing body.

All the references to weights in the following discussion refer to the weight of the wet, plastic clay (i.e. including the weight of the water), and the percentages of colorants refer to the weight of the dry powder.

Specific Color Considerations

Blacks - In general I have found it much easier to get blacks unglazed than glazed. Loading the clay with many combinations of various oxides (such as cobalt, chromium, iron, manganese, and copper) which have been recommended to me produce a dark color, but they are usually more blue, brown, or green than black. They also usually break to one or more of these colors when glazed, and they often flux the body to such a great extent that they vitrify much earlier than the other colors, causing them to crack apart, melt, or cause other problems.

The best black I have found so far is 10% black engobe stain from Standard Ceramics. This works for both glazed and unglazed surfaces in oxidation and reduction. It sometimes gets a bit blue when fired in gas kilns, but it is better
than anything else I have found. The only time I have seen it dissolve into the glaze and run is when the glaze is thick and on a vertical surface — otherwise it is stable.

The main disadvantage of this stain for me is its cost. It is now about $10.00 a pound and has been going up steadily. If cost is a primary concern, the next best black I have used is Jane Peiser's black which is 7% iron chromate + 1.5 cobalt carbonate + 3% manganese dioxide. The only problems I have encountered with this black, aside from it not being quite as black as the 10% stain, is occasional bloating (I suggest experimenting with cutting back on the manganese) and fluxing my clay; I made some plates with my cone 5 body using this black and they warped excessively, but this could be avoided by firing lower or using a more refractory claybody.

**Greys** — Small percentages (.1-5%) of the black stain mentioned above give a wide variety of greys at a much more reasonable cost than the rich black. These greys usually tend to be quite blue.

Iron chromate (I use 1-5%) produces rich speckled greys. It is a more broken color than the stain but I find it rich and beautiful. Additions of iron chromate to other colorants makes the other color more speckled and I often use it with blues and greens when I want them to be deep and not as flat as they otherwise often tend to be in oxidation.

**Blues** — Cobalt oxide or carbonate produces strong, bright blues whether glazed or unglazed. I use about .1% to 3%
depending on the strength I want. The only real disadvantages of using cobalt I have found are that it tends to produce an uneven color when glazed - i.e. I always find little blue specks within the color. For dark blues or other dark colors using cobalt in combination with other oxides, I don't mind these specks. However, for pale colors, the specks tend to stand out and I often find them distracting. I have also found that additions of 3% or more cobalt flux the clay - be cautious. If adding cobalt to a clay, I recommend also adding a non-ceramic pigment - such as poster paint or the "blue jean blue stain" in the glaze pantry (I have tested it up to 10% and it burns out in the bisque). This is because the cobalt does not color the clay in the unfired state and it becomes very confusing to work with.

I have tried numerous blue stains which work very well, such as the bright blue, turquoise, and bluegreen engobe stains from Standard Ceramics. Generally .5%-1% gives a pale color and 5-10% gives a strong color.

Cobalt prices have been soaring lately, as have the prices of the stains. While cobalt looks expensive compared to other oxides, I still find it relatively inexpensive since it is so strong - it is still much cheaper than the stains, so if the specks are not disagreeable I recommend the cobalt.

Cobalt alone often produces a harsh blue and I frequently modify it to make bluegreen with chromium, or with iron or iron chromate to soften it.
Greens – Chromium oxide is what I usually use for greens and I have not experienced any problems with it. I often alter the green with small amounts of cobalt or with burnt umber or iron chromate for deeper greens or green-browns. I have also used 10% bright yellow engobe stain (from Standard) plus a fraction of 1% chromium or green stain for a very yellow-green.

I have found that on pieces glazed with glazes containing zinc oxide, chromium results in browns and tans rather than greens.

Copper in oxidation produces a brighter green than chromium. Very small amounts of copper are needed, and I have found that it dissolves easily in the glaze and moves with it, blurring the color. In reduction copper in the clay produces as wide a variety of colors as it does in glazes – including greens, reds, browns, and blacks. In reduction salt firing I have had the colors from copper migrate in the kiln and color other pieces. Copper is a strong flux in claybodies and I have on occasion used too much and had it flux the clay and make the pieces actually split apart where sections with copper meet sections with other colors.

Green and black nickel oxides produce muted greens and golds. I use up to 6%. I have had the nickel cause crystals in my glaze when 6-10% was used, but I personally found these unobjectionable and often beautiful.

I have used some green stains and have not had any
trouble with them, although I also haven’t found them too necessary since chromium works so well for green and is much cheaper than the stains.

Tans – Rutile produces a beautiful tan. I use 10-20% for a strong color or about 3% for a paler tan. It is usually much lighter and brighter in oxidation than in reduction. With one exception, I have always found the colors from rutile reliable and even. The occasion was on an unglazed piece which had dried unevenly and was fired in reduction – the color was extremely broken, ranging from brown to pale tan. The color variations appeared to be due to a combination of variables such as reduction and soluble materials in the clay reacting with the rutile, as the color changed in accordance with the way the piece had dried. I have never encountered this problem on pieces fired glazed or unglazed with rutile in oxidation and I have used it many times at a variety of temperatures. The color from rutile can be modified in many ways with additions of other stains and/or oxides. I often darken it by using 10% rutile plus .5% crocus martis – this color produces delicious pizza pie crusts and hamburger rolls for my creatures.

I have tried manganese dioxide for tans but I find that it leads to bloating even with small quantities. I find 3-6% necessary for a medium to strong tan, and this quantity often produces bloating.

I have used a tan engobe stain from Standard Ceramics
and it produces a beautiful, rich tan, somewhat darker than rutile. However, it is very expensive and I find it an unnecessary expense since I have generally found rutile successful.

Burnt umber also produces a tannish brown, and while I have relied on it more to modify other colors than alone, I have never had any trouble with it.

**Browns and Red-browns** - Crocus martis and red iron oxide produce a wide variety of browns and red-browns. In oxidation, crocus martis is relatively purpler and the red iron is relatively orange - it is especially orange around cone 04, getting browner with increasing temperatures. 3% gives a strong color, and fractions of 1% can be used for softer tones. In reduction, the color ranges of both these materials are as varied as the colors in iron glazes - including greens, reds, and browns. Yellow ochre is very similar to crocus martis in fired color although it is a bit more orange. I rely more on the crocus martis because its unfired color is more similar to its fired color and this is helpful to me in visualizing my colors during the building processes, and because I like its name better. Red iron oxide has the well known disadvantage of staining one's hands and tools and I use it as infrequently as possible: working with many different colored clays demands constantly washing hands and tools between touching the different clays if smearing is to be avoided, and while I am completely used to that, I find that iron is so hard to keep washing off that I
try to avoid it. Crocus martis has the disadvantage of being
difficult to wedge into the clay evenly in small amounts for
a pale but even color and it often seems to me that no matter
how much I wedge it I get some streaking. Therefore, I rely
more on rutile or the commercial stains for pale, even colors.
Even though the stains are expensive, very pale colors
usually are obtainable with less than 1%, so a little goes a
long way.

Manganese dioxide and burnt umber produce browns (see
discussion of tans above).

I also use brown engobe stain from Standard and I have
had no trouble. 8% gives a rich, strong, brown.

_Reds_ – I have discussed copper reds in reduction (see section
on _greens_) and iron or crocus martis red-browns (see section
on browns). I have not found any other materials which
produce bright reds when mixed in the clay. I tried adding
cadmium to my clay once but it burned out in the bisque.

_Pinks_ – There are many pink stains produced commercially. I
have found many which work well in oxidation but none which
hold in reduction. They are generally strongest at low
temperatures and gradually weaken as the firing temperature
increases. The best pink I have found at cone 5 oxidation is
Mason's Underglaze Crimson No. 161 which is wonderful for
creatures' tongues, watermelons, and strawberry ice cream
cones. About 20% is needed for a strong color and the stains
are very expensive – fortunately I don't use large quantities
of pink.

**Yellows** - The best yellow I have used is 10-20% yellow engobe stain from Standard Ceramics. In oxidation this yields a pale yellow at cone 04, somewhat bright at cone 1, very bright at cone 5, and slightly paler (though still quite strong) at cone 10. In reduction it has fired white on all but a few of my test tiles, so I do not recommend it. I have experimented with a few other commercial yellow stains but so far this is the strongest one I have found - it is excellent for creatures' bananas, and again, while it is very expensive to use, I only use my bright yellow clay in very small quantities - fortunately, it doesn't take much clay to make a \( \frac{1}{2} \)" banana!
BIBLIOGRAPHY


