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GLASS AND METAL

by

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a statement

submitted in partial fulfillment of the

requirements for the degree

MASTER OF FINE ARTS

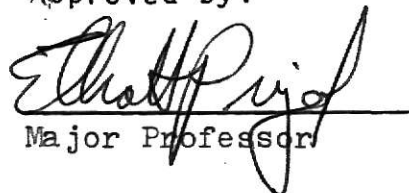
Department of Art

KANSAS STATE UNIVERSITY

Manhattan, Kansas

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This paper is to serve as a summary of the development of my work as a graduate student in metalsmithing and jewelry, what my goals and interests are, and how I intend to accomplish them. My work has been extensively involved with both metalsmithing and enameling. Metalsmithing is the art of working metal, ferrous or non-ferrous, and enameling is the art of fusing glass to metal.

Enameling has been a source of exotic compulsion to me on and off for the past three years; I would begin work with enameling and then realize that I needed to perfect a metalsmithing technique before I did further enameling. A student spends years acquiring the technical skills necessary to create art with metal. When this is added to the technical skill embodied in the art of enameling, the knowledge necessary to combine the two areas becomes enormous.

The art of enameling, or fusing glass to metal, has a sensual appeal. The preciousness, the everlastingly reverent quality of enamels is compelling. The combination of metalsmithing and enameling is even more compelling. Perhaps this can be attributed to enamels' glossy reflection, perhaps to its clarity and depth of color, perhaps to its permanence in conjunction with metal - to leave a lasting monument to one's ego.

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First, a definition of terms as stated by Harold B. Helwig, one of the foremost experts on enameling in the United States.

TECHNICAL: Is the practical knowledge of a particular subject, organized on scientific principles.

TECHNOLOGY: Is the technical language and/or the applied science of achieving a practical solution. It is the totality of the means employed to provide a workable correct conclusion.

TECHNIQUE: Is the manner in which technical details are treated or basic physical relationships are used. It is a method of accomplishing a desired aim.

Helwig also states that when a technique is not based on the technical, the whole organized systematic process becomes flawed. Each flaw diminishes the ability of that technique to survive in relationship to the whole. In fact, it may cause failure of the whole itself.

These statements and terms by Helwig have become more and more important to me as I realize their complete verity. My work has of necessity become a very technically oriented procedure through this past year. It will remain so until I have enough technical knowledge at my disposal to acquire a complete technique in the working of enamel and metal and

glass on metal.

For whatever reason, enameling has experienced a total confusion of terms. Technical, technology, and technique have been lost in a confusing maze of religious objects, icons, flowers, butterflies, and other such subject matter. There are a few artists who are very concerned with taking enameling to a more prominent place in the arts and out of the therapeutic realm. This is what it deserves - to be treated as an art form. The potential of the medium is inherent, it only needs to be brought forth.

I did not begin to enamel with earnestness of purpose until the past year, and in many ways it has been like beginning all over again. I have come to recognize that I had to become a metalsmith before I could become an enamelist. I had a definite need to be in control of all aspects of the medium - both metal and glass and this in some ways slowed me down. I had to learn more about color. I had to rethink drawing in relation to how I wanted to use it. I had to feel I had mastered metalsmithing techniques. Then I had to begin to learn about enamel.

There are so many complex problems to overcome that enameling may be compared in difficulty to gaining a mastery of higher mathematics, mathematics being the same kind of systematized or layering process of learning. At least, mathematics has been organized into a concise body of

information available to students who wish to learn.

Enameling is burdened with misconception, with convoluted information, old wives tales, and rigid formulas that do not pertain to recent developments in enamels or metals.

There are many misconceptions to be waded through and discarded. This process is difficult however, as there are no really accurate, complete texts on enameling. There are many books on enameling, but all contain rigid, if not apotheosized, often outdated, methods and pronouncements. If they are not rigid, they are so loosely experimental as to be laughable. They do not contain a data compiled from technology. They are usually someone's personal translation of historical precedent. Mr. Helwig describes himself as a self-taught enamelist and I now understand that this was of necessity. There are no schools of enameling and very few people capable of teaching if there were such a school. I have also, to a large extent, been self-taught, but the problem-solving that is ever present in enameling is one of the things that make it so exciting.

Enamel has been in large part, religious in nature, in function, application, and methodology. Many enamelists, even in this present day, give long lists of dolorous steps to be taken if one wishes to enamel, and also the dire consequences one faces if these steps are not taken. It has tended to remain a proscribed art and therefore creativity

has not been much a part of enameling. The recommended time-consuming steps often seem to be a symbolic ritual absolution needed to purify the process and drive away the enamel demons. It is as if one follows all forty-six or seventy-two steps for a given piece of enamel, it must necessarily follow that the enamel piece will be successful.

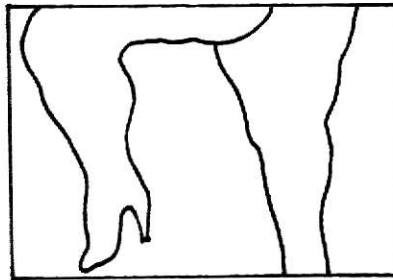
I realized after reading some available books on enameling that I must organize my own body of information based on my technical knowledge of metalsmithing. Because I wanted to project my own images, I needed my own technology to serve me, to remain in control and not leave results to chance. Metalsmithing has taught me a patience in working that is extremely necessary to this quest. If one follows a given set of procedures and the result is not satisfactory, then one goes back and changes the procedure until a workable body of knowledge is found.

I began my investigation with the technique known as cloisonne, perhaps because of my previous exploration with silver wire. Cloisons are small cells of metal in which ground enamel is used. These cloisons, or cells, build the design and to some extent protect the enameled piece from blows or shock. The design is made of small, flat wire standing on its thin edge and bent into shape. The bends in the wire allow the wire to be self-supporting and to stand on its edge.



Traditionally, cloisonne wire has been bent with pliers. As a result, images frequently lack a feeling of complete control. They tend to be rather loosely drawn and sometimes even vague when a very figurative image is attempted. This is due to the way in which the cloisonne wire has traditionally been bent into shape. Enamelists have special pliers that have been made from round-nosed pliers. These usually have been ground so that they have small steps on them and can be used to make bends of varied curvature or angularity. A drawing is made and many hours are spent with the pliers trying to bend the wires in correspondence with the drawing.

After trying this procedure, I realized that it was not nearly accurate enough for the way in which I work. The Terrilegs series was the first of my cloisonne works.



After spending several hours bending the wire for the first of these, and trying to make it accurate enough, I realized that I must find a better way. I developed a small, precise line drawing and xeroxed it several times. I then glued one of the small drawings to a piece of eighteen gauge metal. Using a very fine (5/0) saw blade, I cut the drawing

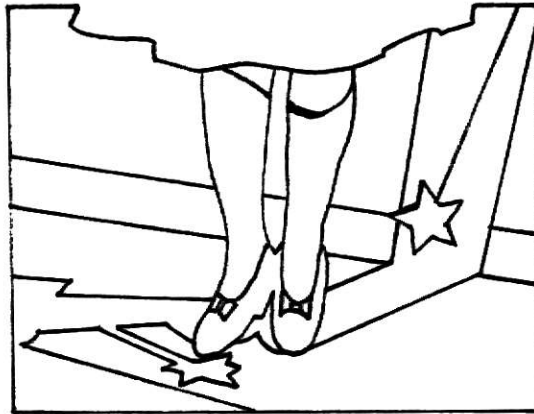
into small pieces. To obtain every shape that I needed, I actually cut the drawing two different times. I then had templates for each shape or line I wanted in the drawing. My metalsmithing experience enabled me to look at the problem and determine a method for solving it.

Cloisonne wire comes from the factory work-hardened and therefore very springy. I make a coil of the wire and put it into a 1500 degree kiln for approximately 45 seconds. The wire is then dead soft and can be easily pushed around the templates. Large areas that are almost a completed enclosure will once again be work-hardened and will tend to spring open to a broader shape than what is wanted. Simply repeating the annealing process in the kiln enables the wires to be closed again to the proper shape. In a very complex area, the wire may be annealed three or four times.

I attribute my ability to develop this technique to my metalsmithing background. I realized that I would never control the wire without softening it several times. The wire is so very delicate in its softened state, though, that I needed a controlled, accurate way of bending it.

After again repeating the image of Terrilegs, and bending all the wires in a matter of minutes to complete accuracy, I knew that I had developed a really workable method. I decided to try a more complex drawing and see

if the data I had thus far accumulated would work for a much more complicated piece. The drawing next used was "Todd's Ruby Slippers".



I followed the same procedure, xeroxing the image, glueing it to metal, cutting templates and then using the templates to form the wire. I was actually saving a great deal of time and also achieving complete accuracy. I have also tended to work in series with these pieces. I believe in this method for myself because I can control the change of one element and determine very quickly if that change will work. I have, in other words, a controlled experiment in which changes are accounted for and I don't have to play guessing games or leave anything to chance.

Most enameling books state that straight lines cannot be used because the wire must be self-supporting. If it is a straight line, the wire will just fall over onto its side. There were several straight lines in the composition of "Todd's Ruby Slippers". I soon realized that all I had to do was work out a method of division so that a line would go completely off the edge of the metal and back on again to

form a second straight line. The pair of lines was then self-supporting. As long as all straight lines were in sets of two or more, they would stand. There is one other problem in using straight lines. If the wire is over approximately 1/2 inch long, it is difficult to make it very straight at all. The wire is so delicate that it becomes springy very quickly and then forms a curve. I found that by pressing the wire equally between two edges of metal, I could obtain a perfectly straight line quickly. All the wires which go entirely off of the metal surface are clipped and removed when the enamel is nearly finished.

I had learned from Bill Helwig, while studying at Penland School of Crafts, that the thinner the finished enamel is, the better. This is because there is less stress on the metal and therefore less danger of the enamel cracking. I had previously been using a standard size of cloisonne wire as it comes from the factory. I now have my silver cloisonne wire specially rolled by a smelter in St. Louis and it is half the height of standard cloisonne wire .

Some enamelists state that cloisonne wire must be hard-soldered to the base metal. I have found this unnecessary. I avoid any type of soldering on my enamels because whenever enamel comes into contact with solder, it will discolor and can produce enormous discolored holes. I fire the wire onto a base coat of enamel, either a flux

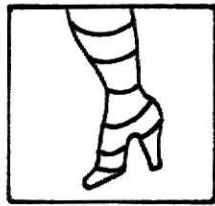
coat or a hard firing coat of enamel. Another method I use is to place it on a base of silver and pack enamel grains around it to hold it in place and then fire it on.

I often use both methods together - fire some wire into a base coat and attach others, which are usually in very delicate areas, by packing enamel around them. Copper wires, however, cannot be attached directly to a silver surface without soldering. Conversely, silver wire cannot be attached directly to a copper surface without soldering. The contact of the two metals, unsoldered, produces a discoloration. Silver wires may be attached to an unenameled silver base and copper wires may be attached to an unenameled copper base.

One of many misconceptions is that sterling silver cannot be enameled. Many of my pieces have been done on sterling silver. Again, because of metalsmithing, I knew how to bring the pure silver to the surface of sterling. The only steps necessary are to repeatedly heat the sterling and, not touching it, slide it into hot pickle. When this heating and quenching process is followed approximately three or four times, the pure silver is brought to the surface of the sterling. The piece can be burnished or glass-brushed, without touching the surface with your fingers, and then enameled very successfully.

There is an added bonus to forming the cloisonne

wire with the template method that I have discussed. Cloisonne wire must remain vertical, not leaning over to one side or another. If it leans, the enamel will end up at different levels and your line of silver will be destroyed. When it is bent in the traditional manner, with pliers, it is often difficult to keep it absolutely vertical. As it is being pushed around the template form, it is automatically straightened into a vertical position at the same time that it is bending. In small areas, such as around the bottom of the foot, up into the instep and heel of the shoe images,



the wire is stretched slightly, which makes it just a tiny bit shorter. This must be watched, but simply annealing it again to get into the tight spots eliminates any problems.

I fully realized, after the completion of these cloisonne pieces that I had to approach enameling in a very scientific, problematical, and analytical way. I had to keep notes on the methods I tried, and on what did and didn't work for a specific process. I was very pleased to find that my method for bending wire was, as far as I could determine, unlimited in terms of being able to execute a line drawing, as complex

as I wished, in enamels. The accuracy with which I reproduce a line drawing in silver wire is almost completely total. I do not have to work out complicated methods of transferring the drawing to metal, via tempera, carbon paper, etc., or to guess at measurements.

There are a few basic things to be avoided with the cloisonne wire. It must not be parallel to the edge of the metal at a distance of less than 1/4 inch. This will cause the enamel to crack, due to the expansion-contraction stresses being confined to so small an area. There cannot be more than three or four wires coming together at one point or this will also cause cracking. Other than these things, I have found no other problems in executing drawings in wire.

Oriental cloisonne has been and is predominately organic, representational work of living forms such as flower petals. Russian cloisonne is usually geometrically designed. This is likely in part due to the method of wire bending heretofore employed. With this method of template bending, I intend to push cloisonne far into the realm of contemporary drawing and design. Of contemporary enamelists, only Jamie Bennett is attempting cloisonne work in a contemporary manner. But Bennett uses very few wires and the drawings are not completely wire drawings.

I am currently engaged in making these cloisonne works much larger and because of this, I have encountered new technical problems. Currently the worst problem is warpage of the metal. I have several methods to try to counteract this before I can accurately describe the results. The bending of the wire, however, will essentially remain the same as described here.

I am also researching other types of enameling. One type used for centuries is basse-taille. With basse-taille, the base metal is worked in some manner. It is chased and repoussed, or marked with a flex shaft tool, or any similar manner of gouging or pushing the metal surface. Transparent enamel is then fired over this and the metal-working shows up as darker or lighter areas. The method I am trying to develop involves etching a drawing onto a metal plate. Silver or copper sheet is then rolled out very thinly, to approximately 36 gauge. It is then annealed to soften it, and cleaned. This very thin, clean, soft metal is then placed on top of the etched plate. It is covered with felts and run through the printing press. The metal is so thin and soft that all details are picked up and fairly deeply printed. It then looks like a very delicately worked repousse piece, but in only a fraction of the time it takes to handwork the piece. The problems left to resolve



are whether this thin piece can be counter-enameled and used by itself or whether it will need to be fused with the use of an enamel to a heavier base metal. I am working on this now and hope to have a final solution in a very short time.

Another area that I am exploring is the use of transparent enamel to achieve a very painterly look. I have, through the past year, realized that each enamel matures at a slightly, and sometimes greatly, different firing temperature. Some enamel requires several firings for it to completely mature. This became really obvious in a small pin recently completed. (Color Study #1). I was concentrating on a color study of four when I realized that two of the colors used were losing all of their coloration before the other had matured. This led to the quick realization that I was going to have to become as familiar with the firing times and temperatures of each separate enamel color. This also applies to transparent colors, and becomes even more important if an opaque is used under the transparent. If the transparent matures at a higher temperature than the opaque, the opaque will come floating up through the transparent in a very spotty, unattractive manner. The problem in experimenting with this is that a piece can be so easily ruined.

There have never been transparent reds for direct use on metal and they are now available.<sup>1</sup> These new colors that have been developed for direct use on copper demand a development of technical knowledge in their use. I have been working with these and am beginning to achieve some of the colors that I wished.

Because of the availability of these colors, I have collaborated with Elliott Pujol in a design for a large sculptural piece for the base of the pendulum which will be placed in Durland Hall, Phase II of the new engineering building on the Kansas State University campus. The commission for this design has been awarded and I will be working on the enameling and construction of it during the coming summer. The exploration of large enamels is another area of interest for me. I would like to have begun work on the large wall pieces that I have designed, but research must be done in the other areas mentioned before I begin this work.

As stated, I have come to the realization that I must approach enameling in a very scientific way and the progress is sometimes rapid and other times very slow. For the time being, my concentration will be on scientific methods.

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Once the technical side of this is conquered, I have many areas of enameling from which to choose. I would prefer to work in and out from one area to another, just as I am now working in and out from metalsmithing to enameling.

I have been using both plexiglas and silver for settings, and I am very pleased with both. Again, from a metalsmithing background, I was familiar with plexiglas and felt that it could be coupled with enamels very successfully. The plexiglas more or less determines a very updated look, has the simplicity of a white mat, and at the same time cushions and protects the enamel from shock. The silver setting establishes a more precious quality and treats the enamel more as a gem. The silver setting, however, will maintain a strict simplicity, much like a simple frame for a painting, or it will serve to accent the enamel as a focal point.

What is most disheartening about enamels today is that there have been relatively few changes and developments. The images and techniques are often outdated and clumsy. I feel, though, that enameling is on the verge of a new emergence. My first goal is to bring to my enameling a contemporary feel through the imagery, the setting, and eventually the use of large, even sculptural, enamels.