

Size Matters

By David E. Parvin, A.L.I.



Photo #1. Now this is a pair of calipers, Mate!

As far back as I can recall, often I have needed to change the size of something I had sculpted, sometimes enlarging and sometimes reducing. In my youth, I just made it over in a new size using nothing more than a ruler to approximate the new dimensions. Later, I learned of and used some of the mechanical devices that had been developed as aids. More recently, I have taken advantage of the new technologies that are making both enlarging and reducing so much simpler. In this article, I am going to briefly cover both the old and the new ways and hopefully encourage any readers who have always hoped that one size fits all to expand or contract their creations.

If I were to daydream about my next commission, I would be more likely to imagine the client saying, “Great work, the twelve inch maquette is just what I want, now go ahead and make it thirty feet tall!” than, “... only now make it two inches tall.” I suspect that most sculptors are more interested in and already more familiar with enlarging than reducing. Fortunately, the process is the same except that large pieces are milled out of foam and small ones are grown in resin or wax or milled in wax. More about that later. First, let’s briefly look back in history.

If you are lucky enough to own or have access to one or both historic sculpting books, *Sculpture Inside and Out*, by Malvina Hoffman or *The Materials and Methods of Sculpture* by Jack C. Rich, you can readily read how complicated and time consuming it used to be to change the size of a piece of sculpture. The first was written just prior to World War II and the second just after. New technology has changed everything. The difference between what sculptors had to do then as compared to now is comparable to navigation in the same time frame. Pressing the “where am I” button on a GPS receiver versus taking celestial readings with a sextant followed by thirty minutes of longhand calculations is loosely analogous to enlarging and/or reduction then versus now.

Methods for enlarging using mechanical devices have been in use since at least the renaissance. Simple calipers, also called proportional dividers, allow one to take a measurement with one end and provide what the proportional measurement should be on the other end. The pair that I am holding in Photo #1 may have been the last of that size ever made. It was a gift several years ago from Bruner Barrie of Sculpture House. At the time, Bruner explained that he had had this particular pair in stock for some time with no prospects in sight because everybody seemed to be taking advantage of the new technologies. I think he felt that I am the only sculptor he knows ancient enough to know how to use calipers; probably a good call on his part since I also own sextant. In any event, it is a well known fact that you can tell a lot about a man by the size of his calipers.

Another helpful device was a pair of frames built to different scales allowing one to measure a locus on one piece and determine where the same locus should be on a piece of a different size.

The most sophisticated device was called a pointing machine or a pantograph. The concept is quite simple. Two turntables are connected so that they maintain alignment when turned. An arm is attached by a universal joint out from the turntables on a line through their centers. Protruding from the arm are two styluses that are the same distance apart as the centers of the turntables. The scale of enlargement (or reduction) is determined by the ratio of the distance between the styluses or turntables and the overall length of the arm. Some models of these were very precisely made, elaborate, and expensive. Malvina Hoffman shows several examples in her book. One of the foundries in my area had a large example which was still in use about fifteen years ago. Bruner Barrie of Sculpture House told me that he carried one for years in his catalogue but discontinued it about 20 years ago because people found it very difficult to adjust correctly. Also, it was relatively expensive and took up a lot of space.

About 20 years ago, I decided to build my own pointing device. After some trial and error, I came up with a design that was simple enough for me to construct. My innovation was to use fixed styluses, in other words, they did not move forming the ends of a parallelogram. This greatly simplifying the construction made adjustment easier. Though I was not able to reach every point on the model with this design, I could transpose enough points that enlarging (and reducing) was still very easy to do accurately. In the past, I had many artists look at it and want their own Parvin Pantograph. Three actually took some photographs and measurements and build them. One even went into the enlargement business and helped support himself until he was able to do so from the sales of his own sculpture. I have used my device many times including enlarging from 1/4 to full life size on three different occasions. It works just as well for reducing. I still use it sometimes. Photo #2 shows fellow sculptor Elliot Summons enlarging a face to 1 1/2 life size. Though we could have used the newer method that I will describe below, it took only about a day’s work to finish the face. But now that there are simpler ways to enlarge or reduce and the pantograph for the most part has gone the way of the sextant. (I am hanging on to my sextant as well. If we have a total energy failure, I will still be able to point up or down and figure out approximate where I am.)

The first time I wanted to reduce accurately something I had sculpted was about twenty years ago. I had been asked to design and sculpt a medallion which would include a bas relief a dancing figure for an annual ballet competition sponsored by the Denver Ballet Guild. I made a 10 inch model first in order to get design just right. (Photo #3) The figure wasn't particularly difficult to sculpt but the letters would have been much more time consuming had I not taken a shortcut by using plastic ones. Gluing them in place was so much easier and faster than sculpting perfectly matching ones. I then sculpted the small version shown cast in bronze microscope under a magnification of 10 power and tiny tools made for eye surgery, time consuming but not too difficult. I decided that sculpting tiny perfect letters would have been just too time consuming and I elected to leave them off. This last year, I repeated the process to test the technology and even the letters turned out perfectly.

Since most sculptors are probably more interested in enlarging than reducing, I'll say a few things about enlarging before reducing. Photo #5 shows a one foot high maquette for a 1&1/2 life size piece titled "Grieving Friends" to be the centerpiece for a Veterans' Tribute Garden" for Westminster, CO. I was awarded the commission which will include six more figures. Realizing that this project would be more than one sculptor could do in the time allowed, I brought in two accomplished sculptors as partners, Bill Hueg and Elliot Summons. In this case, the maquette was made as a rough sketch only and we sculpted a much more accurate and detailed 1/3 life size larger maquette. (Photo #6) This larger size was shipped off to a company that scanned it and carved out 1&1/2 version in foam. (Photo #7) We specified that the foam be 1/4 inch undersize so that a layer of clay could be applied so that we could recapture the desired surface detail and texture. (Photo #8) Once the large figures were finished in clay over foam, they were molded and cast in bronze in the traditional manner. Six foot plus Bill Hueg is shown for scale with the completed, except for patina, "Grieving Friends" in Photo #9. Now let's reduce something.

Reducing is almost the same process. The first thing is to scan whatever it is to be reduced. If the smaller piece is large enough, it could be milled out of foam just as in enlarging. However, if smaller, then the piece will probably be either constructed in wax using a thermojet 3-D printer or grown in light sensitive urethane resin. If very small, then it is milled with a miniature 5 axis milling machine.

Something happened about a year and a half ago that got me interested in again doing the ballet medallion mentioned above as an experiment. 3-D scanners had been so expensive that they were out of the range of most sculptors, probably costing as much as a luxury automobile. But then the company Next Engine came out with a table top 3-D scanner for less the \$3,000.00. (www.nextengine.com) I bought one. Photo #10 shows computer literate Elliot Summons with my new pride and joy. Elliot scanned the original 10 inch medallion complete with the letters. He added more words to the back and also a ring around the edge. The data was emailed to a rapid prototyping company who grew me the new medallion in Photo #11. It was a simple matter to make a mold of the new medallion and cast some samples in metallic urethane and some in wax for bronze.



Photo#2. Elliot using my home made pointing machine.



Photo #3. The 10" model for a 2 1/4" medallion. Here in metallic Forton MG.



Photo #4. The hand sculpted small medallion in bronze.



Photo #5. The 12" maquette for "Grieving Friends."



Photo #6. The 3' maquette



Photo #7. The male figure milled out of foam.



Photo #8. Elliot and self with the male figure covered in clay and detailed.



Photo #9. Bill Hues and the completed, except for patina, "Grieving Friends."

The ladies at the Denver Ballet Guild decided that it would be so special if I would make even smaller version one inch, the size of a quarter, which they could wear as charms. To accomplish this, another method was used. I had Elliot rework the data without the letters and make the charm proportionally slightly thicker. The revised data was fed into a miniature 5 axes milling machine which was designed for making intricate jewelry. What I got was a quarter size prototype carved out of very hard wax. I then roughed up the surface around the figure and scooped out the edges. Next I molded the charm in silicone rubber, cast some waxes under pressure to eliminate bubbles, and had the waxes cast in sterling silver by a jeweler. Two examples are in Photo #12; both are sterling silver but one has been plated in 18 carat gold.

What got me interested in writing this article is what I am going to in Photo #4 using a binocular describe next. Since reducing the medallion to 2 1/4 inches and 1 inch (5.72 and 2.54 cms) worked so well, I wanted to try something in the round. In Photo #13, assistant Jessica is behind three versions of a small statue of mine titled "Brooke." Jessica is there for scale, a purpose she fulfills somewhat better than a ruler or Bill in Photo #9. "Brooke" as I producer her is the 10 inch (24.5 cms) white version on the left. I had Elliott scan her and then I had her grown in photosensitive resin 1/2 size and 1/2 again. Since length reduced arithmetically but volume reduces by the cube, 1/2 becomes 1/8 by volume and 1/4 become 1/64. The smallest is really quite small, 2.5 inches (6.15 cms) but the detail is remarkable good. (Photo #14.)

While I have always enjoyed sculpting directly on a small scale, I have found the work tedious. Being able to construct a model at a more convenient size and then have it reduced accurately is a tremendous advantage. In addition, the door opens into more possibilities. For example, I could take a portrait head, scan it, and have it cast in miniature so that it could become a piece of jewelry. On the other hand, Bill, Elliot, and myself intend on offering "Grieving Friends" in a tabletop size. We have already sculpted the maquette which is too small and both the three foot and nine foot versions which are too large. Using the rubber molds for the nine foot figures, we are casting the pieces in forton MG partially to preserve them if something happened to the molds. But we will scan each piece, assemble them in a



Photo #10 Elliott Summons using the tabletop 3-D scanner



Photo #11. The medallion redone using the new technology. Notice the letters and the boarder. Shown here cast in resin with copper powder.



Photo #12. The quarter size charms in silver



Photo #13. Jessica and the two smaller "Brookes" which were grown in photosensitive resin.



Photo #14. The smallest "Brooke" only 2 1/2" tall. The detail is remarkable.

computer, and have have the tabletop versions grown as perfect replicas.

It is now possible to make statues without knowing how to sculpt in the traditional way. One can dress (or undress) a model, put him or her in the correct pose, scan, and have the statue made large or small in the methods I have described. We artist are way behind industry which has used similar technology for years. The Boeing 777 was the first aircraft made without constructing a nonfunctioning mockup. Most products are now developed this same way. Part of "Grieving Friends" is a rifle stuck into a sandbag with its bayonet. As an experiment, Elliott constructed the bayonet image on his computer, no physical model in clay or wax or anything else ever existed. The computer data allowed the milling machine to construct a perfect 1 1/2 life size bayonet.

There will always be people who feel that any new technology is cheating and besides being immoral will cause the destruction of "real" artists. The same thing was said about photography in its early years. Buy almost 180 years later, painters are still here. I have no doubt whatsoever that had our materials and techniques been available to Michelangelo, Rodin, French, St.Gaudens, etc., etc., and etc., they would have embraced them. But just as it would have been unethical for an early photographer to pass of a photograph as a painting, we have an obligation to be honest with our collectors and not claim to have produced something by a method we actually didn't use.

Speaking of collectors, if you become proficient at changing the size of your work, the next time a collector asks, "Exactly what size is that piece?" You can answer, "What size would you like it to be?"

Note: Two of the very best companies for both reducing and enlarging, Daniels Engraving and Cyber FX, are regular are regular advertisers in Sculpture Journal.

Bibliography

Hoffman, Malvina, *Sculpture Inside and Out*, W. W. Norton and Company, 1939.

Rich, Jack R., *The Materials and Methods of Sculpture*, Oxford University Press