Sculpting from the Inside Out “540 Hidden Split Torus”.

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Abstract

Contrary to what normal sculptors do, I only carve form inside the stone, never the outside. In the beginning (from September 2003) I made simple forms as balls, lenses, rings and cubes inside stones. One of my major assignments is that the integrity of the outside of the stone should be left as untouched as possible. My work is strongly influenced by Escher, and lately also by one of the world’s leading sculptors Keizo Ushio. As the outside of the stones must remain as intact as possible, it is the end result that dictates the way of going into the stone. In the PowerPoint presentation the working process of making “Hidden Split Torus 540” will be explained. During the Biennale (1-9 December 2007) in Florence Italy, this sculpture was chosen to be discussed in a public lecture by the art critic Paul Lorenz from the Art Academy of San Francisco.

Karel Sculptor

Although I grew up around the smell of oil painting, I was never before touched by art. Quite surprisingly I only started sculpting on a blue Saturday morning in September, 2003 at the age of 52 years after a short introduction to working in stone. During this workshop, they tried to teach me that I had to work on the outside of the stone, which I did not want to do. My goal was to separate a ball in the middle of the stone. What I did learn, was that I needed precise measuring instruments and a good feeling of the 3 dimensions of what I wanted to produce within the stone. As I had to develop techniques to go into the stone, I started with simple forms within the stone such as balls, cubes and lenses. [Fig 1 – 6].

I am a self-taught sculptor. My way of sculpting can be seen as an exploration of the inside of the stone. While exploring the inside, I try to leave the outside of the stone as untouched as possible.

Figure 1-6: Balls and cubes in different sculptures.

I even excavated stones completely so that a sort of Buckeye Ball remained. Stone, in whatever form, is for me the most beautiful material to work in. The limited possibilities of the fragile material lead me to my own artistic boundaries. While exploring stones on the inside, I was first strongly influenced by artists like Escher and Dali. Their drawing and paintings of peeled heads were an example of form peeled from stone [Fig. 7], and later on the reversed version where the
peeling is on the inside of the stone [Fig 8]. The different forms resulting from this process have a very organic appearance.

![Figure 7-8: External and internal peeling of the stones.](image)

The influence of Escher led me to the mathematical form of the trefoil knot [Fig 10]. As can be seen in figure 9, it was Escher’s drawing that served as an example for the Hidden Trefoil Knot that was carved in this alabaster boulder, hidden inside the stone as if it was an archaeological finding. This one turned to be extremely complicated to carve. There were more than 1001 possibilities to make a terrible mistake, but fortunately this one was a success.

![Figure 9-10: Escher’s Trefoil Knot served as an example for the Hidden Trefoil Knot.](image)

After all these experiments in stone I searched the internet to find other sculptors, interested in the same geometrical or mathematical forms. It is not difficult to find Carlo Sequin this way, and next all the sculptors he collected on his site of the Berkeley University. It was especially the work of Keizo Ushio that gave new ideas for mathematical sculpting. At this moment I was very excited about the 540 Split Torus of Keizo Ushio: “Dream Lens” in the Kobe Harbour. It appears that it has been formed out of 3 different rings. It is however a 540 degrees Möbius space band
that is splitting the torus in combination with a special surface texture that creates this remarkable sculpture.

Working on an alabaster boulder, this time I tried to hide a 540 Split Torus [Fig. 11] inside the stone. And later on a even more complicated one; a Hidden Split Torus 180 [Fig. 12].

Figure 11-12: Hidden split Torus 540 and 180 degrees.

Intrigued by mathematical knots the next project was a Borromean Knot, named after the famous 15th century architect from Italy. An example of this Borromean Knot was found on Carlo Séquin’s website. This was the first sculpture that was not constructed completely on the inside of the stone. It is an assembly of 3 different alabaster stones that were shaped into 2 rings and a standing part with a ring included. One of the rings had to be opened and contains a precision locking system to hold the 2 parts precisely together. [Fig 13].

Figure 13: Partly Hidden Borromean Knot.
Unlike classical sculpting procedures, for these kind of sculptures a sort of reversed thinking was needed to reach the final goal. One of the first problems is that the final form that will be left inside the stone has to fit rather precisely. If it does not fit, it will be practically impossible to carve it. In this case, the objective was that the torus had to be split with a 540 degrees Möbius space strip so the ring had to cross the borders of the stone on 3 different sides. At this point it was impossible to predict how the eventual splitting process could be executed. So it was decided to make openings on the top of the stone and on the bottom. As the stone is quite large, at a later moment the ring or torus had to be accessible on the inside of the stone. In this case an opening was introduced on the left side that you can see in [Fig. 11]. Without that, it would not be possible to do the splitting process in the end. The same problems and even worse appeared with the Split Torus 180 which was much more complicated to accomplish [Fig.12].

Having more than 100 images of the working process, in this paper only the major steps can be discussed. In the Bridges PowerPoint presentation all the images will be shown to give a detailed explanation of the problems I encountered making the sculpture.

Once the location of the openings was decided, the stone was carefully measured to calculate the diameter of the torus and from there to calculate the diameter of the tube that forms the torus. In this case it was calculated that the Alabaster stone could contain a torus 33 cm wide. The thickness of the stone permitted a tube forming the torus of 11 cm and a central hole of again 11 cm. From that moment on models could be made in cardboard and in wood for the diameter of the tube (11 cm), for the central hole (11 cm) and for the top of the ring (22 cm). They were necessary for quick verifications of dimensions during the carving process. At first on one side of the stone a flat surface was made with a diameter of 22 cm, which corresponds to the top of the torus. [Fig. 15] In the middle a hole was drilled through the stone to mark the centre of the torus on the other side of the stone. Once the centre was marked, on the other side of the stone a similar flat surface of 22 cm in diameter was created. [Fig. 16]. As can be seen in Fig. 16, a bended metal wire was used to draw a line on top of the torus with a diameter of 22 cm. As it is rather difficult to measure the thickness of the disk formed by the two
flat surfaces, for that reason a central hole was already drilled to do the measuring from the inside of the ring that was going to be formed. For this, with the aid of another bent metal wire, the outline of the central hole was carved on both sides of the stone [Fig.17]. Next with long small drills several hole were drilled, enlarged and the central segment taken out. [Fig. 18 and 19] Next using marble files, the inner surface of the central hole could be smoothed where by the two carved circles of 11 cm were joined. From now on it was possible to measure the thickness of the disk in all directions.

Figure 15 and 16  It is the final form that dictates the working process.
Figure 17-19  *It is the final form that dictates the working process.*

As was mentioned before, during the sculpting process the use of simple wooden and cardboard measuring tools facilitated the work. So a measuring tool for the diameter of the tube was made as well as a tool to maintain the 212 cm diameter outline of the torus. On the stone landmarks marked the spots that had to remain intact including surrounding stone in order to keep the integrity of the calculated form inside. Most sculptors work spontaneously and can recalculate the outcome of their work when dimensions do not turn out the way they had in mind. Carving the sculpture inside the stone while damaging the outside as little as possible, as discussed in this paper, demands an exact calculation of the material that must remain intact inside the stone to form the final intended form. Dimensional shift is not permitted.

At this stage the central disk is already clearly visible, both sides are flat and smooth, and the central hole has been adjusted to its final dimensions. (first final step accomplished). As the disk with the central hole must have the same thickness all around, both sides must be parallel. This could easily be verified with visual inspection using 2 pieces of wood and the help of one of my daughters. [Fig 21]. As one can see, some adjustments have to be made. Using this method we can also see if the correction is to be made on the left side or on the right side because using these pieces of wood we can also check the alignment of the disk in the stone.[Fig. 20 and 21].
After the parallel adjustments, the inner curvature was carved using chisels and marble rasps. In the top right corner of figure 22, a cardboard curvature stand can be seen which is used every 23 seconds to check for the proper inner curvature of the torus. After finishing the inner curvature, the predicted openings on the top and the bottom of the stone were made. Here measuring was extremely difficult. Using a wooden stand [Fig. 23] this part of the work became less difficult.
wooden and cardboard “measuring devices” it turned out to be extremely difficult. The problem was that the stone itself was much more brittle than foreseen. This way of sculpting on this scale demands a stone that has a high tensile strength. Marble and granite are on this scale much too brittle. Whatever you try, it will not succeed. On a larger scale, monumental, granite or marble will be the material of preference. Eventually, as you may see in [Fig. 24], a nice smooth torus was created on the inside of the alabaster boulder. For splitting there was not yet enough space on the left wing of Fig 24. The ultimate finding in this sculpture was to create a second hidden torus in the “wingpart” of the stone. This way a splitting process would probably be possible. After so many hours of hard labour, it was quite a risk to proceed with the splitting process. Some of the

![Figure 24 and 25](image)

**Figure 24 and 25** *The torus finished and the ultimate finding, a second hidden torus for better access for the splitting process.*

My friends said “Stop, take another stone and leave this one as it is, because it is already beautiful”. They were right, but the goal was a 540 split torus so the process continued.

**Conclusions**

Seeing the paper written above, my conclusion is that much of the success of the sculpting process depends on decisions taken at the right time. Overseeing the process, having a 3rd sense of possible problems that may occur are probably the most important factors that may influence a certain final result. What is very important in my sculptures is that the original form of the stone must be recognizable. In all of my sculptures, except
the Borromean Knot, the original form of the stone can be restored by filling up the stone with wet sand that is the same color as the stone. Probably in my Bridge’s Power Point presentation an animation will be included where this intriguing process will be explained in a very exciting way using snow and clay,….My secret.

References


Dear Revisers

This paper is not finished,………………. YET

I will probably need 3 or 4 pages more to conclude this paper. My problem, to many images that I really need to explain the sculpting process.

Being Dutch I probably need some help from my English speaking colleagues.
Should I talk about me, “I am sculpting”
Or should I talk about him, “Karel is sculpting?”
I am trying the last one which gives me a weird idea , because I am talking about me as if I am someone else.

Please help me to find the proper solution, maybe a co-author may solve this problem.
Any suggestions??
I did already a presentation during the FIRENZE Biennale in December 2007 on “the making of the 540 Split Torus” which was received with much enthusiasm. (1 hour)