

A Journey into the Genesis of Related Math-Art Works

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Abstract

Serendipity, a key ingredient of artistic creativity and associated with a natural joy and curiosity about cultivating transgressions, brought me again to elaborate on a couple of captivating artworks: in this instance a painting and a bronze dyptic, both involving an optical illusion that finds its root in the Necker Cube.

First an Almost Blind Meandering in Paint...

Friends know my appetite for strange geometrical/artistic occurrences. The evidence consists of my many non-scholarly papers contained within the extensive Bridges vault (see my tangramoids, Atomium, labyrinths, and more recently, musical keyboards). This time, I suddenly sketched a wireframe rendering, in a non-symmetrical 3-point perspective, of a rectangular parallelepiped. See Figure 1a. In front of this scribble of lines, now carried over to the easel, I decided that my first sin would be to use six shades of my American acrylic blue to fill the six zones around a seventh that I had already given a brilliant red. I then broadened the box edges and painted them with mat gouache to give them a differentiated texture as shown in Figure 1b. This coloring destroyed the perspective, as it obviously bore no physical relationship to the represented wire construction.

Yet I placed the object in a credible setting, built from the perspective sightlines, as if it was sitting open between different planes (shown in Figure 1c) where again I used colors between lines, here quite logically. However, as the new color choice seemed inadequate, I washed off the colors and removed the black gouach frame. In a great sunny instant, I saw the upper wooden frames of the glasshouse of my studio shedding large shadows on the canvas. Amused, I made another two strange additions (where physical and mathematic subtleties do play significant roles under the covers): (1) I traced the contours (see Figure 1d) in order to, after a better total recoloring later, just add a white acrylic wash in between, instead of darkening this geometrical zone as the shadow it originally was, and (2) I made the now “hidden” central red spot into a handsome bright oval.

Turning point: another crime! Finally, looking at this black frame, I gleefully tricked the viewer into seeing a completely different object, as it turns out, just by drawing golden contour lines, inducing the perception of the two crossings to be inverted (see the finished painting in Figure 1e, to the left under the red center oval, and to its upper right). What I obtained was what I later discovered to be something similar to the Necker Cube illusion [4]. But there is an important and striking difference with the Necker Cube: the alternate object seen no longer looks like a rectangular parallelepiped but now like a distorted 3D trapezoid, one in which the six faces are just flat quadrilaterals with no parallel sides or right angles! One can even imagine a non-polyhedral solid with non-planar faces!

...and Suddenly Real Surprises! As an unexpected result, when about to enter the exhibition place at our local cultural center, where the work was to be presented like a diamond on a wall (see Figure 1f), too far away from the room entrance to see my new misleading details (see Figure 1e again), I couldn't imagine beforehand what object I'd see, a real flip-flop making it impossible to grasp both views at once. See Figure 1g, where I tried to emphasize clearly the two different interpretations.

Recently, with the painting now installed at home, a new serendipitous occurrence took place as the structures of the glasshouse above and to the left shed shadows on the canvas (see the inserted image on

the bottom left corner, Figure 1h), mimicking the same situation that had triggered my addition a few months earlier in the studio.



Figure 1: *Painting, (a-d): genesis; (e): final; (f): as displayed; (g): alt. visions; (h): recent shadows*

Ancillary Topics, Essential Anchoring Points in my Creation Journey

Similar visions suddenly emerge. Some time later, I happened to see structural artworks by Gérald Dederen and Robin Vokaer at an exhibition in a well-known private home [6] open to the public close to the university of Liège in Belgium, and again I was struck by the same vision. See Figures 2a and b.

Then Zometool and vZome came along. I wanted to define geometrically the possible strange things hidden behind the “regular” primary object, and suddenly along came the most lovely Zometool [7] and the even more powerful vZome [3], which can generate non-existent Zometool-compatible stock. Scott Vorthmann, the creator of the latter, suggested to me that I build a lateral view containing the location point of my eye looking at a given object, here a regular Zometool “b1, b2 and b3” box, to be able to construct the viewing “cone” to the box nodes and beyond. Figure 2c shows the method in a nutshell: to place the new nodes representing the front face of the new object on the back sightline of all the original nodes close to the back face of the original object, and vice versa to return the new object, so inducing one of infinite possibilities of reverse views. The little inserted image on the lower left of Figure 2c even shows the case in which the node the farthest to the left of the alternate solid is moved farther to the left of the cone summit, so generating a non-polyhedron with three non-planar faces, as mentioned above! (Of course, the fading depth mechanism used by vZome prevents one from going far behind the original object, except when viewed closely from the side.) This domain has gained immense and complex developments, with the strong requirement in virtual modeling to often automatically resolve ambiguities. Movement between close views is also an important help, as can be seen in following topic.

“Amuselet.” A nice little optical illusion popped into my mind and needed to be shared with the many who have not seen it! The wire cage, the so-called “muselet” that fixes the cork in place on champagne bottles, allows for a surprising trick that I show my friends at parties. Figure 2d shows it and how to hold it in line of sight, one eye closed, the large ring in front and the smaller behind. The idea is to get the illusion that the smaller ring comes forward (quite easy in fact for most people), and when you get to that, you slowly rotate the object with your thumb (and indeed the small ring keeps floating in front), but very strangely, the thing appears to turn in the opposite direction to your movement.

The mask illusion. A helpful reviewer mentioned something that struck me long before: when you look inside a mask, you may be tricked into contemplating the convex figure instead, possibly influenced by the lighting conditions, and it seems to follow you when moving to the side [5].

Another past work resurfaces. In this context, I feel compelled to share the story of the Golden pyramid (first presented at the Pécs 2010 Bridges conference) that I saw in the K5 graph [2]. I find it strange that it took a while to come back to my mind, knowing how much time I had devoted to it. In [2] I announced that I had expected to see an infinite number of pyramids developing from the K5 between said Golden pyramid and the Bizzarri French fry, itself an infinitely long square-base prism looking for its summit among the distant stars. And I did write a Cabri model [1] that I believed to have lost, but that I recently found buried on an external hard disk. Figure 2e below shows screenshots of the Cabri model, and Figure 2f shows a vZome image I recently constructed in the same vein as above for the Golden Pyramid.

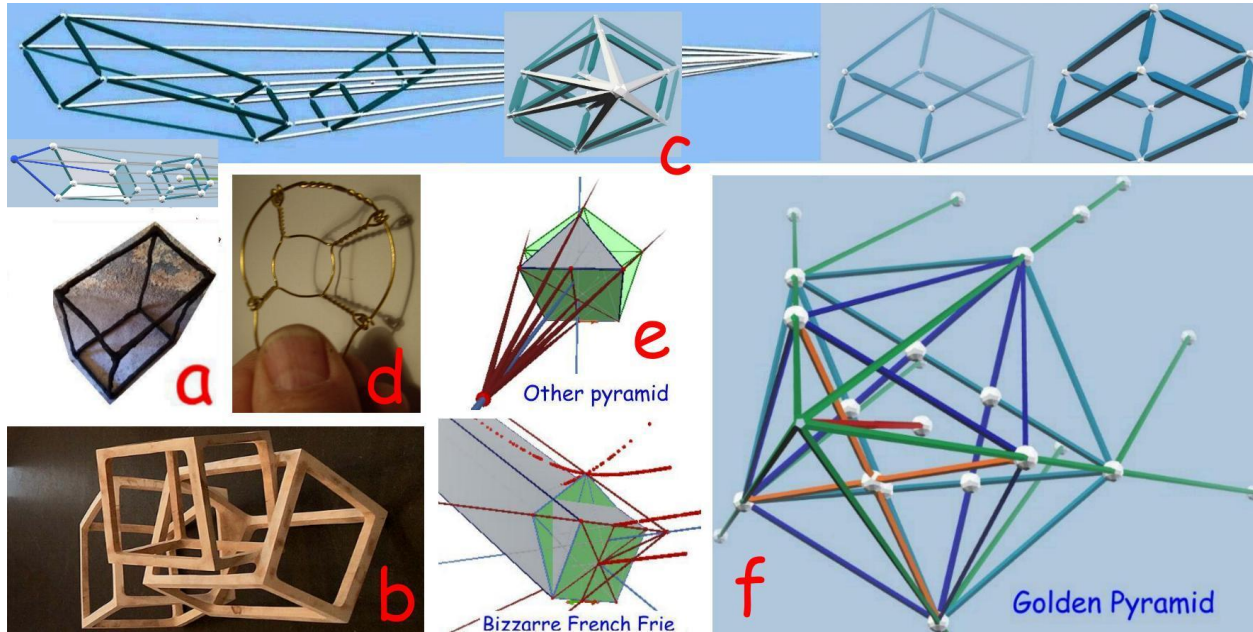


Figure 2: (a, b): other artworks; (c): Zometool/vZome; (d): muselet; (e, f): Cabri/vZome pyramids

Bronze Dptyc Derived from Above as the End of my Journey

As I was introduced to a particular kind of bronze foundry technique at a workshop that suited the production of an experimental pair of bas-reliefs, sure enough I chose to explicitly represent both of the alternate views of the wireframe structure in the above painting.

The end process of industrially producing machine parts in cast steel often involves the use of a pair of wooden half boxes containing a complex empty space of the desired shape molded in a special kind of sand and using several model pieces to encompass the many recesses of the parts. After the molten metal poured inside trough appropriate channels open to the upper side has solidified, the piece is delivered from the baked sand to undergo chiseling (i.e., removal of the solid channels around), reworking of the rough surface, including polishing, and finally, for artworks, etching. For creating statues and smaller artworks, one ends up pouring molten bronze in a standalone mold in special material, a classical technique I was familiar with.

Here instead, for shallow flat bas-relief plaster models without recesses, a much simpler technique involves using only one rectangular wooden frame on the table, placing inside it the model, over which sand is compacted. One then turns over the whole thing and removes the model, readying the opened dish

to directly receive the molten bronze. Figure 3 retraces the successive stages and the final result, where it must be stressed that the strange holes are accidental, yet are interesting from an artistic standpoint.

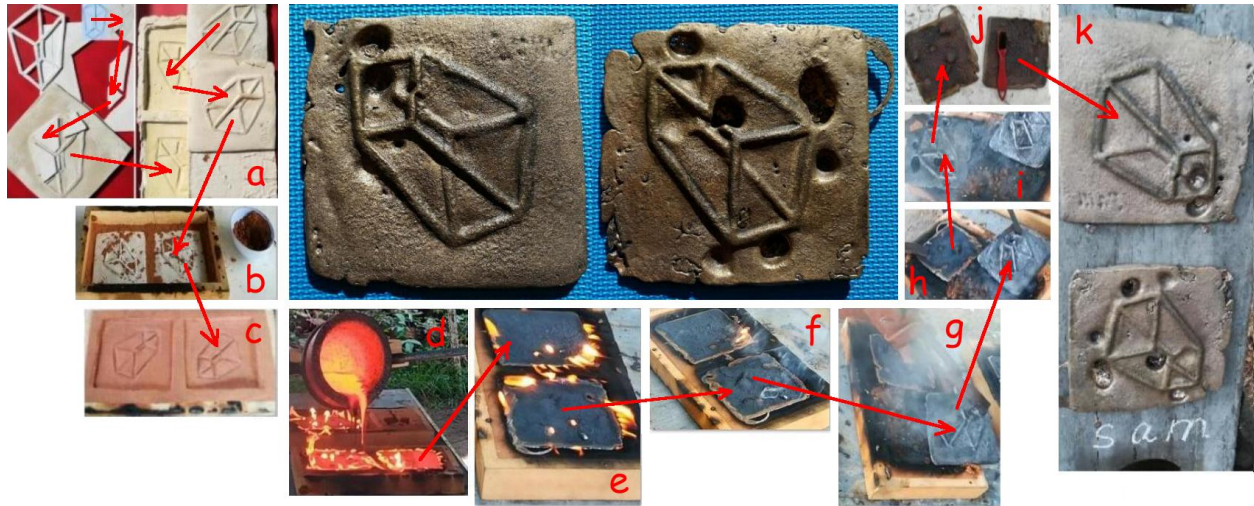


Figure 3: the making of the bronze dyptic optical illusion made unambiguous, resulting in different frames. Starting from top left, the small inserts around the final image of the work signify: (a) initial steps from the sketch to one of the final models, (b) beginning the fill of the frame, (c) mold ready, (d) end of bronze pouring, (e) bronze solidifies, (f) almost ready for unmolding, (g) unmolding of the first part, (h) discovery of the holes, (i) unmolding of the second part, (j) back of part during scale removal, (k) the dyptic as shown on an old wooden pole during the exhibit at the end of the workshop.

Summary and Conclusions

I hope that this paper, which was written in Heidegger's spirit of unconcealment (and is exemplified by his delightful text *Das Ding*), explains my efforts to create interesting artworks on subjects that often rely on knowledge beyond my comprehension in mathematics, physics, and (on this occasion) cognitive psychology.

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References

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