

Artformer Geometry

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Abstract

My reconfigurable geometrical objects are somewhere on the border between scientific curiosity, pure playfulness and sculpture. Their elements can move, and they can be transformed into various forms by rotating them according to our curiosity and mood. The basic underlying form always approximates to a regular solid, which may be turned into a random form or a pleasing, organic statuette. There is an intimate interplay between the sculptures and anyone who chooses to investigate them; there is no set goal and no right or wrong answer. With modern technology they can be automatic, and could be remote-controlled.

Theory and Practice

As an artist I use geometrical terminology in its freer, everyday sense, rather than with its precise abstract meaning. This artistic approach often does not match the strict mathematical usage. We say ice-cube for instance, refer to block buildings as cubic, and use the word pyramid for ancient buildings. In fact, in this we are saying which form they resemble the most. Pyramids most closely resemble the mathematical solids of the same name, however their surface is not what we would expect in geometry because of the technical steps of the construction. That is, they are not the planar faces of a polyhedron. I was inspired by this fact, and tried to turn the process the other way around, and I examined to what extent I could depart from the physical forms while keeping to the original geometrical form in a philosophical and artistic sense. For instance, if I cut a piece from the cube, to what extent can the 7 sided cube (heptahedron) still be called a cube for art and by non-specialists? My first object, named KREABAU (figure 1), is a set of basic geometrical solids that are cut by other regular geometrical forms. These deformed spheres, cylinders and cubes are not imperfect, but have become different from regular forms. They have direction and individuality, and provide many possibilities for building Cubist sculptures.

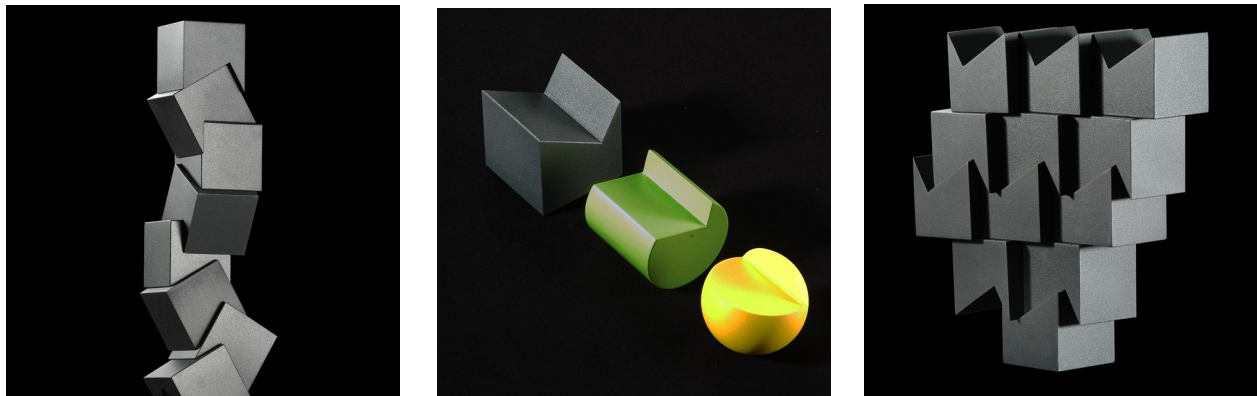


Figure 1: *KREABAU*

Axioms, parameters and preconceptions. Mathematical axioms are simple, strict and were programmed into us a long time ago, however we all are aware of their limitations. The great explorers and mapmakers had to deal with the problem of the difference between plane and spherical geometry, however, for many people, it is still a surprise that the sum of the angles of a spherical triangle is not fixed but varies within a certain range. New geometries can be born with the help of new axioms and parameters. I am proud to mention Janos Bolyai, who created the non-Euclidean geometry with his work *Appendix*. His geometry is an essential basis for 20th century theoretical physics.

Deformations and projections. We don't need to wander so far away because even within Euclidean geometry we have countless possibilities yet to be utilised. For instance, if we distort a circle in a regular way we get an ellipse. If we build a prism or a cone on this ellipse, the resulting solids maintain some of the defining features of their circular equivalents while replacing some other features with new ones, but there are some surprises; we can find strange characteristic features in them. Distorting a circle into an ellipse can be regarded as projection.

Sections and variability. Geometrical solids can be divided into parts by slicing. We know that elliptical cylinders can be cut at angles so as to have exactly circular cross sections, and the joints that can be seamlessly assembled with arbitrary angular rotations. ELLIPSO, a classical wooden toy designed by Xavier de Clippeleir, is a good example of this. With my HELIX object (figure 2), the non-parallel sections are also circles! It is movable, having eleven rotatable segments. The basic form is a simple (but deformed) cone cut by planes to create a variable object consisting of segments. The segments are arranged consecutively, meeting each other at the intersecting planes that divide the object into segments. They can rotate with respect to each other along the section planes. At each of the sections a profile - defined by the bounding surface - is formed belonging to that particular section. There is complete freedom of rotation between connecting parts.



Figure 2: *HELIX*

Thus one can produce an endless variety of forms by rotating the segments. The different shapes may express different personality or emotions. Thus we end up with not pure geometrical forms, but characters with personality, such as chess pieces (Figure 3). In my version of 'chess', MODERN FOLK TALES, there is only a single set of chess pieces, and the fight takes place between the figures of this one team. Stand up, and you become a king!



Figure 3: *MODERN FOLK TALES*



Figure 4: *INFLEXIO*

Ranges, sequences and isomorphism. We can create a series of three dimensional pieces ordered like numbers. In this way, organic looking mobile plastic art can be produced by building simple, abstract geometrical elements. One example is my INFLEXIO (figure 4), which has identical articulated elements connected to form a Möbius strip.

In more complex cases the elements that are built next to each other are not identical, but partially similar, forming parts of a systematic series. The segments belonging to each particular sculpture are joined by a special connection, allowing an unlimited number of rotations, just like with the HELIX. This is how my object group GEOMETRICAL PANTHEON (figure 5) was made. Here, circles are not the only cutting planes: some of the sculptures have triangles and squares, too.



Figure 5: *GEOMETRICAL PANTHEON*



Figure 6: *SPEHERE*



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Mobility and interactivity. The Geometrical Pantheon consists of 12 individual sculptures, the elements of which can be rotated and moved manually. By rotating them, they can be transformed into varied forms according to our curiosity and mood. All the basic underlying forms approximate to a regular solid, which may be turned into a random form or a pleasing, organic statuette. There is an intimate interplay between the sculptures and anyone who chooses to investigate them.

There is no set goal and no right or wrong answer. With modern technology they can be automatic, and could be remote-controlled. They can come alive; their movements and dance are beyond simple demonstration or variations. Analogies can be found and symbolic messages can be imagined. The short film LIBRETTO available on my website at www.artformer.com gives an idea of these possibilities.

Art

Some words about the most recent exhibitions:

The mobile sculpture group named UNIFORM (Figure 7) is an interpretation of being different and the feeling of not being the same. This piece of work has also been exhibited in Dessau, at the Studio-Gallery of Kandinsky and Klee, two of the Bauhaus's famous teachers. The three cones with exactly the same shape, size and decoration are made of different components.

The sections of the first figure are parallel. The second one has periodically varied angles while the third one has a spherical surface. Visitors tried to set and move their mechanism in the same way unsuccessfully, because the results were always different except for the base form.

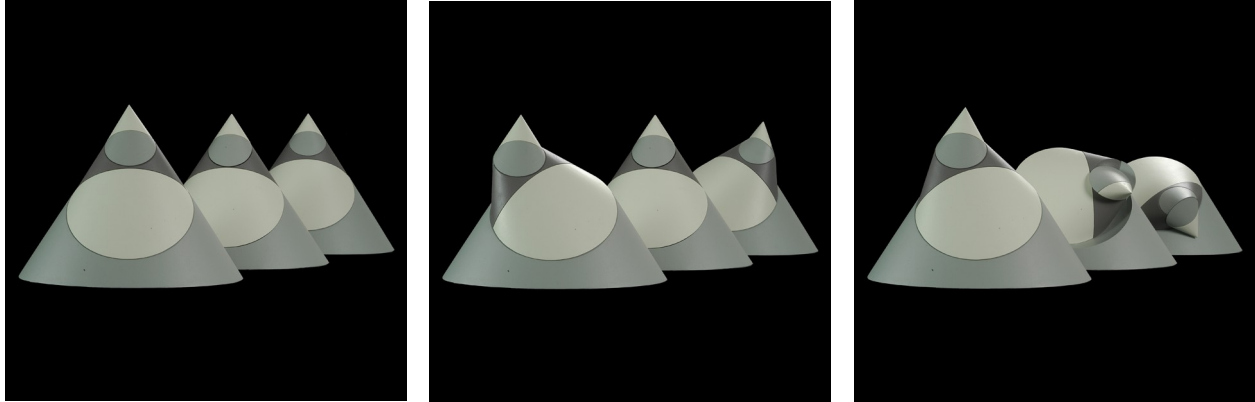


Figure 7: *UNIFORMS*

My NEXUS project (figure 8) was exhibited in Hungary in the Renaissance Hall of the Museum of Fine Arts in 2009. It is a platform for the interaction of several individuals, and uses the most up-to-date technologies. The statue of a couple, almost 6 meter tall, that uses the entire space is exceptional in the history of art from the point of view of interactivity. The change in the joint angles is controlled by the combination of input signals coming from different sources, which can be local to the exhibit or may come from spectators in remote locations who view the sculpture over the internet or even on cellphones. Visitors to the Hungarian Museum of Applied Arts, at the Moholy Nagy University of Art and Design in Budapest, could watch the dance of the sculptures on terminals. The participants in this relationship were unknown to each other. The indirect behaviour and reactions revealing themselves in the movements of the statues developed into play, co-operative acceptance, or even denial.



Figure 8: *NEXUS*



Figure 8: *NEXUS*

My newest project is both the biggest and the most time consuming to build. It will be an interactive moving monument, a more than 25-meter-high moving steel tower, named *INDIAN DESIRE* (figure 9), that is being realized in Ahmedabad, India. Its structure is similar to the sculptures of the *GEOMETRICAL PANTHEON*, with square sectional faces. The shape of the column came from the traditional Hindu temples and Muslim mosques (like Qutab Minar). I abstracted and combined these forms into a non-regular prism, and cut them with planes into 6 pieces. The moving steel sculpture will twist, change shape and colour, and will be controlled by the visitors with the help of sophisticated, robotic motors and special-purpose software.

Conclusion

I have always been interested in objects made with geometrical oddities, especially ones made from identical or similar modules, or ones based on similar principles. When preparing the present paper, I was pleased to discover that several contemporary artists are exploring similar ideas. Koos Verhoeff - with the systematic of the mathematician - examined the possibilities of miter joints and variants [3]. Rinus Roelofs builds – in real and in virtual – module-base sculptures [4]. His Non-Flat tilings resemble to my objects built of identical modules. Roland de Jong Orlando [5] and George Hart build objects of modular kits [6]. In the beginning I made toys with the concept of 2-dimensional modular building blocks which were not joined, and were like puzzles or tangrams. The 3-dimensional sculptures described in this article

are cut and joined in a special way, and the shapes, principles and concepts are patent pending. I believe that these objects deal with contemporary problems, approached more from an artistic than a mathematical point of view.

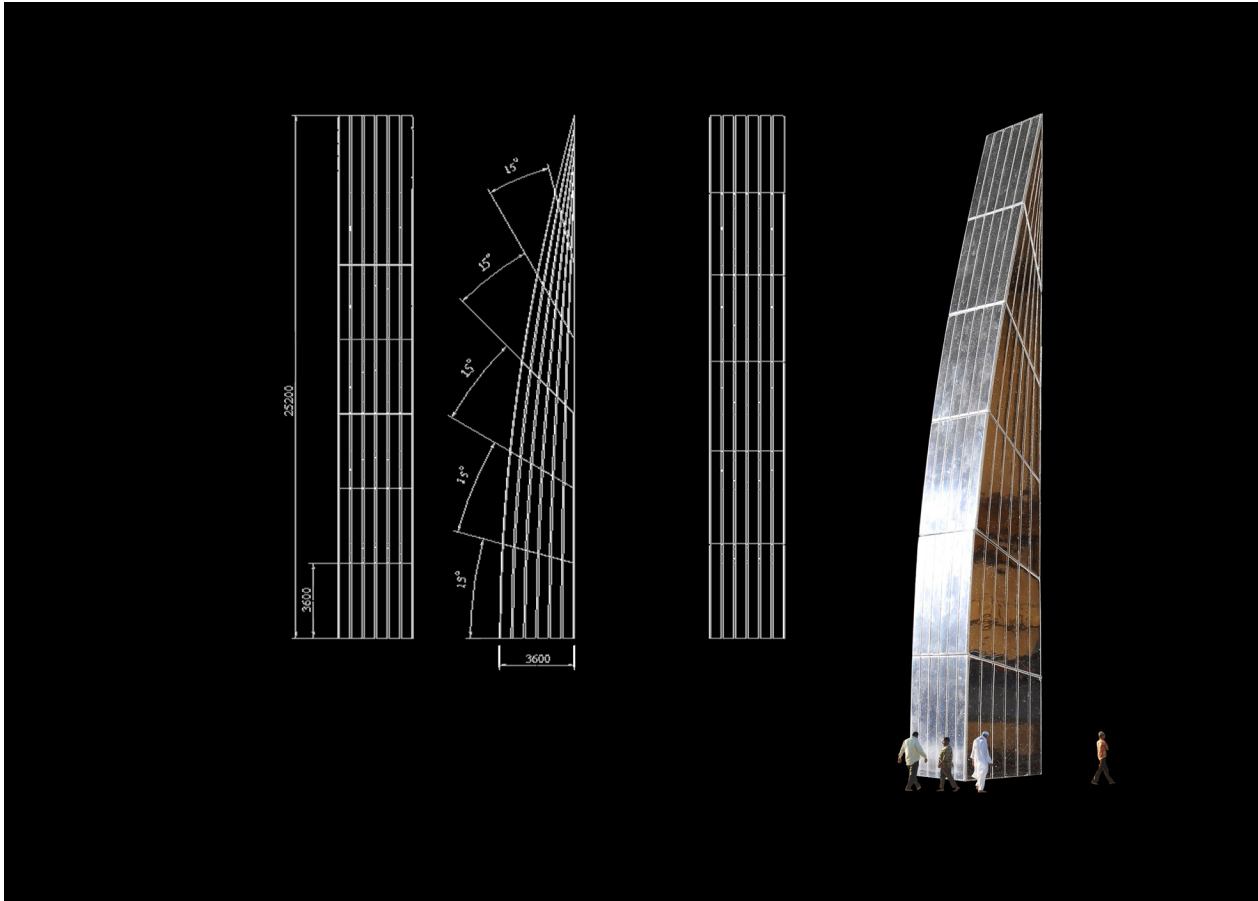


Figure 9: *INDIAN DESIRE*

References

- [1] Xavier de Clippeloir: *ELLIPSO* <http://www.naefspiele.ch/index.php>
- [2] Antal Kelle: *LIBRETTO* <http://www.artformer.com>
- [3] Tom Verhoeff, Koos Verhoeff, *The Mathematics of Mitering and Its Artful Application*, Bridges Leeuwarden 225-234. 2008.
- [4] Rinus Roelofs. *Non-Flat Tilings with Flat Tiles*, Bridges Banff pp.183-192. 2009.
- [5] Roland de Jong Orlando, *Module-Based Sculptural Constructions* Bridges Leeuwarden pp. 353-362. 2008.
- [6] George Hart <http://www.georgehart.com/sculpture/sculpture.html>

Photos by: Istvan Oravec and Emese Kelle