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# The hyposthases of symmetry

**Budişan Tiberiu[1]**

**Abstract: This paper presents and analyses various aspects of symmetry in domains of science, culture, art.**
**Keywords: symmetry, aspects, science, culture**

## 1. INTRODUCTION

Things are generally symmetrical in nature. The notion of symmetry suggests a certain harmony, a certain order and sometimes very precise laws. Symmetry reflects a certain logic of orientation and organization towards which most things seem to aim in their natural evolution. It seems that there is no field where symmetry makes its presence felt. Everywhere around us we find symmetries: the earth has two poles, two hemispheres, the electric and magnetic field show symmetrical appearance and manifestation. Symmetrical structures can be seen in the leaves of plants and trees, the snow flakes and crystals. The human body has an obvious bilateral symmetry. Echinoderms' body has a pentaradial symmetry. Symmetry has not only an aesthetic role but also a functional one.

Symmetry can be of different types. According to [1] these are bilateral symmetry, translatory symmetry (rhythmic and cylindrical) rotary symmetry (cyclical and dihedral) and spatial rotary symmetry.The present paper treats aspects of some unusual symmetries, many of them being proposed by the author.

## 2. THE SYMMETRY IN SCIENCE

### 2.1. The Symmetry in Technical Drawing.

Representation of symmetric parts can be "on half" or "on quarter" and parts, being represented in "half section-half view", reduce the number of necessary projections.

### 2.2. The Symmetry in Geometry

The large majority of geometrical shapes are symmetrical: triangle, square, rhombus, hexagon, circle.

### 2.3. The Symmetry in Chemistry

Many chemical molecular structures and links show symmetry after various directions, ensuring durability and stability of these substances.

### 2.4. The programmed symmetry

Fig. 1 gives a simple example of a symmetrical image obtained using the C++ programming language.

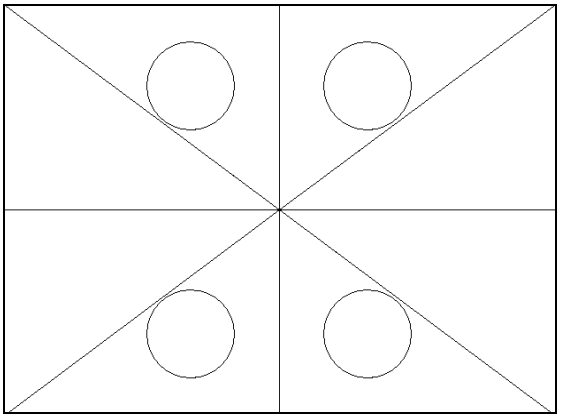

Fig. 1

The program uses functions from graphics.h library for drawing lines and circles. The following is the program source.

```
#include <graphics.h>
#include <iostream>
#include<math.h>
using namespace std;
const double PI = 4.0*atan(1.0);
int main()
{
int gdriver = DETECT, i, gmode;
initgraph(&gdriver, &gmode, "");
moveto(getmaxx()/2,0);
lineto(getmaxx()/2,getmaxy());
moveto(0,getmaxy()/2);
lineto(getmaxx(),getmaxy()/2);
line(10,10,getmaxx()/2,getmaxy()/2);
line(getmaxx()/2,getmaxy()/2, getmaxx()-10, 10);
line(getmaxx()/2,getmaxy()/2,getmaxx()-10,
getmaxy()-10);
line(getmaxx()/2,getmaxy()/2, 10, getmaxy()-10);
circle (getmaxx()/2-100, 100, 50);
circle(getmaxx()/2+100, 100, 50);
circle(getmaxx()/2-100, getmaxy()-100, 50);
circle(getmaxx()/2+100, getmaxy()-100, 50);
getmaxy()/250*sin((PI*i)/180), 50);
return 0
}
```

Based on this model, in a similar manner or other methods one can obtain images with more complicated symmetries. Computer graphics can be implemented using various programming languages and environments.

[1]Technical University of Cluj-Napoca, Department of Automotive Engineering and Transportation, Street Muncii, no. 103-105, zip code:400641, Cluj-Napoca, Romania, E-mail: Tiberiu.Budisan@auto.utcluj.ro

3. THE SYMMETRY IN CONSTRUCTIONS (ARCHITECTURE) AND ART

Fig. 2

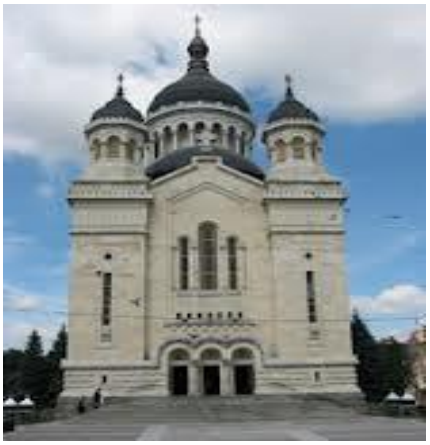

Fig. 3

Fig. 4

Fig. 2 represents the National Theatre in Cluj-Napoca, Fig. 3 the Orthodox Cathedral of Cluj-Napoca and Fig. 4 the Maniu Street in the same city.

Fig. 5 represents the "Kissing Gate", work of the great Romanian sculptor Constantin Brancusi.

In the city of Samarkand is the Timur Lenk Mosque (Fig. 6) with "mirror drawings" at the entrance. The Taj Mahal mausoleum from India is renowned as one of the most symmetrical buildings in the world (Fig. 7).

Fig. 5

Fig. 6

Fig. 7

Contemporary architecture recognizes the wide symmetrical parks, markets and squares with many access points.

4. SYMMETRY OF LOGOS AND EMBLEMS

In situations when people's eyes and minds must be attracted and captivated, symmetry is chosen by many companies since it has important effects in achieving these goals. Here are a few examples, shown in figures 8, 9,10, 11, 12, 13, and 14.


Fig. 8


Fig. 9


Fig. 10


Fig. 11


Fig. 12


Fig. 13

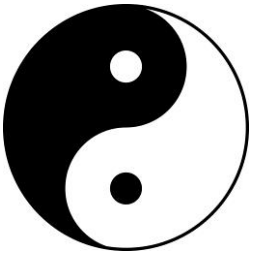

Fig. 14

5. SYMMETRY IN INDUSTRY

Machine tools placement in the production departments of factories is designed according to symmetry principles.

There is also an obvious symmetry, both aesthetically, but also especially functional in cars.

6. SYMMETRY IN SPORT

Sport is another important activity of people in that symmetry is present in the form of football, basketball, handball, hockey, rugby, tennis fields and to form of various sportsmen' equipment.

7. SYMMETRICAL LETTERS, CHARACTERS AND WORDS

| | | |
|---|---|---|
| **COD** | **BECI** | **DECID** |
| **DOI** | **CIOB** | **CODEX** |
| **IED** | **BICI** | **DIODE** |
| **BOI** | **CHEI** | **DEDIC** |
| | | 0 |
| **IOD** | **BOXE** | **DIOXID** |
| **DOC** | **CIOC** | |
| **BOB** | **EXOD** | |
| **COC** | | |

Fig. 15

If the sheet of paper containing the words from Fig. 15, will be rotated by 180°, by the Ox axis located in the plane of the paper and the paper will be looked at a light source, one can see exactly the same words on the paper's back. These words have a meaning in Romanian.

In other languages one can find words that have the same property and have a meaning in those languages.

The palindrome can be considered an example of symmetry of words. For instance:

| |
|---|
| **ELE NE SEDUC CU DESENELE** |

Other examples of symmetric Romanian words:

| |
|---|
| **DUD, RAR, CUC, TARAT, CINIC, COJOC, CAPAC** |

Starting from the symmetry of the letter **E** one can obtain a tesselation elements is shown in Fig. 16:

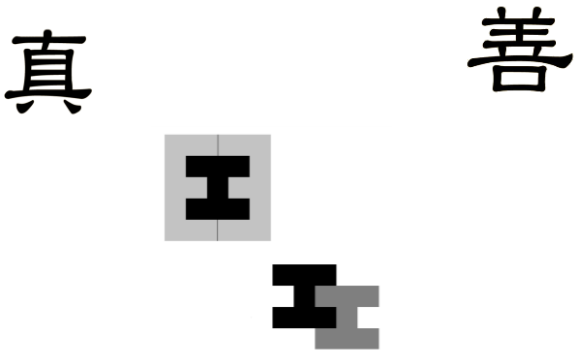

Fig. 16

Some Chinese characters are symmetric and have different meanings. Here, for example, is the character Zhen, meaning "truth" and the character Shan meaning "kindness".

## 8. SYMMETRY OF THE NUMBERS

There is also the symmetry of numbers. When we talk about it, we can think of digit 2, which divides all the even numbers. But numbers can surprise us with other symmetries like in figures 17 and 18.

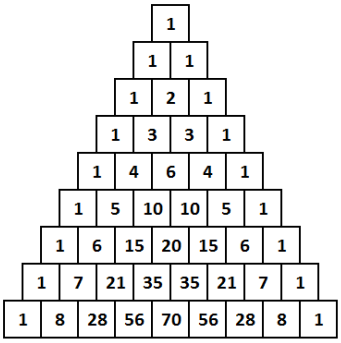


Fig. 17

```
1 x 1 = 1
11 x 11 = 121
111 x 111 = 12321
1111 x 1111 = 1234321
11111 x 11111 = 123454321
111111 x 111111 = 12345654321
1111111 x 1111111 = 1234567654321
11111111 x 11111111 = 123456787654321
111111111 x 111111111 = 12345678987654321
```

Fig. 18

Mirrored digits lead to interesting symmetric shapes like in Fig. 19.

Fig. 19

## 9. OPTICAL ILLUSIONS

Symmetry can create various optical illusions:


Fig. 20

Due to symmetry, using the pads represented in Fig. 20 and their corresponding written letters, a 3D illusion of spaciousness was obtained.

Some overall (symmetric) objects viewed from another angle can lead to optical illusions (Fig. 21 and Fig. 22).

Fig. 21

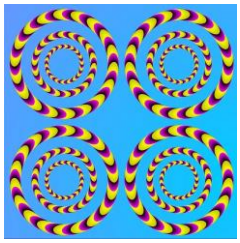

Fig. 22

## 10. ASYMMETRY

Asymmetry is also present people's lives. It can be annoying or disturbing in some cases (Fig. 23), but sometimes it is expressly sought and used to highlight something important or to attract attention.

Fig. 23

## 11. CONCLUSIONS

Whole books have been written and also could be written in the future about symmetry and its hypostases due to the multitude of areas and variety of issues that involve the research of this domain. In this paper, the author briefly presents and highlights some new aspects of symmetry with very varied fields and its forms of manifestation, proposing some approaches and new examples on this topic.

## REFERENCES

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[3] *** http://fineartamerica.com/featured/optical-illusion-spinning-water-lilies-sumit-mehndiratta.html