

ISIS-SYMMETRY: LOOKING FOR TRUTH AND BEAUTY

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In the last six years, *ISIS-Symmetry* became the center of a network bringing closer to each other scientists and artists, got active in over fifty countries, and is present at almost all of the World, the East and the West, all hemispheres, all cultural regions. A part of the participants of the Congress may remember my lecture at the Katachi U Symmetry symposium held in Japan last year, where I spoke about the dimensions of the mutual influences of the approaches to science and art in the East and the West, and in different cultures (Darvas, 1994). Then, in the heart of an Eastern culture, I concentrated on the Eastern origins of creativity. Let me concentrate now on the Western origins of our human creativity. Taking out of consideration the width of the uninhabited Atlantic Ocean, there are about equivalent distances of the lands of Europe and America, i.e., the lands of the traditional Western culture, to the East and to the West from the Congress venue. (Similar statement can be made for the North and South.) Thus, in a certain sense we are in the center of this specially considered region¹, and the feeling to be in a center (of anything) provides us with an illusion of comfort feeling. This follows from our world view. We own a world view since ancient times, what suggests us, that we presumably should live in a world, which is *perfect*. What perfect is, should enjoy a center, and be quasi-isotrop around this center. And one finds the world most beautiful and most quiet, when sees from the center, and finds it similar in each (or periodically repeated) directions.

This picture of the world can be demonstrated in science and art since the origins of any culture. One could mention the *mandala* in India, the *yin-yang* in China, the

¹ The borders of this region have been changing, and so the center moved towards former peripheries during the recent history. Science and art historians demonstrate, that both cultural activities developed around the 'center' in all historical periods *more intensively*, or more precisely: *influentially*, than at the that time peripheries.



tomoe (the perhaps most widespread symbol in shrines) in Japan, etc., but let me concentrate now on the origins of the so called Western culture: the Mediterranean basin, having been its center about three thousand years ago.

Most of our ancient Mediterranean learned colleagues tried to find an as perfect model of the world as much it could be fitted to their experience about the reality. They were convinced, that our world *must be* perfect. One succeeded to describe the world really, if one reflected the nature in *true* statements and represented in *beautiful* compositions. *Truth* and *beauty*, they were the two criteria of the *perfectness*. The perfectness of the world could be treated like an axiom; there were the declines from this state what should have been explained by some reasons. Their strives to describe the perfectness culminated in the search for perfectness in the forms. Form meant different things in different (later so called) 'disciplines': (a) the perfectness of the statements in the logic, (b) the perfectness of the physical appearance in the geometry, and (c) the perfectness of the works of art. In the Hellenistic culture they were not separated. Soon later the first became associated with the rationality (science), the third one with the emotionality, impression (art), while the middle one more or less with both. This explains, why could it (b) save its bridging role (proportion, harmony, golden section, etc., ... *symmetry*) between sciences and arts during the centuries of separation (cf., D. Nagy's opening lecture at the first Congress of ISIS-Symmetry "Symmetry of Structure", Budapest, August 14, 1989). To follow this path, their search for the most perfect forms reached its climax in finding the so called five regular Platonic solids (not mentioning now the evidently most perfect body: the sphere), namely the tetrahedron, the cube, the octahedron, the dodecahedron and the icosahedron. The 'perfect' Greek 'forms' run an unprecedented career in the role played by them in the sciences (a) and the arts (c) since then.

The three golden centuries (6th to 3rd B.C.) of the Hellenic culture incorporated in a unique system all the achievements by the nations in the Mediterranean basin reached in the previous millennium. What worth more attention from our point of view, that this cumulative peak age coincided in the (later terms called) sciences and arts. According to the separated interpretation of the origin of science and the origin of art in the recent centuries, this fact would be not quite natural. In our interpretation we state: this happened not by chance.

Let us have a look to an other example. Perfect reflection of the world characterised not only the exact descriptions, like in the geometry, arithmetics, or astronomy. Description of the sky was exact, projected to (a) sphere(s), and the more phenomenological description of the Earth should have mirror the sky (cf., the Globe model, or at least the plate model). Geography, i.e., the physical

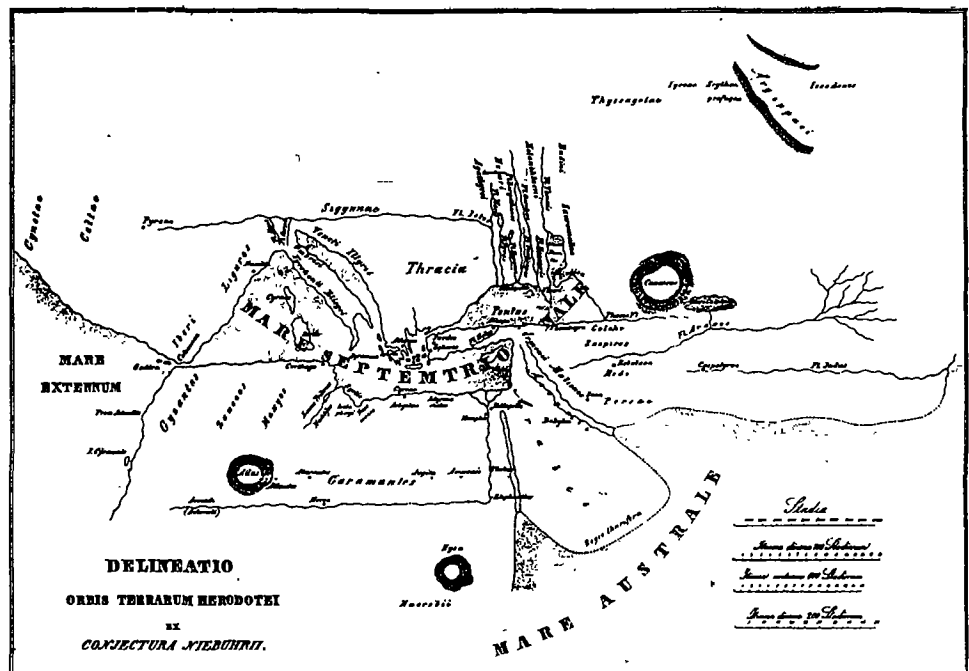
phenomenological description of the surface of the Earth must have followed this picture of the world. (We know, that practically it does not.)

Most of our knowledge about what ancient people knew about the Earth and its inhabitants originates from the historical books of Herodotos, where he summarises all what in his age was known in the Mediterranean basin about the that time known part of the world. Herodotos described not only the history of nations, and provided the geography where they lived, but reflected all the general world view of his age. He tried to describe the world as perfect, as he could imagine it, because according to his belief the Earth could be not less perfect than the sky above us. When he found facts, what did not coincide with the expectations about the perfectness of the world, he felt himself forced to give explanation for the differences. And explaining these contradictions he believed much strongly in the world view about the perfectness, than in the facts, what showed asymmetry on the surface of the Earth.

Please, try to imagine yourself in the role of our ancient colleague. Please, remember your works, when you had to evaluate experiments, systematise facts, summarise results, make conclusions in science, or plan an arrangement, polish art works; please, confess that you had a better feeling if you found a symmetric, more perfect final solution, than when the objects (*natural* or *artificial*) seemed to be more complicated, less ordered, asymmetric, i.e., less perfect. Psychoanalysts can confirm, that healthy human being's strive to symmetry, to perfectness belongs to our immense nature. So, do not feel ashamed, that you strived to symmetry in your decisions when confronting facts and explanations, planned objects and final formations. It is not against the truth and beauty, as long while the spiritual belief in the perfectness does not disguise the experimental facts or objects; in the contrary, our instinctive attraction to symmetry helps to find truth and beauty. (Thus, symmetry became a heuristic, methodological tool in our scientific and artistic creative work.)

So did Herodotos, too. His only mistake was, that overestimated the role of this heuristic tool, but presented us a wonderful fabulous picture of the world. He described the (known by him) world quasi mirror-symmetric to a West-East axis, placed in the middle of the Mediterranean sea, and quasi periodically symmetric when travelling parallel with the West-East axis. He described the Nile and the Danube as mirror symmetrically flowing two rivers. Both flowed, according to his picture, first from West to East, and then made a right angle turn towards each other and run into the same sea. In the case of the Nile, ancient people believed, that the Nile originated on the West in the Libyan desert, but in the case of the Danube, they knew, that it could not flow from the Pyrenes, because in this case it should cross the Rhine. Herodotos here preferred the belief in the symmetric, i.e., the perfect picture of the world against the experimental facts. For the sake of symmetry, he described, that following the bed of the Nile from East to the West in the Libyan desert, one found the oases in equivalent days walking distance

periodically (translational symmetry along the West-East axis). Of course, one did not find oases along the Danube. Because, he explained, there were more rains over the basin of the Danube. Moreover, the level of the water in the Danube was more equal during the year, while there were periodic floods, and droughts around the Nile. Terrible asymmetry, what should be explained, and he found the explanation. Summarising in short his flow of arguments: the Sun shines in a lower angle over the Danube than over the Nile, this is the reason, why the moisture is less in the hot Nile area and more in the cooler Danube basin. But, let us suppose, he speculates, the symmetric arrangement, that the Sun would shine from the North. Then the angle of the rays were higher over the Danube, and lower over the Nile, and in this case there were more rains in the Nile's basin and less over the Danube. So the same would happen with the Danube, as now in the case of the Nile and vice versa. Thus the postulate of the symmetric placement of the Sun over the 'symmetric center' of the known world, i.e., the Mediterranean sea, solved his problem of the disturbing asymmetry in the picture of the world.



The example may be extreme, but strong enough to demonstrate, how the heuristic role of symmetry can influence the thinking of a scientist.

This picture of the World by Herodotus presented us another symmetry. Have a look at the symmetric picture of the Nile and the Danube. The birthplace and the scene of Earth-life of goddess *Isis* and the birthplace and headquarters of *ISIS-Symmetry* can be found symmetrically at the two rivers. The origins of the Western

culture (science and art) can be found almost symmetrically in the middle between them, somewhere along the axis of symmetry of the map. I choose the above example not by chance. This picture has a metaphorical, symbolical significance for us.

The cult of Isis did not cease after the decline of the power of the Egyptian pharaohs and their national religion. The cult of Isis survived and lived further, not only in the Minoan and Hellenic cultures, but even in the Roman imperium. As it arrived from the Nile to the Appenin peninsula, the cult of Isis spread from there over the imperium, even to the Northern limes, the Danube, (and among others in Pannonia, where Aquincum saved the borders of Rome at the place of the present Budapest, the birthplace and headquarters of ISIS-Symmetry).

It was also Italy, where the Renaissance of the Western culture emerged and spread about another thousand years later. Please, notice, that science and art prospered again in parallel. Moreover the greatest Renaissance personalities, like Leonardo, Dürer, etc., were as excellent creative representatives of science as of arts. The return to ancient masters moved symmetry in the foreground in the quattrocento (cf., the paper by D. Nagy at the present Congress). Even in the time of the accelerated separation of science and art after the Renaissance, the ancient roots and science-art interrelations did not cease to motivate the most outstanding masterminds. See, e.g., Kepler's 'perfect' model of the celestial world (using Plato's perfect solids) (Kepler, 1696), combined with the music of the spheres (with reference to the Pythagoreans and Aristotle) (Kepler, 1619), or the topics of painters and sculptors of the baroque.²



Fontana di Quattro Fiumi (Piazza Navona, Roma). Fragment of the drawing by G. B. Piranesi, 18th c.

² Later in the 20th century Hindemith composed the symphony *Harmonia Mundi* inspired by Kepler.

For example, one finds a symbolic sculpture in the heart of Rome, in the middle of the Piazza Navona: the Fontana di Quattro Fiumi (the Fountain of Four Rivers) by Lorenzo Bernini. A quadratic obelisk, surrounded by four symbolic figures looking to the four cardinal points. The figures symbolise four rivers: the North is represented by the Danube, and the South is represented by the Nile (while, for the completeness, the East by the Ganges and the West by the Rio de la Plata): The reincarnation of the symmetric picture of the world by Herodotos in the city where the cult of Isis survived for the longest time. Looking around that perfect composition there you feel yourself in the center of the world, and really, in the seventeenth century in certain symbolic cultural sense it was the center of the world, (to be moving towards the North-West in the next period).

The interweave of sciences and arts (the skill of truth and beauty) demonstrated itself also in the poetry. For illustration, let's quote from the Sonnet LIV by Shakespeare:

“Oh, how much more doth beauteous seem
By that sweet ornament which truth does give!”

The French R. de Piles (1708, p. 30) wrote on painting: “*Je trouve trois sortes de Vrai dans la Peinture: Le Vrai Simple, le Vrai Idéal et le Vrai Composé ou le Vrai Parfait.*” [There are three kinds of Truth in painting: Simple Truth, Ideal Truth and Complex or Perfect Truth.] According to Piles, the Simple Truth [...] is the simple and faithful imitation [...]; Ideal Truth is a selection of various perfections which are never to be found simultaneously [...]; while he gives not too much information about the third, which represents a combination of the other two but emphasises again the strive to perfectness and the artistic reflection of the truth.

At the same time, we cannot conceal, that these centuries provided a widely accepted paradigm in the sciences according to which sciences must base only on the pure rationality, proving of truth, and keep far distance from the intuitive arts, influence of the beauty. (Cf., e.g., Kant's *Transcendental Logic* and *Transcendental Aesthetic*.)

Nevertheless, the human culture evolved; science and arts walked ‘hand in hand’ along the two banks of the widening river of the culture (cf. D. Nagy's lecture, 1989) looking at each other from a distance. *Science was searching for the truth, the arts for the beauty.* Open-minded intellectuals were looking for bridges.

The pillars of the bridge were found again and again in turning to the ancient culture, where science and arts, truth and beauty have not been separated yet. Let me quote from a well known poem by John Keats, the *Ode on a Grecian Urn*. He closes the ode with the following words:

““Beauty is truth, truth beauty,” - that is all
Ye know on earth, and all ye need to know.”

(Vendler, 1983, pp. 114-115). These two lines tell everything about the unity of the culture. The inspiration to the whole ode and its summing up in the last two lines came from the Greek culture again. These words were not only a tool of poetic expression or a poem needed to close the poem. Keats attributed importance to this sentence, this can be verified in his correspondence after having written the ode (Rollins, 1958; cf. his letters to his friend B. Bailey³ and to his brothers George and Tom in November and December 1817, the same year when D. Brewster patented his invention: the kaleidoscope), where he repeatedly analyses and explains this statement. The historians of literature devoted hundreds of pages to the analysis of this ode and these two lines. It is widely cited (even by the mathematician L. Fejes Tóth), but now let us add something to all of these. It is symmetry what most successfully combined the search for truth and beauty. Symmetry studies realized the dream of Keats to unify our knowledge.

Arthur Koestler⁴ wrote in 1976 "that the artist and scientist do not inhabit separate universes, merely different regions of a continuous spectrum - a rainbow stretching from the infra-red of poetry to the ultra-violet of physics, with many intermediate ranges - such hybrid vocations as architecture, photography, chess playing, cooking, psychiatry, science fiction or the potter's craft. But to avoid oversimplification, after emphasising the affinities, I must briefly discuss the differences - some apparent, some real - between the opposite ends of the continuum. The most obvious difference seems to lie in the nature of the criteria by which we judge scientific and artistic achievement" (Koestler, 1978, p. 152). And what else are these criteria than those evaluating the attainment to the truth and the beauty? Look at his cited list: almost all or more are represented at this congress. Have a look at the faded contours on K. Kuchta's light installation at our exhibition: all the colours of the mentioned rainbow can be seen there from the infra-red "of poetry" to the ultra-violet "of physics", and the "intermediate ranges" of the "continuous spectrum" are represented symbolically by all of us, the participants of this congress and exhibition.

There are crossings in the paths followed by scientists and artists: when formulating a found scientific 'truth' the scientist strives to give a beautiful presentation, this makes his achievement easier acceptable for the peers, and when formulating an art-work's 'beauty' the artist strives to reflect truly the reality. It is attributed to H. Poincaré, that he was guided in unconscious groupings towards the happy combinations which yield new discoveries by the feeling of mathematical beauty, of

³ "I am certain of nothing but of the holiness of the Heart's affections and the truth of Imagination - What the imagination seizes as Beauty must be truth" p. 184.

⁴ Arthur Koestler, was an outstanding writer of the twentieth century. His life and work was full with drastic turns. He was born in Hungary, then moved to Vienna, Berlin, Tel-Aviv, and Moscow, took part in the Spanish civil war, then lived in France, and after World War II in England, used to be a fan and enemy of the same ideology. His work did not miss the drastic turnovers too. So happened that in a period of his life this artist attracted to the sciences (to turn later against). We quote from his pro-science period.

the harmony of number, of forms, of geometric elegance. This is a true aesthetic feeling that all mathematicians know. It is told about Dirac, one of the greatest physicists of our century, that he went further in a pronouncement, according to which it is more important to have beauty in one's equations, than to have them fit to the experiment. Compare it with Herodotos' approach to draw the picture of the world!

Artists have also used to be guided by science motivated theories, the golden section, the geometry of perspective and foreshortening, the Renaissance masters' ultimate laws of perfect proportion, Cézanne's doctrine that all natural form can be reduced to spheres, cylinders, and cones; the reflection, repetition, counterpoint in the musical composition, the harmony of colours and the combination of usefulness, simplicity, beauty, and symmetry in the Bauhaus' principles, the inspiration of graphic artists and sculptors by geometric higher dimensions or by the quasicrystals, etc.

Mutual influences are evident between scientists and artists. This is possible, because beauty and truth are not fully dividable. Nevertheless, both parties act and are judged in the same social environment.

Returning to Koestler, he analyses the cited words of Keats in the following: "This is ... a touching profession of faith in the essential unity of the two cultures, artificially separated by the quirks in our educational and social system. In the unprejudiced mind, any original scientific discovery gives rise to aesthetic satisfaction, because the solution of a vexing problem creates harmony out of dissonance; and vice versa, the experience of beauty can only arise if the intellect endorses the validity of the operation - whatever its nature - designed to elicit the experience. Intellectual illumination and emotional catharsis are the twin rewards of the act of creation, and its re-creative echo in the beholder. The first constitutes the moment of truth, the *Aha* reaction, the second provides the *Ah...* reaction of the aesthetic experience. The two are complementary aspects of an indivisible process." (Koestler, 1978, p. 155.) (The Aha and the Ah... reactions, i.e., the scientific and the aesthetic cathartic sensation can be combined, visiting the AHA Gallery by C. Schwabe in Zürich, in the *Spiegelgasse*, which in English means 'Mirror Street'.)

In summary: we looked over the role of symmetry, as a form of appearance of the perfectness in the history of the Western culture. We followed this line since the picture of the world by the ancient Greeks, parallel with the cult of Isis, who borrowed her name to the Symmetry Society, from the ancient Egypt to Rome and further, and the parallel attempts of scientists and artists in their search for truth and beauty. We were looking for bridges between these separated intellectual activities, and concluded, by means of the poetry, that they are undividable. All who are present at the Congress and Exhibition of ISIS-Symmetry demonstrate with our interest and work that science is attributed also beauty, and arts bear also truth.

There is symmetry in their roles, and it is symmetry what can in the most appropriate way demonstrate the cross-fertilisation of science and arts.

Dear scientists and artists! Let symmetry help us to find mutually beauty and truth.

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