

THE “WEDDING” OF ART AND SCIENCE IN THE INTER-NET-GALAXY

This opening address of the Sixth Interdisciplinary Symmetry Congress and Exhibition is strongly inspired by the sites of the event: the Wedding Palace and the Ráday Street in the Ferencváros District of Budapest and the old Hungarian culture of Tihany.

1 “TWO CULTURES” OR A “SPLIT CULTURE”?

Fifteen years ago, in the opening talk of the First Congress and Exhibition (Budapest, 1989), I suggested considering the concept of symmetry as a bridge, not the only bridge, but one possible bridge, between the two hemispheres of our split culture:

- Art (and the humanities)
- Science (and technology).

The expression “split culture” replaces here the widely discussed term “two cultures” by C. P. Snow or, referring to the same person, Sir Charles, later Lord Snow, the distinguished scientist, writer, and politician. Indeed, I still believe that art and science are organic parts of the same culture, which is, to use an expression from brain research, split into two hemispheres. Obviously, these two should be bridged, as the *corpus callosum* links the two hemispheres of the human brain. The advantage of the expression “split culture” is that we emphasize a desire for the two sides not to be fully separated, but that they should cooperate. I am especially glad to see that my expression “split culture” made its way into scholarly literature. T. Avital’s recent book published by Cambridge University Press, the same publisher where C. P. Snow published his beforementioned essay, discusses the idea of “split culture” in detail (*Art versus Nonart*, Cambridge, 2003). Avital, after a historic survey where he deals with, among others, the Gutenberg revolution and Kant’s Copernican revolution, devotes a sub-chapter to “Building bridges” (pp. 33-35).

An effort in that direction is needed [...] to bridge the gap of alienation between the “two cultures” of C. P. Snow (1962). In a more organismic formulation, D. Nagy (1996) called this the “split culture”. According to Nagy’s approach it is not a matter of two cultures but rather that our civilization is divided, like the split brain, into opposed tendencies between which it is essential to build and maintain bridges. Bridges of this sort can be built only at a level that is higher than the two trends,

precisely in order to forestall a situation in which the cultural split brain brings into being two opposed and hostile cultures.

I believe that if a new paradigm for art were to arise in the future that assimilated all the revolutions that have been mentioned, it would inevitably build the corpus callosum that would reunite our collective brain. It will be the transdisciplinary bridge between the two cultures and will make of them once again a single culture with different aspects.

Note that Snow first lectured on “two cultures” in 1958, while I introduced the term “split culture” in 1989, then I returned to it at the Tsukuba Symposium in 1994 (*Katachi U Symmetry*, Tokyo, 1996, p. 27).

The reason that symmetry may be useful in building bridges between the two sides is the very fact that the expression “symmetry” has roots in both ancient art and science. The more recent developments are also interesting. The physicist E. P. Wigner, who earned the Nobel-prize for his symmetry-related studies, pointed out the following hierarchy: events - laws - symmetries (as the laws of law). This idea, from the side of science, is in “harmony” with the recently mentioned view of Avital from art theory: the bridges should be at a higher level than the considered events and laws.

2 LEONARDO: LONELY GENIUS OR TEAM WORKER (AND A HUNGARIAN CONNECTION)?

Let us go back briefly in time and start from that period when there was not yet a strong split between art and science. In other words, there was no need for bridges because many artists and scholars were able to jump back and forth between the two sides. The Renaissance produced many “universal men”, from Leonardo to Dürer and, mentioning less widely known ones, from Francesco di Giorgio Martini to Faustus Verantius. Were they just lonely geniuses? Leonardo owned and even annotated a copy of Francesco’s manuscript. Earlier I discussed this manuscript in connection with the early usage of the expression *symmetria* in a non-Latin context (Washington Congress, 1995, p. 26). Interestingly, three versions of Francesco tracts survive, two of them in Italy, including the copy once owned by Leonardo, and a third one in Budapest (Szabó Ervin Library, which is just a few-hundred meter walk from the place of the opening ceremony of our congress). It is also known that Leonardo cooperated with the mathematician Luca Pacioli and even made illustrations to his mathematical manuscript on polyhedra. Their cooperation is often discussed in connection with the golden section, although, as I demonstrated, Leonardo’s expression “divine proportion” (in the sense of an excellent proportion) is not identical with Pacioli’s “divine proportion” (an earlier name for the golden section, cf., this journal, 1996, pp. 432-434). Note again an interesting Hungarian connection: in Leonardo’s *Treatise on Painting (Codex Urbinas)*, King Matthias Corvinus is the person who emphasizes the importance of the “divine proportion” in painting. Perhaps it is not an actual quote by the Hungarian king, but

Leonardo's interpretation. Obviously, Leonardo was aware of the wide artistic and scientific interest of Matthias Corvinus. With great probability Leonardo painted a picture for the Hungarian King, but this work does not survive. It is true, that the only surviving sculpture by Leonardo is in the Museum of Fine Arts in Budapest, but it was purchased in the late 19th century.

We may conclude, that even Leonardo was a team-worker in some periods of his life. More recently, the European Union started an educational project "Leonardo". It is nice that we may consider his name not just as a symbol of excellence in art and in science, but also an evidence for the need for cooperation. Why not have, for example, mathematical textbooks illustrated by the best artists?

3 FROM GUTENBERG GALAXY TO INTER-NET-GALAXY

The link between Leonardo and Pacioli was associated with a fortunate fact: both of them were employed by Lodovico Sforza in Milan. Their cooperation led not only to a manuscript, but also to a printed book by Pacioli, a typical product of the Gutenberg Galaxy. Although the split between art and science became stronger through the next centuries, more recently the possibility for cooperation became easier via the internet. A few hundred meters from our present site is located the old buildings of the Eotvos Lorand University, where John von Neumann, a pioneer of modern computing, was educated. Ironically, he was not the inventor of the "von Neumann machine" (which was an effort of a large team), but he significantly contributed to the "non-von-Neumann machine". Specifically, he dealt with the problem of how to make a reliable device using non-reliable elements (the old vacuum tube computers) and suggested using parallel processing. His fresh ideas, which were regularly discussed with Hungarian scholars, including Z. Bay and R. Ortway, significantly helped the development of computing.

Since we have a much larger body of knowledge, we need new methods of communicating with others and of collecting information. Many people contributed to the Information Age, including such developments as the personal computers, the internet, and the world wide web:

- Engineers-researchers (e.g., V. Bush's *Memex* or Memory Extender, 1945; N. Wiener's *Cybernetics*, 1948; P. Baran's works on digital communication systems, 1960; I. Sutherland's *Sketchpad*, 1963, and 3D-display with "virtual reality", 1966; A. Kay's "windows"; D. Engelbart's on-line systems, 1968; and especially J. C. R. Licklider's scholarly and managerial work that culminated in the ARPANET, 1969 and later T. Berners-Lee's proposal for the www, 1990),

- Inventors-entrepreneurs (e.g., S. Wozniak, S. Jobs, B. Gates, P. Allen).

However, the results of the Gutenberg Galaxy were not lost, but became part of the Internet Galaxy (Inter-Net-Galaxy). Remaining with the astronomical metaphor, these two galaxies are not disjoint, but the latter is a cluster that includes the earlier one. Of

course, the electronic books will not eliminate the printed ones. Remember, the invention of printing did not eliminate the importance of hand-written manuscripts. Second hand bookstores often sell manuscripts at higher prices than rare books.

Libraries are very useful for locating something by chance. All of us had the experience of trying to find a given book on the shelves and something on the neighbouring shelf was even more interesting. Search engines cannot provide a similar serendipitous joy. On the contrary, they give too many pieces of information and this list may hide the more important items. In other words, the excess of information may lead to the lack of the relevant information. Thus, we should not disregard the advantages of non-electronic communication: walking in libraries, leafing journals and books, speaking with people personally.

4 HUNGARIAN CONTRIBUTIONS TO ART AND SCIENCE

Many scholars asked me about the reasons that Hungary produced a relatively large number of well-known artists and scholars. Interestingly, most of these Hungarians are associated with interdisciplinary fields, from Farkas Kempelen (talking machine, chess automaton, 18th century) to János Bolyai (non-Euclidean geometry and related philosophical questions, 19th century), from Victor Vasarely (op-art) to John von Neumann (computing, mathematical physics, mathematical economics). Let us see some interesting aspects of the contributions by Hungarians.

4.1 Using a non-Indo-European language, parallel with other ones

If someone speaks, let us say, in English and Russian, he or she knows two very different Indo-European languages that have similar structures (flexional languages). The situation is quite different if one of the spoken languages is Hungarian (an agglutinative language). It has no genders (*he, she, it* is the same word, *ő*), instead of prepositions there are suffixes, in some cases even an object can be expressed by suffixes ("I love you" is just one word, *szeretlek*), and, as a regular confusion, the first name is the last name and the last name is the first name. Perhaps, the familiarity with such a language helps a better understanding of "deep structures" not only in the linguistic sense (Chomsky), but also in a more generalized way. (I believe that symmetries play an important role in describing the "deep structure" of art works, especially ornamental art.) It is not surprising that Hungarian and Hungarian-born scholars made important contributions to the birth of "languages" in a generalized sense, including artificial languages. We may refer here to Kempelen's phonetic studies and talking machine, Bolyai's mathematical notation system, "language of algebraic symbols", and "sign-theory" (long before the birth of computer languages and semiotics), Kodály's sol-fa system and his interest in our "musical mother tongue", Laban's dance-notation, Kepes' book *Language of Vision*, and especially von

Neumann's pioneering computer language and Kemeny's BASIC language. In Hungary, which was not independent for many centuries, the Latin and German languages were official for a long time. However, written Hungarian expressions and sentences appeared in Latin contexts as early as the 13th century. The earliest surviving written Hungarian words (58 of them) are in the royal document ordering the construction of the Tihany Abbey in 1055.

4.2 Location at the border of East and West, not only Eastern and Western Europe, but between the Occidental and Oriental cultures

Obviously, such a position in Europe is an optimal place to collect information from both directions. A large number of travellers and Orientalists, from Father Julianus (13th century) to Sándor Kőrösi Csoma (1784-1842) and Aurél Stein (Sir Marc Aurel Stein, 1862-1943), demonstrate that the "Eastern connections" of the Hungarians were never forgotten. Among others, the first comprehensive Tibetan dictionary and grammar in English (Kőrösi Csoma) and the description of forgotten Asian cultures (Stein) became the standard reference of Western scholars. In addition to this, there are some ideas and inventions that spread worldwide from Hungary. Thus, the name of the Hungarian village, Kocs, became an international expression for horse-carriage (wagon, cart); see the Hungarian *kocsi*, the English *coach*, the German *Kutsche*, the Italian *cocchio*, the French *coche*, the Spanish *coche*, the Polish *kocz*, and so on. However, we should consider not only the present location, but also the Hungarians' Eastern origins. The Western world became richer with such Oriental inventions as the saddle and stirrup. (According to Lynn White, Jr., this invention led, indirectly, to the system of knights and even to feudalism.)

4.3 "Café-house-democracy": an institution of informal discussions

Until the late 1940s, Budapest was famous for its café houses, which were different from similar establishments in most other cities (and the pubs and restaurants in Budapest): you were able to order just a cup of coffee and spend the entire day there without any "disturbance" from the waiters. Some authors, who had no money in hand, used the newest pages of their manuscript as payment. The waiters accepted these and later cashed at an editor. Although the society was very much hierarchic, the café houses provided a form of democracy, where people with different backgrounds came together for informal discussions. Literary journals were edited, novels were written, and inventions were born in these "institutions" of Hungarian cultural life. Even the "birth" of the Biro pen, or ball-pen, is associated with the café houses in Budapest, as it is explained by Ladislao José Biro (*Una revolución silenciosa*, Buenos Aires, 1969), who is, in Hungarian, Bíró László József (*Csendes forradalom*, Budapest, 1975, pp. 41-42). According to a recollection, John von Neumann was very much surprised that in Princeton there were no café houses and he seriously considered opening one. Although he did not do so, the von Neumann House gained a similar function for some circles.

Ferenc Molnár, who became a successful Broadway author, complained that there is just one café house in New York, the Hungarian one.

Although the political system after World War II destroyed this vibrant café-house-culture, we may now observe a gradual rebirth of it and the center of this movement is the Ráday Street of the Ferencváros district. ISIS-Symmetry tries to provide the same café-house atmosphere from the early beginnings: let us have more discussion...

5 WEDDING: STRONGER RELATIONSHIP BETWEEN ART AND SCIENCE (AND THE 15 YEARS OF ISIS)

In the last years, art and science made important steps to help the other sides, too. Among many exciting examples, may we refer just to two larger fields:

- Non-linear science (catastrophe theory, fractals, chaos)
- Media art (using computers, lasers, holograms, video, etc.)

Of course, these topics are not very recent, but earlier their “territories” belonged to smaller groups. During the last 15 years or so, however, these fields became more widely known. ISIS-Symmetry’s own electronic journal *Visual Mathematics (VisMath)*, thanks to the heroic work of Slavik Jablan in Belgrade, also contributed to the dialogue. Here “visual” refers not just to visual arts, but all topics that can be visualized, including musicology, poetics, and so on, while the second expression is interpreted as all fields that can be considered mathematically.

Being inspired by the location of the opening session of the present congress, the Wedding Palace of the Ferencváros District of Budapest, I would like to refer to a new “wedding” between art and science. Of course, marriages are not without conflict (and even hostility), but both sides should work towards a good marriage where they keep their integrity, while helping the other. Although seven days from now, at the closing ceremony, we will have a temporary separation for three years, the distances may even help in maintaining a good marriage... Looking back over the last fifteen years, each congress and exhibition had some surprises that were not planned:

- Budapest (Buda side), 1989: The Chua-Hámori-Roska workshop on analog-digital thinking and computing, which outlined the now very important field, bioinformatics; the re-union of crystallographers and designers who did not meet for a long period; and the exhibition of the wooden model of the funeral setting of the martyrs of the Revolution of 1956 (which coincided with the first cracks of the Berlin wall made from Budapest).
- Hiroshima, 1992: The presence of Husimi, Ogawa and the start a new cooperation with *Katachi no kagaku kai* (Society of Science on Form); Iijima’s lecture about Japanese basket weaving and fullerene tubes.
- Washington, D.C., 1995: The first ever meeting of Connelly (Cornell) and Sabitov (Moscow) and the solution of the “bellows conjecture” on flexible polyhedra.

- Haifa, 1998: Hales' announcement that his long-awaited proof of the Kepler conjecture on the densest packing of equal balls is finally complete, including all computer programs; Shechtman's talk on new developments in connection with quasicrystals.
- Sydney, 2001: For the first time a numerical "symmetry" between male and female lecturers; an Ikebana demonstration by the Moriyama Sisters, a special "gift" from His Imperial Highness Prince Mikasa.
- Budapest (Pest side) and Tihany, 2004: We do not know yet, but we will have a "Polyhedral Birthday Party" with Császár (the discoverer of the Császár polyhedron 55 years ago), Longuet-Higgins (the discoverer of the complete list of uniform polyhedra, together with Coxeter and Miller, 50 years ago), Crowe (who inspired Gardner's *Scientific American* article on the Császár polyhedron about 30 years ago), Szilassi (the discoverer the Szilassi polyhedron), Bokowski (who continued this research), Ogawa (the discoverer of the 3D Penrose tiling), and architects-geometers Huff, Korren, and Magyar. The first ever Császár-Crowe-Szilassi-Bokowski meeting will be followed by the first ever meeting of the members of Fejes Tóth Geometry Seminar (Budapest) and the scholars who translated Fejes Tóth's book into Japanese and continued his research in Japan (Tanemura, Ogawa, and their students). We also will have a "Fibonacci Party" with mathematicians at the congress (Huylebrouck and others) and artists at the exhibition (Rákóczy and Vásárhelyi), which fact is also represented on the cover of this volume.

Let us have a good and symmetric wedding...

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