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## Report on Bridges 2016 -- In Memory of Our Founder, Reza Sarhangi (1952-2016)

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For the last decade, Bridges has been the premiere international conference devoted to mathematical connections in art, architecture, music, and many other cultural domains. It regularly attracts a few hundred participants -- artists, mathematicians, computer scientists, teachers, etc. -- from dozens of countries. The first conference was organized by Reza Sarhangi [1] in Winfield, Kansas, in 1998. Since then it has moved through nine different countries and diverse places such as London (UK), Seoul (South Korea), Pécs (Hungary), Granada (Spain), Coimbra (Portugal), Leeuwarden (the Netherlands), and Banff (Canada). You can learn more about the origins and history of this conference series in an article by Kristóf Fenyvesi, one of the organizers of this year's conference [2].

This year, the annual Bridges conference was held in a particularly beautiful and serene location: The University of Jyväskylä in Finland. The facilities in the Agora Center were superb: comfortable, modern auditoriums and pleasant, more intimate meeting rooms. Everything was well-signed and easy to find, and there was also a great cafeteria in the same building! The conference comprised four days of talks and interactions plus an optional excursion day. The formal, refereed part of the conference entailed 10 plenary presentations, 40 regular papers, 61 short papers, and 17 “hands-on” workshops. At any time, there were many interesting options in four parallel tracks, and it was often difficult to choose which session to attend. Fortunately, the complete printed proceedings were available at registration time; this allowed one to make informed – but still very hard – choices.

Bridges is much more than just the presentation of submitted papers. There is also a curated art exhibition, a festival of short mathematical movies, a session of mathematical poetry, and an informal theatre event performed by conference participants. Moreover, participants who did not want to formally present a refereed paper can still give 10-minute oral summaries in a couple of “abstracts only” sessions and could also display tangible works that they brought to the conference in a large “Show and Tell” area in the lobby and its adjacent corridors.



*University Hotel Alba, Jyväskylä*



*The lobby of the conference building*

Sadly, this was the first conference where Reza Sarhangi, the founder of this conference series and the President of the Bridges organization, could no longer be with us and infect us with his boundless enthusiasm. The conference started with a touching memorial session, where Bridges board members and friends shared fond memories of interactions with Reza [1]. We all miss him very much as a person; but it was also clear, that he was present in spirit and that he lives on through his various legacies: the annual Bridges Conferences, the Mini-Bridges Symposia, and a whole shelf full of beautiful and inspiring Bridges Proceedings!

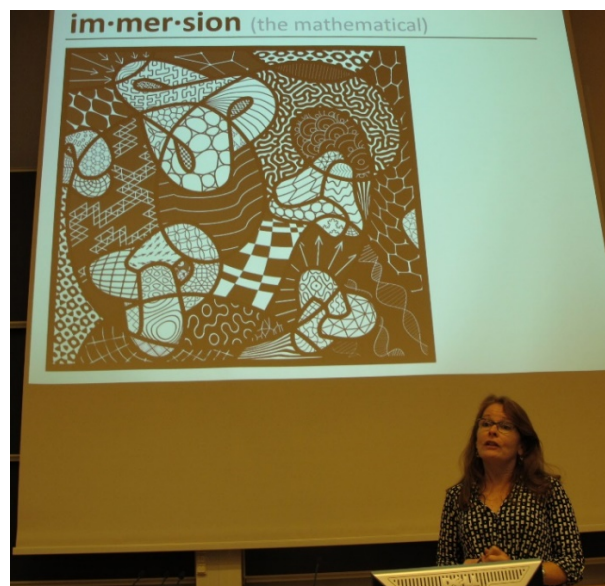


*Founder Reza Sarhangi at the CrossBorderScience 2012 Conference in Kaposvár (photo: Sarhangi)  
 (The photo was first published in an article by Dirk Huylebrouck "Is mathematics halal?" in the Dutch popular science magazine Eos [<http://www.kennislink.nl/publicaties/is-wiskunde-halal>] )*

The memorial session was followed with two inspiring plenary papers. Marjorie Wikler Senechal’s “The Subtlety of Influence; Math, Art, and Black Mountain College” was an illuminating set of reminiscences about the role of this college in the hills above Asheville, NC, promoting a spirit and interactions similar to those fostered by the Bridges conferences. Henry Segerman then showed us what astounding pictures a true  $4\pi$ -spherical camera can produce, when coupled with the right image-processing software. On the second day, Judy Holdener talked about “Immersion in Mathematics”, explaining, among other things, her black&white submission to the Art Exhibit, which won the prize for “Most Effective Use of Mathematics.”



*Henry Segerman and his  $4\pi$  camera*

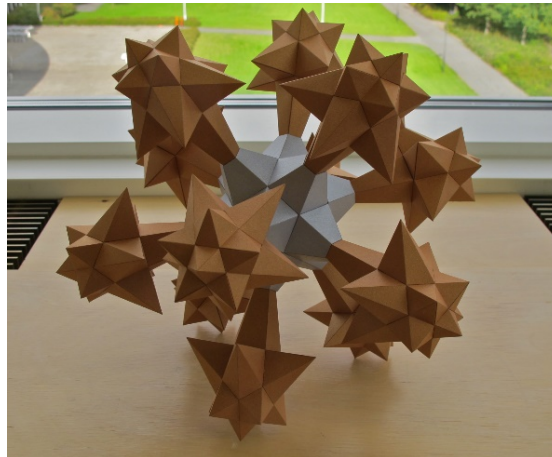


*Prize Winner Judy Holdener discussing “Immersion”*

This year's Art Exhibit received many high-quality submissions, and participants were restricted to exhibit at most two works of art. Still, there were so many entries that the exhibit could not be accommodated in a single room; it had to be spread over multiple rooms and a corridor on two floors. In most rooms it also felt a bit more crowded than in the last couple of years. On the other hand, there were beautiful views through the windows that served as natural, contrasting backdrops for some of the sculptural art works.

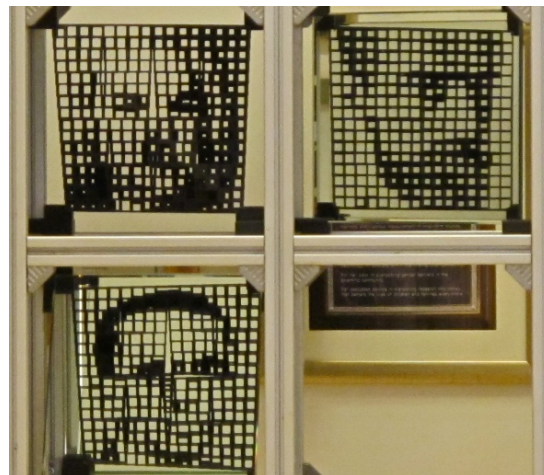


*Art Exhibit with George Hart's "Oxalis"*



*Robert Webb's "Game of Thorns"*

The most astounding piece was clearly "Gödel, Escher, Bach: just another Braid" by Hans Kuiper & Walt van Ballegooijen. The central piece consists of 256 connected cubelets connected in a fractal tetrahedral lattice. The black plastic struts of each cubelet were individually modulated in thickness to change the gray-tone density when the lattice was viewed from a particular direction. A frame was set up to show this lattice from the front, from one side, and from the bottom with two suitably placed mirrors. As a result, from the proper vantage point, one could see simultaneously the portraits of Gödel, Escher, and Bach. This piece won the "Best of Show" award.

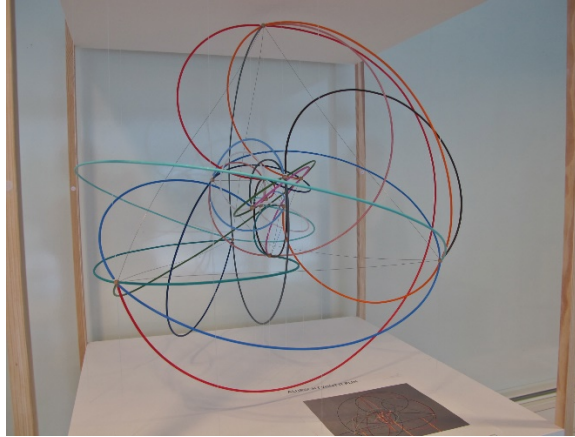


*"Gödel, Escher, Bach: just another Braid" by Hans Kuiper & Walt van Ballegooijen*

Other awards were given to Kyoko Urata for "Icosahedral Temari" ("Best Craftsmanship"), and to Albrecht Winterlin for "Projective Plane without Crossings" ("Most Innovative"). High-quality pictures of all exhibited art work can be seen online in the Bridges Galleries [3]. This year art lovers have been particularly fortunate, since they also were treated to some special exhibits outside the Bridges premises, one featuring the works of Rinus Roelofs [4], and the other a juxtaposition [5] of the works by Lajos Szilassi, and by István Orosz.



*Kyoko Urata: "Icosahedral Temari"*



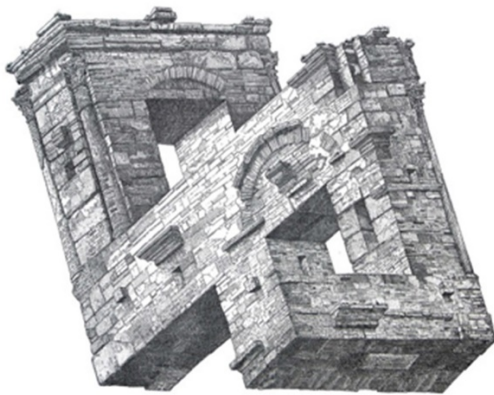
*A. Wintterlin: "Projective Plane without Crossings"*



*Rinus Roelof: "Elevations"*



*Kristóf Fenyvesi and Lajos Szilassi*



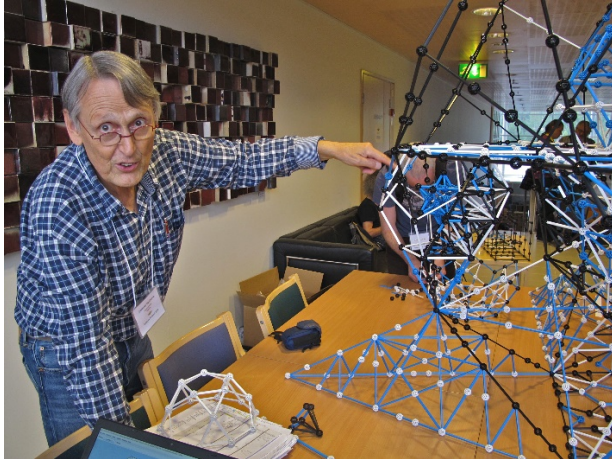
*An "impossible" geometry by István Orosz  
(photo: Orosz)*



*A polyhedral toroid by Lajos Szilassi*

The paper presentations and workshops spanned a dizzying range of topics. They included: “The Size and Shape of Utopia” by Andrew Simoson, “Hypocycloid Juggling Patterns” by Craig Kaplan, as well as “Shape-Changing Polyhedra” by Roger Burrows. There is no way that my report can do justice to this amazing span of domains where mathematical structures can be found. Fortunately, all the accepted papers are freely available and readily accessible via the Bridges Archives [6].

One of the four conference days was open to the general public. It is typically referred to as “Family Day,” since it attracts a large number of children. This is another great opportunity to get exposed to a variety of different venues and to put one’s hands on all kinds of different toys. The great lobby of the main conference building was teeming with multiple activities: sculpture constructions, dozens of “Show & Tell” tables, 3D-printing of mathematical pancakes, and occasional music performances.



Various Family Day activities

A large collaborative piece, the “Pentacosido Zometool Sculpture,” was made possible through the support of Zometool [7]. It was assembled from thousands of modules by dozens of volunteering adults and children under the devoted coordination of Samuel Verbieste. It honored the memory of the architect and designer Fabien Vienne (1925-2016), who co-designed Zometool’s ‘green struts’ and contributed to several Bridges events.

The “whirlwind atmosphere” in this splendid atrium that hosted some of the activities of Family Day is probably best expressed in a group photo taken by Henry Segerman with his  $4\pi$  spherical camera in the lobby of our conference building.



*Group photo taken by Henry Segerman with his  $4\pi$  spherical camera (photo: Segerman)*

Saturday was excursion day. We started out with a visit to the Alvar Aalto Museum, right next to the university. Many objects ranging from a wide variety of chairs using pre-formed wood, to vases and clocks and other household items, as well as architectural models for some buildings looked very familiar. This demonstrates the astounding world-wide influence that this architect/designer has had.



*Alvar Aalto Museum: Various chair designs and modular wood parts used in chair construction*

A bus then took us to a UNESCO World Heritage site: the Old Wooden Church at Petäjävesi, known internationally as a historical masterpiece of Scandinavian architecture. Inside we found a large variety of carved and painted wood sculptures. A particularly memorable example is the Christophorus figure supporting the pulpit. The inner roof construction is also geometrically fascinating; it is made from partially painted wood slats, which makes it look like the whole surface consists of stitched-together bamboo screens.



*Christophorus figure supporting the pulpit*



*The inner ceiling in the church at Petäjävesi*

Subsequently, we traveled to the small town of Mänttä and visited the Serlachius Museums in its neighborhood. We visited the historical ArtHotel Honkahovi with its serene view, where a sculpture park and a lake were reflected in the grand piano in the living room. The Gösta Museum showcases some pearls of the “Golden Age” of Finnish art, as well as some more contemporary art; the latter, however, could not compete with the kind of art work that we have gotten used to seeing in the Bridges Art exhibits. A third visit included the Gustaf Museum, which is housed in the former headquarters of a paper factory that had dominated the economy of this region for almost a century.





*Living room in the ArtHotel Honkahovi*



*A tour through the Gösta Museum*



*A model of the paper factory at Mänttä*



*Art in the headquarter villa*



*Corey and Paavali (photo: Sujan Shrestha)*



*Evening sky in Finland*

For dinner we returned to the Mänttä Club house, where we then enjoyed the Bridges 2016 Music Night Program featuring an exquisite concert by the duo Corey Cerovsek & Paavali Jumppanen. They performed with virtuoso brilliance three intense and challenging pieces: Prokofiev's Sonata for Violin and Piano, No. 2, Debussy's Sonata for Violin and Piano, and Beethoven's "Kreutzer" Sonata. Afterwards we could relax on the bus ride back to Jyväskylä, traveling under dark blue skies with spectacular, orange flaming clouds. More pictures from this (and previous) conferences can be found at [8].

I am sure that most participants are already looking forward to the next Bridges conference, which will be held in Waterloo, Ontario, July 27–31, 2017. Check out the web page [9] for an informative introduction to this venue and for the various deadlines for submitting papers, art work, or short movies.

## References

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- [5] István Orosz & Lajos Szilassi: *Vivid Spirit*, curated by Kristóf Fenyvesi. <http://bridgesmathart.org/bridges-2016/2016-additional-exhibits/istvan-orosz-lajos-szilassi-vivid-spirit/>
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