Report: The 2009 Art Show at the Second Renaissance Banff Conference

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The twelfth annual conference entitled *Bridges: Mathematics, Music, Art, Architecture, Culture* took place from July 26th to 30th, 2009, at the Banff Centre in Banff, Alberta, Canada. As it has in previous years, the conference included an art exhibit, curated by Robert Fathauer, featuring works that bring together mathematics and visual art (Figure 1 and Figure 2).

Figure 1. Room 1 of the Exhibit, in the Max Bell Centre. Photo Copyright E. Knoll, 2009.

Figure 2. Room 2 of the Exhibit, in the Max Bell Centre. Photo Copyright E. Knoll, 2009.

Regular readers of this journal know that 'bridges' between art and mathematics can take many forms. The 2009 *Bridges Art Exhibition* demonstrates with particular success the range of possibilities. According to the catalogue [1], forty artists from eight countries participated. They provided visitors with work which combined ideas from mathematics and art; used mathematics to generate art; used traditional craft and

art techniques to create instances of mathematical objects, real and ‘impossible’; used mathematics to create new renditions of existing images and used mathematics to take an artistic medium or idea to a new level.

Most impressive in the 2009 exhibition was the sheer variety in the themes that were explored. Mathematical subjects included tessellations and polyhedral sculptures, two themes beautifully combined in Bob Rollings’ work. In the piece depicted in Figure 3, for example, the harmony of the dodecahedron, which was associated by Euclid with the idea of the Universe [4], is augmented on each pentagon by a clever pattern combining Golden triangles, rhombi and kites with the natural colours of exotic woods.

Figure 3. Bob Rollins’ *A Stick or Tunbridgeware Dodecahedron*, multiple wood varieties, 7” X 7” X 7”, 2007 (Reprinted with permission)

Robert Bosch made clever use of knot and graph theory in his renditions of Celtic knot designs invoking the Travelling Salesman Problem. In the example shown

in Figure 4, he depicts a single island, riddled, Venice-like, with canals that restrict circulation as a maze would. From a distance, the piece evokes two intertwined loops, while up close, the meandering branching of the island, and of the canals, remind the viewer that figure and ground can sometimes reverse themselves at will.

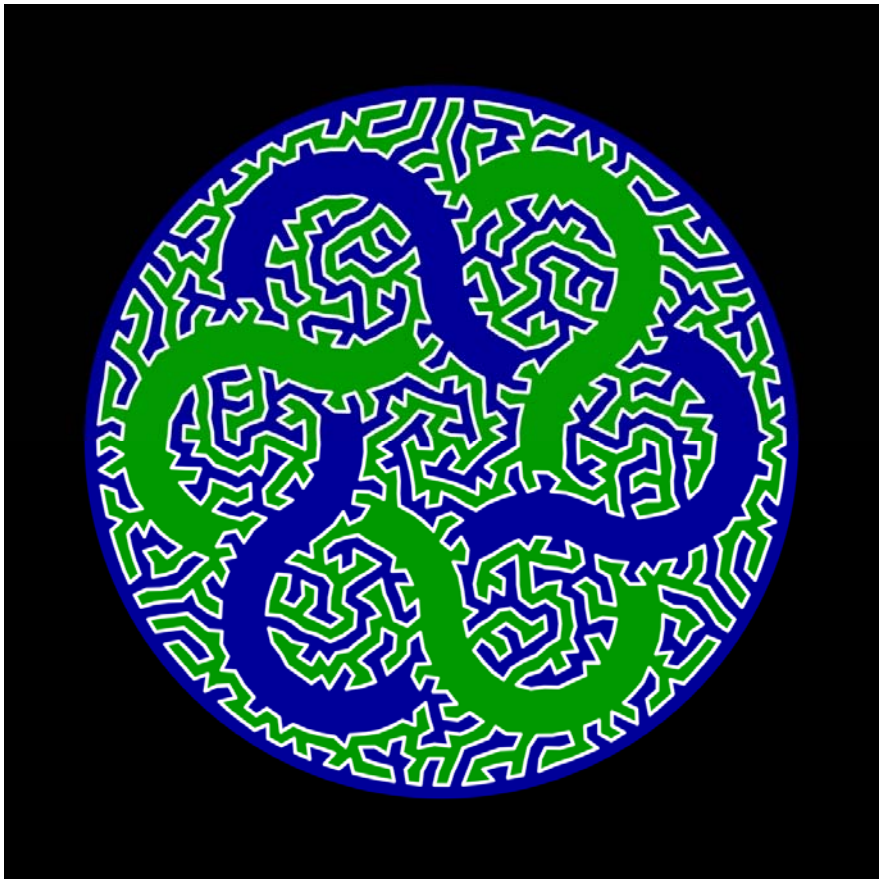

Figure 4. Robert Bosch's *Island II*, digital print on canvas, 17" X 17", 2008 (Reprinted with permission)

Topology and non-Euclidean geometry were represented by several of Carlo Séquin's pieces. In *Klein Bottle with Fig-8 Cross Section* (Figure 5), the artist uses the straightforward look of plain weaving (over-under-over etc.) to show the connectivity of the single surface. The piece also reminds us that the Klein bottle exists in a form that connects it visually to the Moebius band.

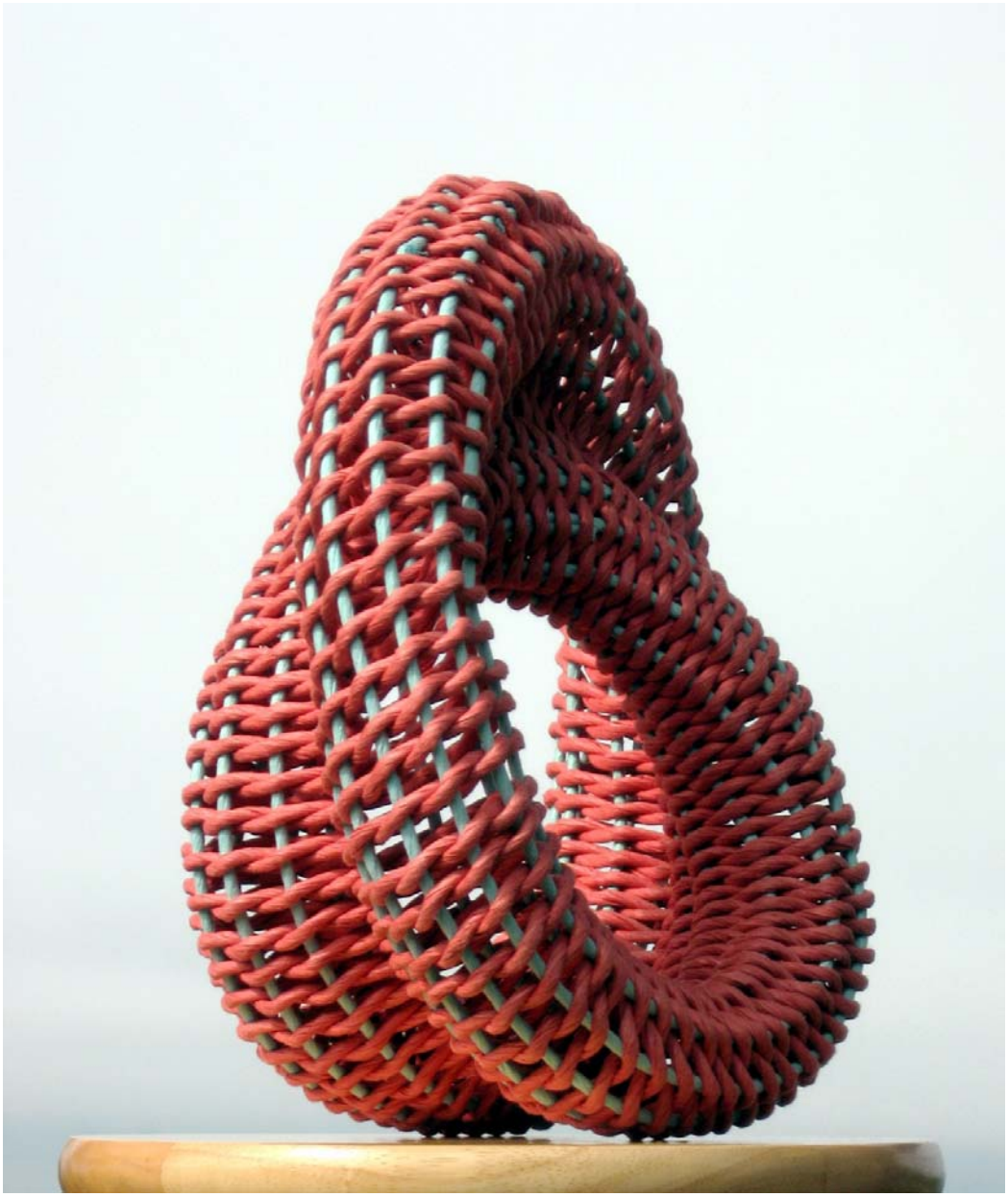

Figure 5. Carlo Séquin's *Klein Bottle with Fig-8 Cross Section,* woven paper strands, 16" tall, 1997 (Reprinted with permission)

More classical brands of geometry as well as Fibonacci's famous sequence were also the subject of several pieces, and fractals were a popular subject of mathematical explorations. Andrew Pike's portrait of Sierpinski (Figure 6) using a representation of his own invention was particularly clever: taking the idea of photomosaics, which flourished in the first part of the 1990s [3], to a more conceptual level, Pike, rather than creating an image composed of a regular grid of squares as

ordinary digital images are, uses the famous Sierpinski carpet as a template for depicting a portrait of the mathematician who is credited for its invention. Each element of the carpet is given a grey-tone value approximating that of the ‘pixel’ that was originally in its place.

Figure 6. Andrew Pike’s *Sierpinski Carpet*, digital, printed on canvas, 16.75” X 20.25”, 2007 (Reprinted with permission)

Cultural artefacts and traditions and some of their mathematical content were also the subject of several pieces. A fine example of this is Anita Chowdry's *Illuminated Shamsa* (Figure 7). The piece is painted using the exacting traditions of miniatures and illuminated manuscripts [2], combined with the Fibonacci spiral design found in natural structures such as the sunflower. As such, it shows, once again, that our human sense for beauty is inspired, at least in part, by the harmonious symmetries of the natural world.

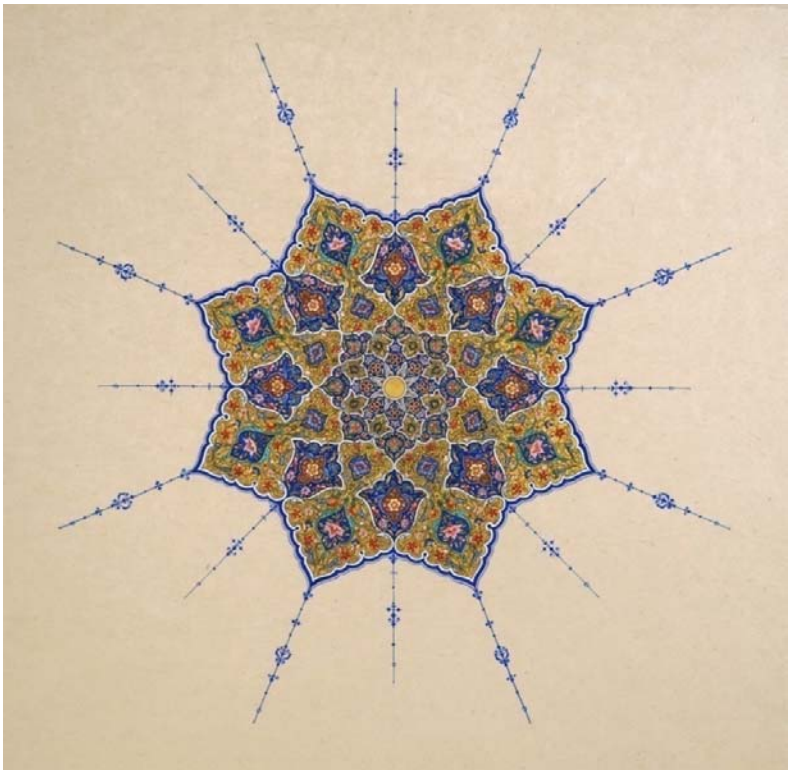

Figure 7. Anita Chowdry's *Illuminated Shamsa,* Gampi paper, hand painted with water based hand ground mineral pigments and 24 ct. gold, 36 cm X 36 cm, 2007 (Reprinted with permission)

Samuel Verbiese's musings on mazes (see for example Figure 8) are also inspired from long past cultural traditions. Using ideas from topology, the artist transfers a flat, circular design found on the floor of European cathedrals into one spanning the surface of a sphere. Doing so, he connect the ancient pattern with the

more modern space-filling curve attributed to Hilbert [5], and to the idea that the space in which we exist may indeed itself be curved.

Figure 8. Samuel Verbiese's *Chartres Laborange*, ink on dried orange (Reprinted with permission)

Goran Konjevod's pieces (see for example Figure 9) connect the viewer to the traditional craft of Origami. Eschewing the widespread thirst for realism, Konjevod brings an aesthetic intensity to *Kozo Twist* that is enhanced by its apparent simplicity of execution.

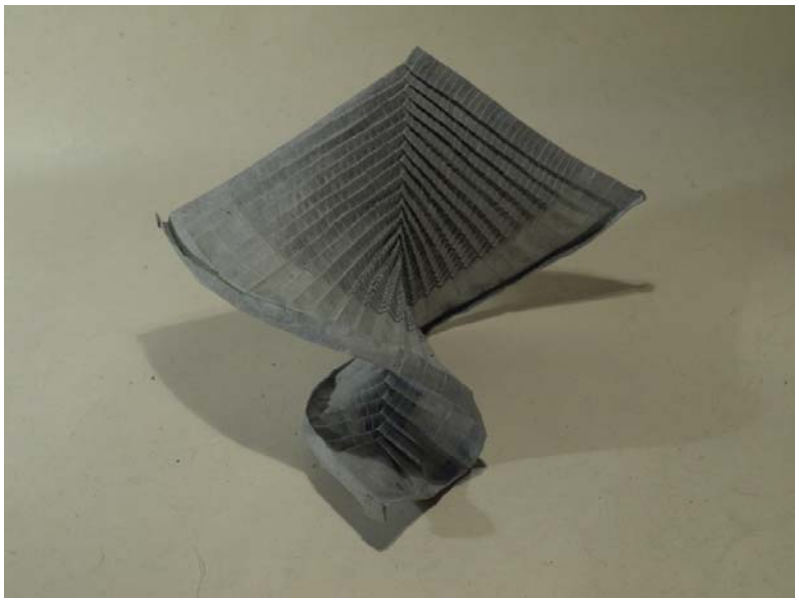

Figure 9. Goran Konjevod's *Kozo Twist*, folded paper, 6" X 4" X 5" (Reprinted with permission)

One of my favourite aspects of the Bridges annual exhibit is the variety of media represented, and the cleverness of the way they are used: there is always something new to learn. Because of the close connection between mathematics and computer science, of course, there are always many pieces that make use of the wide range of technologies now available to the savvy programmer, from 2-D printing (Curtis Palmer; Doug Dunham; Robert Bosch, Figure 4; Anne Burns; Robert Fathauer; Mehrad Garousi; Paul Prudence, Figure 10; Reza Sarhangi; Nathan Selikoff; Mark J. Stock; Philip van Loocke; Benjamin Wells; Brian Evans; Paul Gailiunas; Gary Greenfield; Susan Happersett; Kaz Maslanka; Susan McBurney; Fatma Mete; Col. Kenzou Nakamura; Andrew Pike, Figure 6) to 3-D printing (Carlo Séquin; Dániel Erdéli and Vladimir Bulatov) to laser-cutting and -etching (George Hart; Briony Thomas and Vladimir Bulatov), to rendering, and iterative calculations (for fractals).

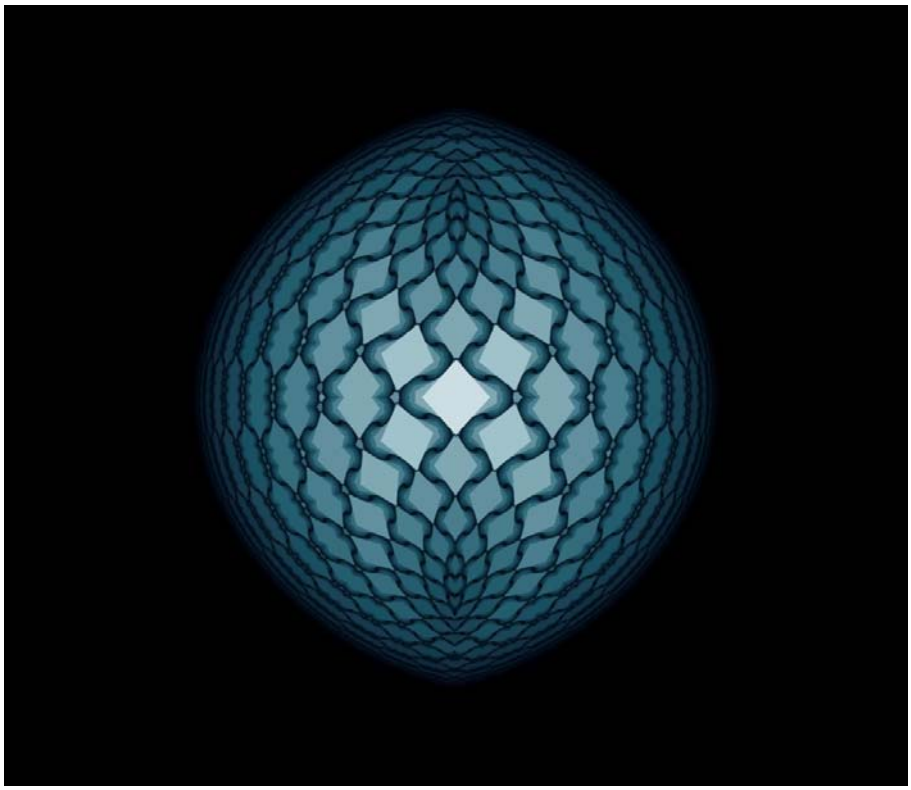

Figure 10. Paul Prudence's *Talysis II a*, archival inkjet print, A2, 2007 (Reprinted with permission)

In addition, however, more traditional craft and art techniques were also well represented this year: textile arts included quilting (Elaine Krajenke Ellison), knitting (Mickey Shaw) and beading (Laura Shea); woodworking included stickware (also known as Tunbridgeware) and other techniques (Bob Rollins, Figure 3; Owen Paul Meyer and Vladimir Bulatov); besides as a matrix for printed work, paper was the medium of choice for rope weaving (Carlo Séquin, Figure 5) and Origami (Goran Konjevod, Figure 9); time was the medium of choice for Merrill Lessley and Paul Beale; even food items were featured, with Samuel Verbiese's a-maze-ing citrus fruit (Figure 8) and, of course, paint and mixed-media collages (Aurora; Anita Chowdry, Figure 7; Krystyna Laycraft and Suman Vaze).

My personal favourites were varied as well. Anita Chowdry's stupendous *Illuminated Shamsa* (Figure 7), Paul Prudence's *Autotrophs (Morphogenetic Sequences 1 and 2)* and *Talysis II a and b* (Figure 10) and Goran Konjevod folded

paper sculptures (Figure 9) impressed me by their sheer beauty. Robert Bosch's *Islands I-IV* (see Figure 4 for number II), Carlo Séquin's *Klein Bottle with Fig-8 Cross Section* (Figure 5) and Samuel Verbiese's *Chartres Laborange* (Figure 8) struck me as particularly clever for their use of material, both physical and mathematical. Bob Rollins' *A Stick or Tunbridgeware Dodecahedron* (Figure 3) showed what beautiful execution is possible when working manually with skill. I also very much enjoyed Robert Fathauer's *Twice Iterated Knot No. 1* (which is reproduced in the 3(2) issue of this journal, page 101, Figure 6) and the way it creates a bridge between two classic Bridges themes, Celtic knots and fractals, while alluding also to Gothic arches. Finally, Andrew Pike's *Sierpinski Gasket* and *Sierpinski Carpet* (Figure 6) reveal a keen sense of humour in their self-referential subject matter. In addition, as a conference attendee I had the privilege of spending time with artists who are interesting, entertaining, and creative, and with whom it seems that I could talk endlessly about mathematics topics that fascinate me!

References

[1] E. Akleman (Ed), *Bridges Banff Art Exhibiton 2009 Catalog*, Tesselations, Phoenix, AZ, 2009.
[2] A. Chowdry, *Geometry, Illumination and Beyond*. The Middle East in London (2009), pp. 14-15.
[3] J. Francis, *History of Photo Mosaics* (2004). Available at. http://www.digitalartform.com/archives/2004/12/history_of_phot.html
[4] T.L. Heath, (Translator). *The Thirteen Books of Euclid's Elements*. Dover, Mineola, NY, 1956.
[5] E.W. Weisstein, *Hilbert Curve*. MathWorld–A Wolfram Web Resource. Available at http://mathworld.wolfram.com/HilbertCurve.html