George Hart

Conference Report

Bridges / ISAMA 2003

University of Granada, Spain
23-25 July 2003

The International Society of Art, Mathematics, and Architecture (ISAMA) conference and Bridges: Mathematical Connections Between Art, Music, and Science are inspiring forums which bring together people who love mathematics and art. A vibrant community meets annually to share ideas, show off new works, and recharge their inventive energies. To such people, art and mathematics is a single subject, a creative, intellectual, enriching, and worthy study of patterns and relationships in sensual form. Every mathematical topic, including chaos theory, non-Euclidean geometry, polynomials, and tangrams, and every form of art, including architecture, origami, pentatonic scales, poetry, and sundials, is welcome at these interdisciplinary gatherings.

Although mathematics has been central to the liberal arts for over 2000 years, and Renaissance artists and architects considered mathematics absolutely essential to their crafts, our popular culture of the past 100 years has largely lost track of these relations. So conferences which celebrate the links between math and art help restore a great intellectual tradition. The grandfather of these recent meetings is Michele Emmer, the Italian mathematics professor and film maker who has been a seminal impresario of math and art conferences in Europe for many years. In the USA, it was Nat Friedman, a mathematics professor and sculptor, who created in 1992 a series of U.S. meetings which evolved into the ISAMA conferences. And after attending one of those meetings, the mathematics professor Reza Sarhangi was enthused to form in 1998 the series of Bridges conferences.

The July 2003 Meeting Alhambra was a joint Bridges and ISAMA conference held at the University of Granada, in Granada Spain. This was an excellent location not only for the local culture, sights, food, and drinks, but especially for its walking-distance proximity to the Alhambra, a pinnacle of the great Islamic art tradition. A tour of this “cathedral” to geometry was the climax of the conference, after three days of papers, posters, and exhibits.

The 588-page conference proceedings is an attractive book containing sixty five papers and thirty abstracts. While the talks extended to complex variable theory and “a feminist deconstruction of philosophy of mathematics,” the bulk of the work focuses on things which are simply beautiful to perceive and think about: artworks inspired by mathematics and mathematical results inspired by art. And doubly creative, there are many contributions which are simultaneously original mathematics and original art. See, for example, Figures 1-3.

With so many excellent offerings, I can only adumbrate a few of my favorites to evoke the richness of the goings on. Manuel Baez presented large modular sculptures assembled from sticks, influenced by Louis Sullivan. Jay Bonner gave an analysis of Islamic geometric ornament illustrating multi-level self-similarities. Claude Bruter showed architectural designs for a mathematical village and fountain being erected to exemplify ideas such as energy minimization and bifurcation. Jean-Marc Castera demonstrated a lucid construction for the elaborate *muqarnas* (carved wooden ceilings) at the Alhambra. Douglas Dunham introduced us to arrangements of spirals in hyperbolic spaces. Michele Emmer spoke of films and plays with mathematical themes then showed a film about M.C. Escher in homage to the late H.S.M. Coxeter. Paul Gailunas

projected computer-generated animations of morphing Petri polygons. Gwen Fisher and Elsa Medina presented quilts based on the group theoretic idea of a Cayley table. Katrina Hebb analyzed the mathematics which one must implicitly know to make a quilt. Akio Hizume displayed a dodecahedral sculpture patiently assembled from twisted paper plus a clever spiraling “sunflower tower.” Ulrich Mikloweit showed striking models of uniform polyhedra made of intricately cut colored paper. Nikolaos Nikolis categorized spherical geometric structures underlying a variety of nuclear particle detectors.

Figure 1. Take-apart sculpture by Rinus Roelofs. Photo by Carlo Sequin.

Chris Palmer presented dynamic mandala-like patterns and ingenious geometric origami partly based on designs he studied while living for six months in a cave outside the Alhambra. Rinus Roelofs displayed elegant take-apart geometric sculptures and an architectural dome idea related to the work of Leonardo da Vinci. Carlo Sequin showed us what can be done with warped saddle surfaces and detailed the design and construction of an enormous minimal-surface snow sculpture. John Sharp illustrated the power of geometric inversion with sliced paper models and the stunning architectural models of John Pickering. John Sullivan demonstrated the art of geometric optimization with movies of knot arrangements and a sphere eversion. Raymond Tennant gave straightedge and compass classroom constructions for generating Islamic ornamentation. Godfried Toussaint had everyone clapping after his analysis of complex African rhythms.

An exhibit room allowed attendees to spend three days appreciating in depth many of the artifacts mentioned above plus a wide range of other works brought by the attendees. This included playful tessellations of pinned beetles by Jennifer Angus, origami jewelry folded from sheets of silver by Fred Bryant, three-dimensional stone mosaics based on hyperbolic tilings by Irene Rousseau, multilayered textile constructions by Beninga Chilla, a patterned paper scroll by Susan Happersett, ornamented zonohedral dome models by Marc Pelletier, and paper polyhedra by Magnus Wenninger. Out in the lobby was a large construction made of kite-like multicolored cloth triangles by Eva Knoll and Simon Morgan. In addition, a concert performance of Tessellations composed and improvisationally performed on the piano by Veryan Weston provided a musical highlight one evening.

Figure 2. Origami box by Chris Palmer. Photo by Carlo Sequin.

Figure 3. Bottom-up view of novel tower structure by Akio Hizume.
Photo by Carlo Sequin.

Splendid as the presentations and artifacts were, the best thing about these conferences is always the people. Elsewhere one might find “two cultures” of narrowly focused artists and mathematicians who would claim little interest in the other's field, but here one has a chance to chat with convivial multidisciplinary people who love to share their expertise. Anyone who enjoys a visual mode of thinking is certain to enjoy the experience of attending these conferences, which are especially valuable opportunities for creative educators looking for ideas to enhance the curriculum. There were many examples of how art and math may each be used as a “hook” to engage and enrich students.

Grateful recognition must be given to the many organizers for putting together such an outstanding event and permanent proceedings record, especially to Javier Barallo, Nat Friedman, Reza Sarhangi, Juan Antonio Maldonado, and Jose Martinez Aroza for overall organization and for the superb arrangements in Granada, to Nat Friedman and Benigna Chilla for curating the exhibit, and to Reza Sarhangi and Carlo Sequin for editing the proceedings.

In his opening remarks at Granada, Carlo Sequin commented that a conference is successful if one takes home at least one good idea—something which becomes the germ of something new. By that criterion, this was a most successful conference. We all enjoyed a feast of ideas to take home.

To order the Proceedings of ISAMA-Bridges 2003, send an e-mail to Javier Barrallo, mapbacaj@sa.ehu.es.

About the Reporter

George Hart is a research professor in the computer science department at Stony Brook University, NY. He holds a B.S. in Mathematics and a Ph.D. in Electrical Engineering and Computer Science, both from MIT, and was previously a professor at Columbia University. He is the author of a linear algebra text *Multidimensional Analysis* (Springer Verlag, 1995), a geometry text, *Zome Geometry* (coauthored with Henri Picciotto, Key Curriculum Press, 2001), and over fifty scholarly articles, conference papers, and technical reports. Hart is also a sculptor, and his works have received praise and awards in numerous exhibitions. His web site <http://www.georgehart.com> illustrates the range of his work.