Bridges 99: Mathematical Connections in Art, Music and Science

Reza Sarhangi, Daniel F. Daniel

The second annual conference, *Bridges: Mathematical Connections in Art, Music, and Science,* was a gathering of visual artists, computer graphicists, mathematicians, musicians, and scientists from several schools and countries –as close as Canada and as far away as Kuwait. The purpose of the conference was to explore the links among disciplines through mathematical properties of objects and matter. The conference was held at Southwestern College, Winfield, Kansas in the United States, during a three day period, July 30-August 1, 1999. It included three General Sessions in the mornings, six Special Sessions, and three Workshop Sessions in the afternoons.

In addition to the three-day conference, there was also an activity day structured for high school students titled "Bridges for the Next Generation". On this day, some of the invited extramural speakers joined presenters from Southwestern College to work with these public school students. The Proceedings of the Conference, a 310-page book with approximately 200 illustrations, included peer-reviewed papers by presenters and was distributed during the conference.

The conference exhibited artwork by some of its participants. Among these was Brent Collins, a sculptor from Kansas City, Missouri, USA, who brought wooden and bronze casts of his work. Janusz Kapusta, a New York Times cartoonist, exhibited his geometrical eleven-sided shape called the K-Dron. He distributed a sample of this form among participants of the conference as well as a complimentary book on the history of the evolution of the K-Dron. Robert Fathauer, the founder of Tesselations Company in Tempe, Arizona, exhibited his fractal and post-Escher tilings. Irene Rousseau, an artist and art historian from New Jersey, exhibited "Mosaics". Additional exhibits included John Sullivan's "Optiverse and other Sphere Inversions" and Nat Friedman's "Geos".

The conference started with an official welcome from President Dick Merriman of Southwestern College. He talked about the excitement in academics and in life being generated at the borders of fields and ideas. Nat Friedman from SUNY-Albany next spoke on hyper-seeing and showed a series of slides of his sculpture to illustrate his concept. This presentation was followed by Irene Rousseau who spoke on "Math at the Service of Meaning: Links between Geometry, Mythology, and Philosophy in Mosaic Art." The final General Session speaker of the first day was violinist Corey Cerovsek who concluded the morning with a talk about mathematics and music. He illustrated his presentation with music performed on his Guenari violin. The afternoon sessions included talks on "Artistic Patterns in Hyperbolic Geometry" by Douglas Dunham from the University of Minnesota. Gary Greenfield, from the University of Richmond, Virginia, spoke on "Understanding the Search Problem for Image Spaces." David Gerhard, from Simon Fraser in Canada, discussed audio visualization in phase space. Physicist Richard Krantz from the Metropolitan State College in Denver, Colorado spoke on "Music, Mathematics, and Magnetic Ordering." Joel K. Haack, of the University of Northern Iowa, presented a paper on "The Music of the Just Intonation Used in the Music of Terry Riley." The first day also included workshops such as "Exploring Laptop Computers" by George Gangwere from the faculty of Southwestern College. "Art and Mathematics of Tessellation" was presented

by Travis Etheridge, a 1999 math graduate of the host college.

The second day of the conference featured Michael Field, from the University of Houston in Texas. He offered a commentary on "Harmony, Chromatics, and Chaos." These comments were supported with stunning two color patterns and other symmetry icons created by his own software named PRISM. Jay Kappraff from the New Jersey Institute of Technology spoke on systems of proportions in design and architecture and announced his discovery of a new proportion used in classical design and architecture. Brent Collins, sculptor, spoke on "Merging Paradigms." After his talk, the audience was invited to the stage to inspect his various casts and wooden laminates used in producing the finished works of art.In the afternoon sessions of the second day of the conference, Eric Demaine from the University of Waterloo in Canada presented "Polyhedral Sculptures with Hyperbolic Parabaloids." Paul LaFollette from Temple University in Philadelphia, Pennsylvania offered a commentary on aesthetics and computer science. Isaiah Jackson, the conductor of the Youngstown Symphony Orchestra and Nathan Ritchey of Youngstown State University in Ohio spoke on the quest for a "Topology of Music." In addition, Ralf Carriuolo from the University of New Haven in Connecticut presented a paper on behalf of a colleague, Richard Morrison, who had died during the past year. Morrison's daughter also traveled to Winfield to represent her father's memory.

Origami as a subject and methodology for teaching mathematical thinking was introduced in a workshop format by Janine Meyer of Pace University in New York. At the end of the second day, Eva Knoll and Simon Morgan of Rice University of Texas, offered a barn-raising using an Endo-Pentakis-Icosi-Dodecahedron. This workshop benefited from the presence and labor of several Winfield public school students.

The last day of the conference started with John Sullivan from the University of Illinois presenting a video of his work on everting a sphere-"The Optiverse". The video was based on Sullivan's research on the quest for minimal energy levels in eversions of spheres. Dan Daniel, Southwestern College, and poet Gar Bethel spoke on "Repetition and Self-Similarity in Modern Poetics." Bethel illustrated the discussion with one of his sonnets titled "Connections". The final speaker during a General Session was Carlo Sèquin from the University of California at Berkeley. His talk was on "Analogies from 2-D and 3-D –Exercises in Disciplined Creativity."

The afternoon session for day three included a talk on Mobius Knitting by Daniel Isaksen from the University of Chicago and by Alabama Petrofsky from San Rafael, California. Reza Sarhangi presented a commentary on "Mathematical Aesthetics of Persian Dome Interiors." Steven Eberhart from California State University at Northridge spoke on stylized proportions perceived by a "musician-mathematician." Kristyann Manske, University of Wisconsin in Madison, presented software concerned with periodic tilings. Semiotician Kent Hooper from the University of Puget Sound in Washington spoke on the complexity of discourse in interarts dialogue. The conference concluded with a banquet and a final violin concert by Corey Cervosek.Other speakers were Lawrence Holbrook, East Lansing, Michigan; Joe Cusumano, Pennsylvania State University; Beverly Mayhew, Richland, Washington; Mara Alagic, Wichita State University, Kansas; Ranganathan Padmanabhan, University of Manitoba, Canada; Jason Barnett, St. Paul, Minnesota; Andrea Karkowski, Capital University, Ohio; Craig Kaplan, University of Washington.

For further reading.

REZA SARHANGI, ed., *Bridges 1998. Mathematical Connections in Art, Music, and Science.* (Winfield, Kansas (USA): Southwestern College, 1998). ISBN 0-9665201-0-6.

REZA SARHANGI, ed., *Bridges 1999. Mathematical Connections in Art, Music, and Science.* (Winfield, Kansas (USA): Southwestern College, 1999. ISBN 0-9665201-1-4.

About the reporters.

Reza Sarhangi was a math high school teacher, teacher trainer, drama teacher, play writer, play director, and scene designer before coming to US in 1986. After obtaining a Ph.D. in applied mathematics (Control Theory-Distributed Parameter Systems) from Wichita State University, Kansas, he joined the faculty of Southwestern College. Besides teaching mathematics courses, he teaches courses such as Math and Art, Chaos and Fractals, and Mathematical Bridges to Science. These courses are offered through the Integrative Studies Program -- the general studies component -- at Southwestern College. Recently he and a group of his students wrote and directed a play. He is the conference director and the proceedings editor of *Bridges: Mathematical Connections an Art, Music, and Science*. He is also the author of "The Sky Within: Mathematical Aesthetics of Persian Dome Interiors" in the *Nexus Network Journal* vol. 1.

Daniel F. Daniel received his BA in English Literature from Berea College in Kentucky, his MA in literature from the University of Chicago, and his PhD in literature and philosophy from the University of Wisconsin-Madison. He has done post doctoral work in Semiotics at Kansas University and in Prosaics at Northwestern University in Evanston, Illinois. He currently serves on the Board of Environmental Ethics at Dade County Community College in Miami, Florida. He is a professor of English Literature and a member of the Integrative Studies faculty at Southwestern College in Winfield, Kansas.