Bridges

Mathematical Connections in Art, Music, and Science

2001

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Conference Proceedings
2001

Reza Sarhangi and Slavik Jablan, Editors

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Fire and Ice

Some say the world will end in fire,
Some say in ice.
From what I've tasted of desire
I hold with those who favor fire.
But if it had to perish twice,
I think I know enough of hate
To say that for destruction ice
Is also great
And would suffice.
Robert Frost

We celebrate the fourth gathering of *Bridges*, a conference that has grown every year both in number of those involved and in the quality of presentations and proceedings. We marvel at the talents that have joined and are joining *Bridges* every year to extend the horizon of the conference: the music of Corey Cerovsek, the *Bridges Mathematical Visual Art Exhibit*, the *Bridges CD*, and the *Bridges Index* to mention a few. We continue our efforts to integrate the disciplines of mathematics, art, science, and music.

The front cover, *Fire and Ice*, is a digital artwork by Robert Fathauer. It combines graphically constructed fractals with photographs taken by the Hubble Space Telescope. The work was inspired by Robert Frost's poem, noted above. Each snowflake is a copy of the same fractal tiling, devised by Robert Fathauer and based on v-shaped prototiles. Each full tiling forms the classical fractal known as the Koch snowflake. The large black fractal in the center of the design, nicknamed *Pentakoch*, is a fractal tile related to a five-fold analog of the six-fold Koch snowflake, and was devised by Chaim Goodman-Strauss. This shape tiles with similar copies of itself in a variety of complex ways. The background—the universe—turns our attention to origins. From even the smallest snowflake or flame of fire, we are reminded of the big picture. Robert is the founder of Tessellations Company in Tempe, Arizona. He is the coordinator of the *Bridges Mathematical Visual Art Exhibit.*

Back cover art, by Slavik Jablan, combines his mathematical training with his artistic instinct. This combination has made him a unique mathematician, an expert in symmetry and ornaments. The name of the design is *OrnTile*. This is the name of a software utility that he has designed to function both as a puzzle and a design generator. The *OrnTile* design is a modular interlacing pattern, which is based on a single tile. Slavik is the Co-editor of the Online Journal of Visual Mathematics, *VisMath*, the author of *Theory of Symmetry and Ornament*, published by the Mathematical Institute, Belgrade, Yugoslavia, and numerous other scholarly publications in mathematics and in the arts.

Special thanks must be given to Slavik: for accepting a position at Southwestern College during my leave of absence, for helping me organize the *2001 Bridges Conference*, and for helping edit the proceedings. He spent many nights at the computer, communicating long distance with me, the authors of the articles, and the referees, in order to complete the proceedings. Additionally, he spent countless more hours compiling the accompanying CD. I should say that even if what has been achieved—a refereed proceedings along with a CD prior to the conference—is not the first time this has ever been done, surely it is among the first in the world.

Special thanks also go to my wife, Mehri Arfaei, from the entire Bridges community. She has provided Slavik with the help he needed in my absence and has served as contact person for this year's conference. In addition to her own workload as a mathematics faculty member at Southwestern College, she has handled departmental problems. I rarely thank her for what she does for me as a spouse, and I would be remiss in not acknowledging her excellent work as a colleague. Thank you Mehri.

Compiling these proceedings could not be done without others as well. Thanks go to the Office of Communications and Public Relations at Southwestern College, particularly Sara Weinert, Joni Rankin, Sunni Sheets, and the late Karen Mages, for their help in compiling the cover art, printing, and communicating with the media; to Pam Frank, faculty assistant in the mathematics department; to Barbara Kaiser, in the business office; and to Steve Ruggles, in the Computer Information Center. Thanks also go to Robert Craig, who compiled the index with the help of Simon Luhur; Robert Fathauer, who has coordinated the first Bridges Conference exhibition, and to Southwestern College English Professor Dan Daniel, who has a vision for integrating knowledge and who has helped tie up loose ends.

Genesis, a sculpture by Brent Collins, is the logo of Southwestern College's Integrative Studies Program and the Bridges Conference. It was first acquired by the college with the help of trustee and Wichita attorney Jack Focht and has symbolized the college's vision for integrating fields that traditional education tends to separate. For two years *Genesis* found its home among the halls of Southwestern College. After its disappearance, Southwestern College President Dick Merriman pursued a replacement that could be permanently installed on campus as an icon for integrative studies and the Bridges Conference. We proudly unveil *Genesis* during this year's conference.

Reza Sarhangi