*What I Did on My Summer Vacation**

Michael Serra

I finally got a vacation, and what did I do? I attended two geometry conferences, combining my passions for geometry and Italy. During the first week of June, I attended *Nexus 98*, a conference on architecture and mathematics in Mantua. The purpose of *Nexus 98* was to “provide a panorama of ideas about architecture and mathematics”. Most presenters and participants were university professors of architecture, with a sprinkling of mathematicians, including Jay Kappraff from the Department of Mathematics at the New Jersey Institute of Technology; Kappraff is the author of a wonderful resource book for teachers titled *Connections: The Geometric Bridge Between Art and Science*.

Kappraff and Ben Nicholson of IIT presented one of the most intriguing papers at the conference, “The Hidden Pavement Designs of the Laurentian Library”. In 1774, a portion of a terracotta panel beneath the floorboards of the Florentine library designed by Michelangelo was accidentally uncovered after being hidden for almost two hundred years. In 1928 all fifteen geometric panels were uncovered and photographed before the wood flooring was replaced. Nicholson’s ten years of research at the library –along with Kappraff’s mathematical analysis of the panels– has added to the understanding of the geometric pavement designs.

Nicholson conjectures that the original intention of the panels “was to infuse the spectator with the foundations of ancient geometry” while walking about the reading room of the library. The teacher in me thought, “What a great project: give my kids a floor plan of a library and have them design a series of geometric panels to symbolize the different sections of the library, with panels for the sciences, the visual arts, the history section and even for fiction.”

Nicholson and Kappraff believe that ancient architects used a number of traditional geometric designs in their constructions: the Sacred Cut, based on the half-square, the ad quadratum, or square within a square and circle grids are three of the designs from the ancient geometers’ toolkits.

My month in Italy concluded with the *Escher Centennial Congress* held in Rome, June 24-26. One of the first presenters was Douglas Hofstadter, who shared Escherian anecdotes, including the story about Mick Jagger and M.C. Escher. Jagger wrote to Escher, asking permission to use one of the artist’s prints for a Rolling Stones album cover. His letter to Escher began “Dear Maurits”, which was too much for the very formal Dutch artist. Escher wrote back, “No, you may not use my art, and it is not Maurits but M.C.. Escher to you.”

Another treat was seeing M.C. Escher’s son George Escher present a mathematical investigation of cubic arrangements of eight linked cubes. In his presentation you could see the attention to detail, the perseverance and the organized investigations that characterized his father’s work with symmetry and tessellations. The most delightful thing about the presentation was George’s modest denial, like his father’s, that he was doing any real mathematics and not just exploring in depth a problem that interested him.

The conference attracted artists, math teachers, and M.C. Escher fans from all over the world. One group of artists focused on Escher-like tessellation art. Japanese artist Makoto Nakamura created intricate wooden space-filling tessellations. Ken Landry created tessellations on the paper surfaces of complex stellated polyhedra. Artist Rinus Roelofs, from the Netherlands, went

in another direction: rather than looking at the plane-filling figures in the tessellations, he experimented with the lines between the shapes. He made the lines thicker, extended them and created intricate knot designs. He then used these patterns to create wooden dowel dome-like structures that could be built by adding one stick at a time. Roelofs also created a jigsaw puzzle in which one side of the pieces created the familiar tessellation of the Chinese character with a triangular hat, and the other side was rearranged to form the famous reptile tiling.

Some of the other presenters who focused on symmetry and tiling patterns included Doris Schattschneider (author of the definitive work on Escher's periodic drawings, *Visions of Symmetry*), Kevin Lee (creator of *TesselMania!*, and Key Curriculum Press' upcoming *KaleidoMania!* software), and Arthur Loeb (professor at the Carpenter Center for the Visual Arts at Harvard University). Loeb pulled a wonderful trick on the audience. He presented a slide show of places all over the world that exhibited the various types of planar symmetry groups. Although the presentation seemed a bit routine, it was an impressive collection of photos of incredible quality showing wonderful buildings and facades, magnificent stained glass windows, and richly detailed fabrics. Only later at dinner was it revealed that he had created all the slides on his computer, that not one of the architectural sites or fabrics existed--and we all bought it!

Another group of artists created Escher-like "impossible art", as illustrated in Escher's lithograph *Belvedere*. Works by Swiss artist Sandro Del-Prete, Hungarian artist Tama's Farkas, and Belgium painter Jos de Mey were impressive examples of the impossible-figures genre. Dick Termes, an artist from Spearfish, South Dakota, took Escher's idea of sketching reflected images on the surface of reflective spheres to another dimension. He created actual spheres whose surfaces were completely covered with images in what he calls his 6-point perspective.

As we have all discovered, there is more to a conference than the presentations. The opportunity to meet and exchange ideas with other professionals and the chance to discover new publications are at least as important at the presentations. The complete proceedings of the Escher Congress will be published by Springer-Verlag, and I'm sure you will want to read them.

*This conference report is reprinted by permission from the Fall 1998 issue of the Discovering Geometry Newsletter.

For further reading

JAY KAPPRAFF. *Connections: The Geometric Bridge Between Art and Science*. (New York: McGraw-Hill, 1991).

DORIS SCHATTSCHNEIDER. *Visions of Symmetry*. (New York: W.H. Freeman, 1992).

MICHAEL SERRA. *Discovering Geometry: An Inductive Approach*. Second edition. (San Francisco: Key Curriculum Press, 1997).

KIM WILLIAMS, ed. *Nexus II: Architecture and Mathematics*. (Fucecchio, Florence: Edizioni dell'Erba, 1998).

About the reporter

Since 1990, with the publication of the first edition of *Discovering Geometry: An Inductive Approach (DG)* (San Francisco: Key Curriculum Press, 1990), Michael Serra has continued to teach at George Washington High School in San Francisco. When he is not teaching, he is either writing new material or traveling all over the country giving workshops to districts that have already adopted or are thinking of adopting *DG*. He also gives presentations at four

or five National Council of Teachers of Mathematics (NCTM) regional conferences, or state mathematics conference around the country. In 1997 the second edition of *Discovering Geometry* was published. Other publications include the very popular supplementary geometry book, *Patty Paper Geometry*, and the set of five workbooks used as classroom starters called *Mathercise* (*Mathercise A-E*). He is currently working on two supplementary books, *What's Wrong With This Picture? - Activities for Discussion in Algebra* and *What's Wrong With This Picture? - Activities for Discussion in Geometry*. Also planned is a *Patty Paper Algebra* book, and a third edition of *Discovering Geometry*.