

Art by Bill Thurston

The December cover image accompanies the memorial article about Bill Thurston coordinated by David Gabai and Steve Kerckhoff. It reproduces a drawing made by Thurston that was included as a color insert in the book *The Eightfold Way: The Beauty of Klein's Quartic Curve*, published by the Mathematical Sciences Research Institute (MSRI) in Berkeley and Cambridge University Press in 1999. The immediate motive for the book was the unveiling at MSRI of a sculpture by Helaman Ferguson inspired by the algebraic curve discovered by Felix Klein containing $\mathrm{PSL}_2(\mathbb{Z}/7)$ as an automorphism group. This curve is a quotient of the Poincaré half plane by an arithmetic subgroup of $\mathrm{PSL}_2(\mathbb{R})$, and the drawing illustrates how that works.

The editor of the book was Silvio Levy. He writes to us:

“Bill Thurston was always looking for ways to visualize and explain geometric facts. While the standard gluing construction easily describes the topology of a closed surface of arbitrary genus, Bill wanted to visualize the *geometry* of particular examples as well. He was intrigued by Hurwitz's 1893 theorem, which (in Bill's preferred geometric language) specifies the maximum number of possible self-isometries a closed hyperbolic surface of a certain genus can have. Around 1990 he became aware of work of Felix Klein from the 1870s, exhibiting a compact Riemann surface that exemplifies Hurwitz's theorem in genus 3; it has 168 automorphisms, or 336 symmetries if we allow orientation reversal. Known as the Klein Quartic, this surface has the remarkable projective equation $x^3y + y^3z + z^3x = 0$.

“In 1992, as director of MSRI, Bill was in a position to commission a sculpture (paid for with private donations) from the sculptor Helaman Ferguson, and it was decided that it should illustrate the Klein Quartic. The base was to be a heptagonal tiling of the Poincaré disc, made in serpentine; I prepared a paper collage of the tiling with a few hundred heptagons, to serve as a model for the stone cutting. The upper portion, an elegant rendition in white marble of a genus-three surface with tetrahedral symmetry, showed ‘the same’ tiling by heptagons on the wrapped-up surface, but some of the edges were raised to represent the ‘eightfold way’ that leads from any vertex of the tiling back to itself after a polygonal trip along the edges, alternating lefts and rights.

“At the sculpture's unveiling in November 1993, Thurston lectured briefly on the mathematics behind it; the event handout included the drawing on this *Notices* cover, which he made to indicate both the symmetries and the eightfold way—but also the right way to pronounce the abbreviation MSRI. (He disliked the thitherto prevalent nickname for the Institute. He was successful in supplanting it but not with his proposal of ‘Emissary’,

which became instead the name of MSRI's newsletter; what caught on for the Institute was, simply enough, Em-Ess-Are-I.)

“A few years later, *The Eightfold Way* was published in the MSRI Publications series. The texts of the articles in it (but not the insert with the cover image) are available at library.msri.org/books/Book35/contents.html

They deal with the Klein Quartic from several points of view (complex-analytic, algebraic, geometric) and with the sculpture itself.”

Silvio Levy got his PhD at Princeton in 1985 under Thurston and collaborated with him as a programmer, illustrator, and editor until the late 1990s. We thank him for suggesting the cover image to represent Thurston's art, and we thank both Cambridge University Press and the Mathematical Sciences Research Institute for allowing us to reproduce it.

—Bill Casselman
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