Bridges 2025: Mathematics and the Arts

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Bridges is an annual event held alternately in America, Europe, and Asia. People interested in mathematics, art, architecture, music, poetry, and fashion gather for lectures, workshops, and exhibitions. This year, Bridges was hosted by Eindhoven University of Technology, with Tom Verhoeff as host. Henk Hietbrink, a graduate of TU/e and Bridges volunteer, provides a report with numerous links so you can fully experience Bridges.

Exhibition

On Sunday, the exhibition was set up with over a hundred pieces on display. Alongside many digital works, there was also fine traditional craftsmanship by Margi Lake[1] and Hanneke Rijks[2]. Particularly impressive was the Penrose table featuring a so-called Wieringa roof, designed by Brechje Vermaat[3], as shown in Figure 1.

Figure 1 Penrose table – Brechje Vermaat

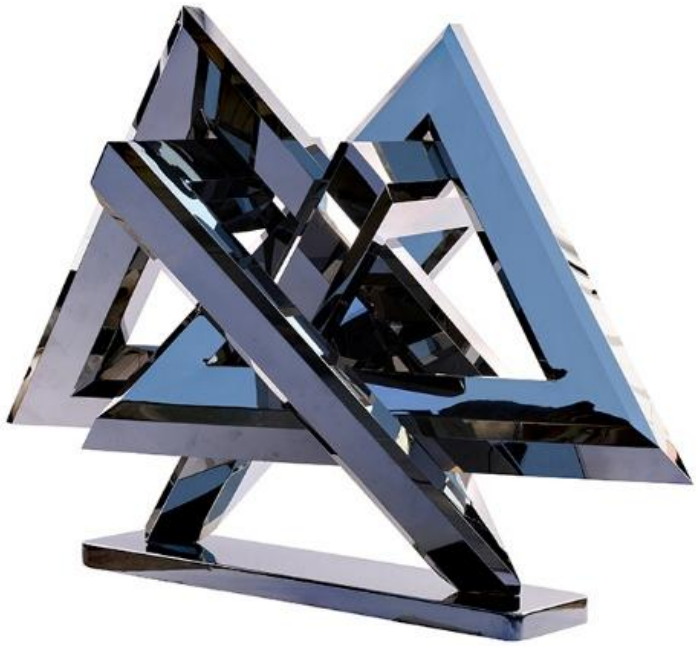

Figure 2 Quartangle – Anton Bakker

The major eye-catchers of the exhibition were three large sculptures by Anton Bakker. Visitors to the Ars et Mathesis anniversary event or the digital mathematics museum are familiar with his work. The Bridges 2025 logo is based on one of Anton's sculptures[4], as shown in Figure 2.

Lectures

Renowned speakers such as Rinus Roelofs[5] and Ingrid Daubechies were invited to give a lecture. Roelofs's work is so comprehensive that a teacher could use a different piece, each with its own surprising mathematics, in every lesson for years.
Daubechies presented the art project *Mathalchemy*, an installation with a lot of mathematics hidden inside. The comic book of the same name is available as a free download in many languages[6].
A particularly surprising lecture was given by Brigitte Kock. As a first-year Industrial Design student at TU/e, she almost dropped out on the boring math until she discovered how to create beauty with math and programming through Digital Craftsmanship. Complex natural patterns that would take days to produce by hand appeared on the screen in seconds. Everything suddenly fell into place: those early patterns, the precision, and the creativity. Since then, Brigitte has come to love mathematics, which now forms the foundation of her modular, 3D-printed fashion. Like Roelofs, she uses Rhino Grasshopper software for the parametric design of her clothing[7].
Edmund Harriss is known for his coloring books with Alex Bellos. The Harriss spiral bears his name. As co-author of *Algebraic Number Starscapes*, he demonstrates how mathematics can be beautifully depicted graphically in the complex plane. Less well-known is his tool *Curvahedra*[8], which can be used to create beautiful spherical shapes, see Figure 3. Ready-made kits are expensive, but buying a laser cutter yourself isn't cheap either. Perhaps we should start an exchange program to better utilize precious equipment: if your school makes this for me on your machine, my school will make that for you on ours...

Figure 3 Curvahedra spheres

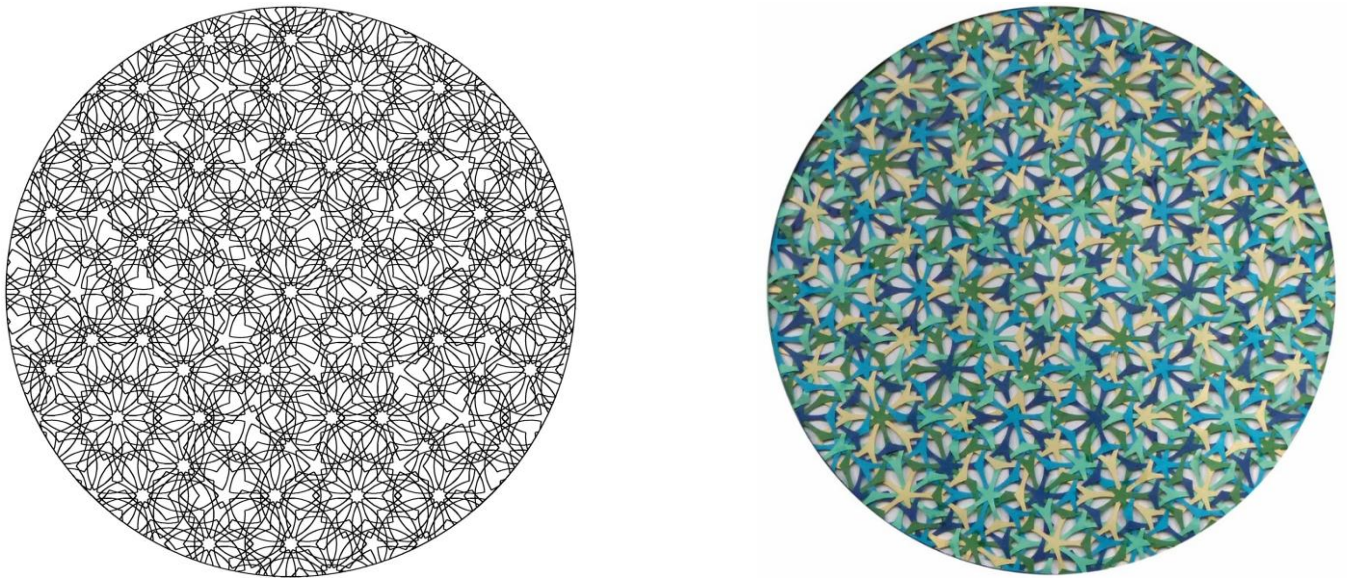

Figure 4 The five linked starfish / ivy leaf / hexagon tilings

Presentations

Participants could present their papers, all of which are published in the conference proceedings[9]. Ulrich Reitebuch's paper translates the challenging yet accessible mathematics introduced by De Bruijn in 1981, underlying the pentagonal aperiodic Penrose tilings, into elegant graphic designs. Using modular arithmetic, sets of line segments are removed and then recombined, resulting in a series of five complementary tilings. Executed in paper, the result is a true work of art. The image of the *Starfish–Ivy Leaf–Hexagon Tiling* in Figure 4 is small; a much larger version can be found in Ulrich's paper[10].
Fahreddin Başeğmez has developed a Python library to generate symmetrical patterns. With only a few statements, impressive results can be achieved in no time. A key component is weaving. While many programs can draw patterns, his software can also deal with weaving, as shown in the example in Figure 5. His paper includes many more examples[11]. It seems to be a fully fledged tool for a school research project focused on designing and analysing (Islamic) geometric patterns.

```
import simetri.graphics as sg

canvas = sg.Canvas()
Star = sg.stars.Star
radius = 50
gap = 300
for  i in range(10, 15, 2):
    star = Star(i, radius).level(4)
    star.translate(i * gap, 0)
    swatch = sg.random_swatch()
    lace = sg.Lace(star, offset=5,
                   swatch=swatch)

    canvas.draw(lace)

canvas.display()
```

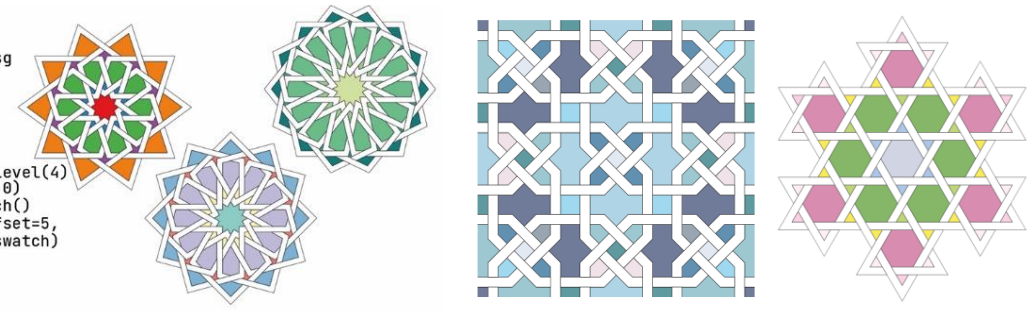

Figure 5 Generating Patterns including Weaving with a Few Statements

Family Day

Thursday was Family Day[12], an open house where exhibitors demonstrated their work. One area featured programmable sewing machines used to embroider geometric patterns. Henc Bouwmeester showed how three-dimensional shapes can be assembled from simple plastic strips and split pins, for example with pentagons. Perhaps something for a workshop day, all hands on deck. Because the result is spherical, the angles of the pentagon are slightly larger than the expected 72°.

Figure 6 Coded Embroidery – Joek van Montfort

Figure 7 Divided spheres – Henc Bouwmeester

Henk Hietbrink presented his research on Turkish and Iranian muqarnas and explored both the possibilities and limitations of constructing a complete muqarnas from a limited set of standard building blocks[13]. Reading original Turkish and Iranian literature proved essential for understanding the underlying principles of muqarnas design.. Participants had the opportunity to build muqarnas themselves; see Figure 8.

Figure 8 Muqarnas Workshop

Notes

[1] https://margilake.com/
[2] https://hannekerijks.com/
[3] https://www.studioinhout.nl/
[4] https://www.bridgesmathart.org/b2025/
[5] https://www.rinusroelofs.nl/
[6] https://mathemalchemy.org/a-comic-book-adventure-in-math-and-art/
[7] https://www.youtube.com/watch?v=YOCiKLc4TEA en
https://www.instagram.com/variableseams/ en
https://www.nvvw.nl/2025/08/brigitte-kock-van-variable-seams-over-de-schoonheid-van-formules/
[8] https://curvahedra.com/
[9] https://archive.bridgesmathart.org/2025/#gsc.tab=0
[10] https://archive.bridgesmathart.org/2025/bridges2025-263.pdf
[11] https://archive.bridgesmathart.org/2025/bridges2025-29.pdf
[12] https://www.bridgesmathart.org/b2025/bridges-2025-public-events/bridges-2025-family-day/
[13] https://henkhietbrink.nl/muqarnas.htm

About the author

Henk Hietbrink enjoyed many years as a mathematics teacher. For the time being, however, he has stepped away from teaching to focus on muqarnas and sundials.