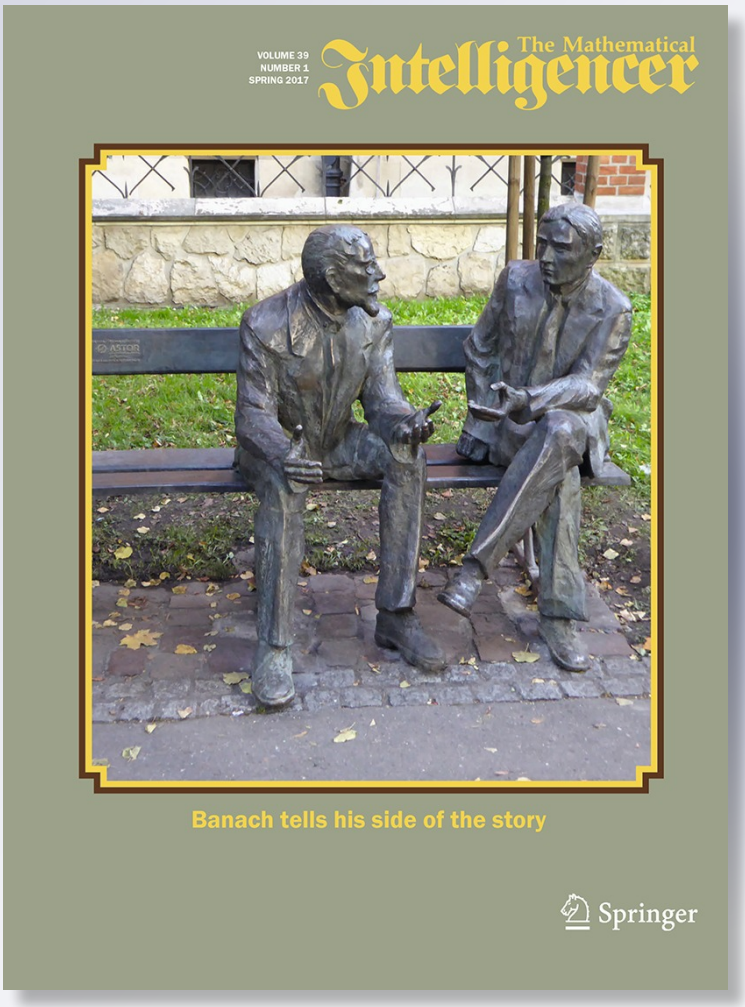
# *A Bike Tour for Rinus Roelofs' Art in Twente, The Netherlands*

**Dirk Huylebrouck**

**The Mathematical Intelligencer**

ISSN 0343-6993
Volume 39
Number 1

Math Intelligencer (2017) 39:60-65
DOI 10.1007/s00283-017-9712-3




Springer

# A Bike Tour for Rinus Roelofs' Art in Twente, The Netherlands

Dirk Huylebrouck

*Does your hometown have any mathematical tourist attractions such as statues, plaques, graves, the café where the famous conjecture was made, the desk where the famous initials are scratched, birthplaces, houses, or memorials? Have you encountered a mathematical sight on your travels? If so, we invite you to submit an essay to this column. Be sure to include a picture, a description of its mathematical significance, and either a map or directions so that others may follow in your tracks.*

➢ Submissions should be uploaded to http://tmin.edmgr.com or sent directly to **Dirk Huylebrouck,** huylebrouck@gmail.com

Rinus Roelofs is an artist known to the readers of *The Mathematical Intelligencer* because he noticed an error in a 500-year-old geometric drawing by Leonardo da Vinci (see [2]). Mathematicians may have crossed paths with him at conferences, such as the "Bridges Conference" (see [1]), or during his workshops for the "Imaginary" exhibitions organized by the Mathematisches Forschungsinstitut Oberwolfach, Germany (see [3]). His home region of Twente, The Netherlands, displays some of his artworks permanently at different locations. In a radius of about 5.6 mi (9 km) around Enschede, one can see seven of his sculptures. This is an ideal distance to test the typical Dutch bike, on which the rider sits straight, vertically, not hunched over as on most bikes. The more experienced biker can see seven more statues by riding an extra 10 mi (16 km) to Almelo, and the sportive mathematical tourist one more, in Coevorden, but that requires an extra 27.5 mi (44 km; see Fig. 1).

The Enschede railway station is a good start, as it is a major station with good connections to most towns in The Netherlands. The local "Tourist Info" office will be happy to provide the mathematical tourist with addresses for renting a bike. Moreover, in front of it stands Roelofs' sculpture "Trees," inspired by a grid concept of Leonardo da Vinci that Roelofs translated to polyhedral structures. Every grid element or stick is connected to 4 other sticks, so that the endpoints connect on only one of the midpoints of another stick. Translating this concept to the 3D grid of a cuboctahedron leads to 4 sets of 3 parallel sticks, a concept Roelofs used to design the sculpture (see [4]). Strobos Metal, Hengelo, executed the artwork in stainless steel (see Fig. 2).

This artwork is the second version of a similar one that can be seen at the Aquadrome in Enschede (see Fig. 3). It is also called "Trees," but it has only 2 components instead of 3. The reason is that the town of Enschede initially wanted to move this artwork from the Aquadrome to its railway station square when the latter was renovated, but the Aquadrome refused. When the city counselors asked Roelofs for a new version, "something similar" (quote!), he decided to build a slightly larger version with three "trees." Many towns don't have any mathematical artwork; Enschede has two.

Next, a short ride brings the tourist to the University of Twente, on the way to Hengelo, but still in Enschede. Along the "Calslaan" on the university campus, four concrete statues adorn the park near the bell tower. Two of these works are based on a concept Roelofs calls "helical holes." They are inspired by a Kenneth Snelson paper in which Snelson explained how to assign opposite orientations to a cell and its neighboring cell in a weaving pattern (see [8]). Roelofs further developed it using patterns with


DOI 10.1007/s00283-017-9712-3


**Figure 1.** Map for the mathematical bike tour; a good start is the Enschede railway station, where the mathematical tourist can ask at the "Tourist Info" office about places to rent a bike; in front of it is one of Roelofs' sculptures, "Trees."

**Figure 2.** Other views of the artwork "Trees."

square grids and hexagonal grids in these campus artworks (see [5]). Two other sculptures are designed starting with a set of two interwoven layers, which are then rolled into a cylinder. As a result of the enrolling, one layer is connected into the second layer, ending up in a structure having only one single (entwined) surface. It leads to two single-surface

**Figure 3.** The first version of the work "Trees," at the Enschede Aquadrome.

cylindrical sculptures (see [6]). The statues were executed in concrete, using a 3D concrete printer by Italian Enrico Dini's company "D-Shape." The printer measures $5 \times 5 \times 3$ meters, and has 300 printing heads on a distance of 2 cm, which can, theoretically, provide a 25-dpi result (in reality the result is closer to 5 dpi; also, note that in this case it is more correct to say the voxel size or "volume cell" size is about $5 \times 5 \times 5$ mm; see Fig. 4).

A ride from the University of Twente to the nearby city of Hengelo is within reach of any biker. On the crossing of the "Woolderbeekweg" and the "Vijverlaan" stands another piece of artwork inspired by the "helical holes" principle, but this one looks still different, as it was executed in Cor Ten Steel (Strobos Metal, Hengelo). If you are lucky, you can meet artist Rinus Roelofs here, because this statue is only a few pedal kicks from his home and his art studio (see Fig. 5).

A little more effort is needed to reach the second to last stop: the waterway "Doorbraak" in Almelo. In a series of seven artworks, inaugurated at the end of 2016, Roelofs wants to express the ever-changing impression of the brook and its surroundings (see [7]). In each of the seven sculptures, a single repeating identical shape

**Figure 4.** Roelofs' statues at the University of Twente.

creates a spiral impression. It differs for every sculpture, thus referring, in the words of the artist, to the whirling in the water. At the time the sculptures were put in place, there was a series of workshops in the Almelo schools to allow children to make models of these works of art (see Fig. 6).

Within reach of the trained cyclist lies Coevorden. Here Roelofs shows another single-layered surface, which looks

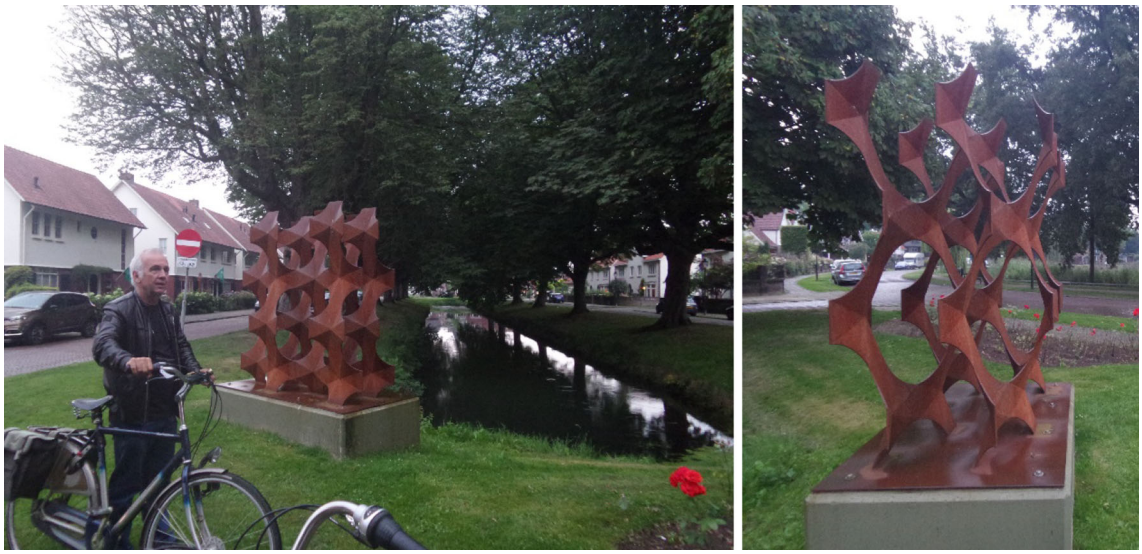


**Figure 5.** Artist Rinus Roelofs in front of his sculpture "Helical Holes," with an appropriate bike.

**Figure 6.** The seven works of art along the Almelo River "Doorbraak," and students making a copy of one of them.

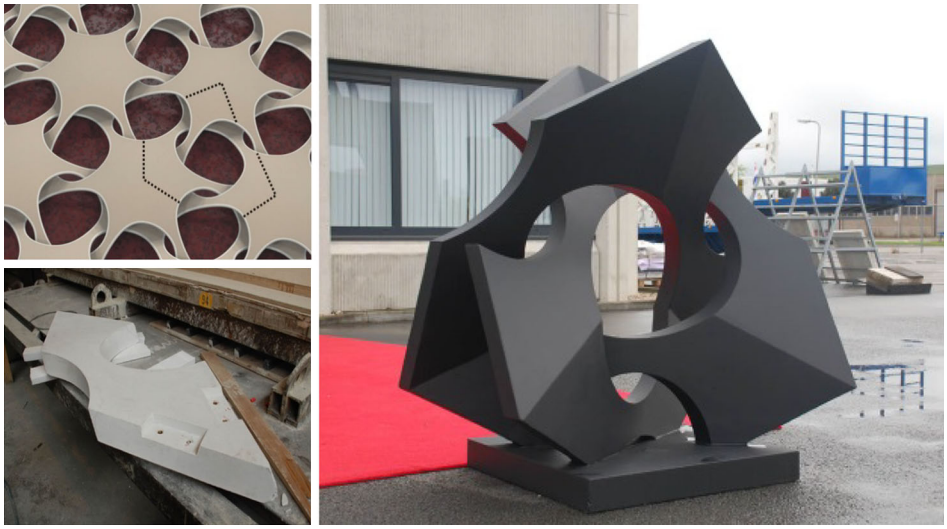


**Figure 7.** A double one-layered surface, a flat element, and the final artwork in Coevorden.


**Figure 8.** Images from an art–bike project showing painting on a bike; similar images from math bikers are most welcome.

like a double-layered one at first sight, or even like a knot. It is one of his older works, from before the time of 3D printing in concrete, and thus making a mold for such a surface was problematic. Yet he found out that the "double one-layered surface/knot" could be made from a single flat element, with a rather simple mold, so that it was sufficient to produce this one element in several copies. The concrete received some black protective paint, and it now proudly stands outside, in front of the offices of the Westo company in Coevorden (see Fig. 7).

As for the trip back from Coevorden to Enschede, just put your bike on the train. It is a common practice in the Netherlands, and wise advice from the locals such as Rinus Roelofs, to avoid riding against the prevailing southwestern winds. Another suggestion is doing some mathematics on the long bike ride back, and Roelofs already did during an art–bike project (see Fig. 8).

Faculty of Architecture
KU Leuven
Hoogstraat 51
Gent 9000
Belgium
e-mail: huylebrouck@gmail.com

## REFERENCES

[1] Kristóf Fenyvesi, "Bridges: A World Community for Mathematical Art," *The Mathematical Intelligencer*, June 2016, Volume 38, Issue 2, pp. 35–45.

[2] Dirk Huylebrouck, "Lost in Enumeration: Leonardo da Vinci's Slip-Ups in Arithmetic and Mechanics," *The Mathematical Intelligencer*, 2012, Volume 34, Issue 4, pp. 15–20.

[3] Imaginary Berlin, Germany: https://imaginary.org/sites/default/files/imaginary-conference-2016-program-booklet.pdf; Imaginary Taipei, Taiwan: https://imaginary.org/event/imaginary-in-taipei-taiwan; Imaginary Valencia, Spain: https://imaginary.org/event/rsme-imaginary-in-valencia, accessed on 30 August 2016.

[4] https://www.utwente.nl/facultyclub/Qua_Art_Qua…/RR_structurele_sensatie.pdf.

[5] Rinus Roelofs, ''About Weaving and Helical Holes,'' *Proceedings of Bridges 2010: Mathematics, Music, Art, Architecture, Culture,* August 2010, pp. 75–84, http://archive.bridgesmathart.org/2010/bridges2010-75.html.

[6] Rinus Roelofs, ''Restruimte—Remaining Space, the Importance of What is Not There,'' *Stichting Qua Art Qua Science*, 1 September 2011, https://lirias.kuleuven.be/handle/123456789/522863.

[7] Rinus Roelofs, ''Non-Flat Tilings with Flat Tiles,'' *Proceedings of Bridges 2009: Mathematics, Music, Art, Architecture, Culture*, 2009, pp. 183–192, http://archive.bridgesmathart.org/2009/bridges2009-183.html.

[8] Kenneth Snelson, ''Weaving, Mother of Tensegrity,'' http://www.kennethsnelson.net/icons/struc.htm, accessed on 30 August 2016.