

# The Mathematical Tourist

Ian Stewart\*

*The catapult that Archimedes built, the gambling-houses that Descartes frequented in his dissolute youth, the field where Galois fought his duel, the bridge where Hamilton carved quaternions—not all of these monuments to mathematical history survive today, but the mathematician on vacation can still find many reminders of our subject's glorious and inglorious past: statues, plaques, graves, the café where the famous conjecture was made, the desk where the*

*famous initials are scratched, birthplaces, houses, memorials. Does your hometown have a mathematical tourist attraction? Have you encountered a mathematical sight on your travels? If so, we invite you to submit to this column a picture, a description of its mathematical significance, and either a map or directions so that others may follow in your tracks. Please send all submissions to the Mathematical Tourist Editor, Ian Stewart.*

## A Transylvanian Lineage

Martin Bier

Encyclopedias and textbooks commonly write that the Hungarian mathematician János Bolyai (1802–1860) was born in Kolozsvár and died in Marosvásárhely, two towns in Transylvania. A search for these places in a modern atlas would be unsuccessful: both are now part of Romania and are named Cluj and Tîrgu Mureş. It is often added that János and his father Farkas would have been more prolific mathematicians had it not been for their geographical isolation.

Today Transylvania is still a predominantly rural region where distances are long and travelling is slow. There are many ethnic groups, but foreigners are a rarity.

There is a statue of Farkas and János Bolyai (for the latter of whom the geometry is named) in Tîrgu Mureş and, about 300 feet from the statue, a museum that is devoted to them. The museum is just one room in an old and solid building. One enters from a courtyard. A somewhat disinterested woman comes over to unbolts the heavy metal door. She gives an affirmative sigh when I ask if it would be possible to take some pictures.



Romania today.

Farkas, the father, studied in Göttingen, where he became a close friend of Gauss. After his studies he returned to Transylvania and for the next 47 years held

\* Column Editor's address: Mathematics Institute, University of Warwick, Coventry CV4 7AL England.



Display case with the skull of Farkas Bolyai and the scalp of János Bolyai.



The statue of Farkas and János Bolyai in Tîrgu Mureş.



The graves of Farkas and János Bolyai.



The working desk of Farkas Bolyai.

a position as a science teacher at the Evangelical Reformed College in Țirgu Mureș. He kept trying to find a proof of the parallel postulate, but never got any further than finding and promoting an equivalent formulation of it (three points not on one line are always on some circle). He was a well-rounded person; he published a number of plays, and hanging in the museum are two paintings of his (one of them a self-portrait); one of the display cases contains a cup with the ashes of poems he burnt in discontent.

János was taught mathematics by his father from an early age. He, however, opted for a career in the army and, in 1818, went to the Academy of Military Engineering in Vienna. For the next decade and a half his contacts with his father were mostly by mail. Many of the letters are preserved, and photocopies are on display. While in the academy János took on the parallel postulate despite his father's warnings ("... leave the doctrine of parallel lines alone; you should fear it like a sensual passion; it will deprive you of health, leisure and peace—it will destroy all joy in your life"). But János's approach was different: instead of looking for a proof of the parallel postulate he constructed a geometry that was independent of it. In 1823 he finished the Academy and was stationed in Timișoara. It was in that same year that his research came to a head; in November he wrote to his father, "... from nothing I have created a new, different world."

In 1832 Farkas Bolyai published his *Tentamen*: two thick volumes in Latin containing a systematic and rigorous exposition of geometry, arithmetic, algebra, and analysis. In a twenty-nine-page appendix to his father's first volume János gives a very condensed presentation of his "Absolute Geometry."

On the wall above the letter-filled display cases in the museum, there is an explanation of non-Euclidean geometry in Romanian, Hungarian, and German. At the end it states in prominent red letters that non-Euclidean geometry affirms the dialectic-materialist viewpoint that space and matter are one. Since the violent revolution of December 1989 Romania has no official ideology, but it seems as if no one has bothered to rewrite the explanation in a less tendentious manner. Also, one of the display cases is devoted entirely to quotes from János on political issues. In a region with a lot of ethnic friction it is comforting to read that János loved the Romanians as much as he loved the Hungarians. But it is ironic to see a highlighted quote: "the land, like the air, should belong to all the people together," as outside they are dealing with the complications of giving back to people the lands that were taken away from them in the 1949 collectivization.

During his career in the army János was moved around frequently between the many garrisons at the edges of the enormous Austro-Hungarian empire: Lvov (now Ukraine), Olomouc (now Czechoslovakia), Szeged (now Hungary), Oradea and Arad (now Roma-

nia) were among the places where he served. János did not like life in the army, and when his health deteriorated he requested to be pensioned off. Permission was given and in 1833 he moved back to Țirgu Mureș.

When asked to do so, Carl Friedrich Gauss commented extensively on the *Appendix*. In a letter to Farkas he proposed names for some basic notions, showed how one proof could be done differently, and suggested a way to continue the research. Concerning the *Appendix* as a whole, he said that he couldn't praise János for it because "praising him would mean praising myself: because all the contents of the work, the way followed by your son, and the results he obtained agree almost from beginning to end with the meditations I had been engaged in for 30–35 years already." From an earlier correspondence of Gauss this appears to be true. However, he exaggerated the number of years. Farkas was delighted that his son had apparently had the same ideas as the famous Gauss, but the son himself was embittered by these comments.

Even though he had ample opportunity, János did little mathematics after his retirement at the age of thirty-one. He worked on proving the consistency of his geometry, but never published anything. In 1837 he sent a paper, *Responsio*, to a competition on the geometric representation of complex numbers. In his unsuccessful entry he made references to the *Appendix*, which probably hadn't reached the referees.

János Bolyai is one of the few 19th-century mathematicians of whom no portrait has remained. Recognition for his work did not come until the 1870s, more than 10 years after his death. The name "Bolyai-Lobachevski geometry" became established in the last years of the 19th century under the initiative of Henri Poincaré.

In 1911 the bodies of father and son were exhumed and removed to adjacent graves in the Reformed cemetery of Țirgu Mureș. The large cemetery is a 10-minute walk from the museum. There are no signs to indicate the way to the graves of the two mathematicians and I had to ask a caretaker for the exact location. In his *History of Mathematics* Florian Cajori relates that Farkas was a very modest man who didn't want a monument over his grave, just an apple tree in memory of the apples of Eve and Paris that brought chaos and the apple of Newton that "elevated the earth again into the circle of heavenly bodies." I didn't have the botanical knowledge to check whether it actually was an apple tree, but the tree over the graves was so prominent that, even on the bright, sunny spring day when I was there, a maximal lens opening was needed to take a picture.

Franklin College  
via Ponte Tresa 29  
6924 Sorengo, Switzerland