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# Mathematical Monuments in Finland

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## Abstract

With “mathematical monuments” we mean either monuments for famous mathematicians and their achievements or works of art representing mathematical objects in public places. We present a panoply of such monuments in Finland for the purposes of the mathematical tourist visiting our country. As we are interested in symbolic representations of science, we take a broad view of the notion of “monument” and take into account also some minor artefacts, such as portraits, medals and stamps, and other semiotic signs, such as street names and commemorative plates, illustrating some highlights of the history of mathematics in Finland.

## Introduction

Some great centres of science in the world have so many monuments for past scientists and their deeds that it has been worthwhile to publish specialized guides for visitors who wish to spot them. The Hungarian couple of science historians István and Magdolna Hargittai have recently published such guidebooks about their home city Budapest [1] but also about New York [2], Moscow [3], and London [4]. Unsurprisingly, there is a similar guidebook about Paris [5]. The German couple of mathematicians Martin and Iris Grötschel have produced an analogous book focusing on mathematical sights in Berlin [6]. *The Mathematical Intelligencer* has a column entitled “The Mathematical Tourist” devoted to spotting of mathematical monuments. Finland holds an honourable place in the history of mathematics as a country. But how about mathematical monuments? Is there something worth visiting?

## The mathematical tourist in Finland

The first university of Finland was founded in 1640 in Turku, and it functioned there until the great fire of 1827, which destroyed most of its buildings, and also most of its works of art, such as the portraits of professors. The university was transferred to Helsinki in 1828, so it is the present University of Helsinki that continues the traditions of the oldest university. The University of Helsinki has an extensive collection of portraits of its past professors, including many mathematicians, and there are portrait collections in the other universities, as well, but we choose not to list them all as “monuments” here.

Let us single out, nonetheless, the portrait (Fig. 1) by Anna Snellman (1884–1962) of Rolf Nevanlinna (1895–1980), a somewhat legendary Finnish mathematician [7] who has given his name to the Nevanlinna Prize awarded every four years at the International Congress of Mathematicians (ICM) for outstanding contributions in mathematical aspects of information sciences. The golden Nevanlinna prize medal (Fig. 2) was donated by the University of Helsinki and sculpted by Raimo Heino (1932–1995). Nevanlinna’s most prominent student was Lars Ahlfors (1907–1996) who was one of the two first recipients of the Fields medal in the ICM of Oslo in 1936 and later made career at Harvard [8]. Ahlfors has no other monument but his Fields medal, which is preserved as a treasure of the Helsinki department of mathematics. The ICM itself came to Helsinki in 1978, and a commemorative stamp (Fig. 3) representing the Poincaré disc and some other mathematical objects was issued on that occasion.

As historians of science, two of us have written extensively on two historical figures: Osmo Pekonen on the French mathematician Pierre Louis Moreau de Maupertuis (1698–1759) and his expedition to

Finnish Lapland [9], Johan Stén on the Finnish mathematician Anders Johan Lexell (1740–1784) [10, 11]. We are happy to report that our research topics have been immortalized by monuments in Finland.

Maupertuis is famous for the measurement of the shape of Earth in Lapland in 1736–1737. Indeed, he experimentally proved what Isaac Newton had theoretically predicted: that the Earth is slightly flattened near the poles because of its rotational movement. The triangulation that Maupertuis used to measure the length of a one-degree arc of meridian in the river valley of Tornio in Lapland had nine vertices: the spire of the Old Church of Tornio (built in 1686 and a cultural monument as such) and eight mountain tops which were from the south to the north: Niva, Kaakama, Huitaperi, Aavasaksa, Horilankero, Niemi, Pullinki, and Kittis. In front of the Old Church of Tornio, there is a major monument (Fig. 5) for Maupertuis which was unveiled in 1971, on the occasion of the 350<sup>th</sup> anniversary of the founding of Tornio. It consists of two parts: an abstract part sculpted by the Finnish artist Olof Eriksson (1911–1987), representing the network of triangles used in the land surveying and the star Delta Dragon used to measure the astronomical latitude, and an effigy (Fig. 9) of Maupertuis sculpted by the French artist Gwen Jégou. Four of the mountain tops have been adorned with monuments, as well. The French ambassador Gérard Jouvé inaugurated a pyramid-shaped monument (Fig. 6) on the Kittis mountain on Midsummer Day in 1956. A similar monument was inaugurated in 1994 by Carl XVI Gustaf, King of Sweden, on the top of Pullinki which is on the opposing Swedish side of the border river Tornio. A monument (Fig. 7) representing the flattened Earth, sculpted by Hanna Koskinen, was inaugurated in 2005 on the top of Aavasaksa, and another one (Fig. 8), representing God’s hand weighing our planet, sculpted by Markku Kangas was unveiled on the top of Huitaperi in 2018.

Maupertuis is the oldest symbol figure of Finnish-French scientific exchange. The French embassy in Helsinki issued in 1958 a medal sculpted by Roger Bertrand Baron (1907–1994) representing him. Maupertuis is also the only mathematician who has been honoured with a stamp in Finland (Fig. 4); that was in 1986 on the occasion of the 250<sup>th</sup> anniversary of his arrival to Lapland. There exists in Berlin a contemporary portrait of Maupertuis by Robert Levrac-Tournières (1667–1752) from 1741; using it as a model the Russian-Finnish artist Svetlana Ruoho created a new portrait of Maupertuis which was inaugurated in Tornio on the occasion of the 400<sup>th</sup> anniversary of the founding of the town in 2021.

The triangulation of Maupertuis in the Tornio river valley, corresponding to a one-degree arc of meridian, was exploited one hundred years later as a part of a much larger scheme of land surveying launched by Russia: the Struve Chain measured in 1816–1855 which extends all the way from the Black Sea to the Arctic Ocean passing through Finland. The Struve Chain is a Unesco World Heritage Monument common to ten independent countries through which it passes. There are 100-odd vertices of its triangulation on Finnish soil, and six of them have been developed into national landmarks; from the south to the north: Mustaviiri, Tornikallio, Oravivuori, the Alatornio church, Aavasaksa, Stuorrahanoaivi.

As for Anders Johan Lexell, he became as a young man an assistant of Leonhard Euler (1707–1783) at the Imperial Academy of Sciences of Saint Petersburg, and also his ephemeral successor for one year, until his premature death in 1784. Lexell made contributions in astronomy, theory of ordinary differential equations and spherical trigonometry; he was also the first one to reckon out that the new heavenly object (“King George’s Star”) discovered by William Herschel (1738–1822) in Bath in 1781 was indeed a planet, later to be known as Uranus. On our initiative, a monument (Fig. 10) for Lexell was created in 2016. It is a granite relief sculpted by Sofia Saari representing Lexell’s silhouette and some geometrical figures. It was unveiled in Turku, Lexell’s birth town, in the premises of the local mathematics department.

Besides Maupertuis, there is one other foreign mathematician who has a monument in Finland: the Russian female mathematician Sofya Kovalevskaya (1850–1891). Having defended in 1874 a doctoral thesis in mathematics with Karl Weierstrass (1815–1897) as her advisor in Berlin, she prospected various possibilities of becoming a professional mathematician, which was denied to her in Russia because of her sex. During her lifetime, Finland was a part of the Russian Empire as an autonomous Grand-Duchy with a more liberal legislation of its own, so Kovalevskaya considered obtaining a chair at the University of Helsinki instead. However, the Finns were cautious about Russian professors, fearing increasing Russification of the country’s intellectual life. Thus, Kovalevskaya became a professor of mathematics at

the University of Stockholm instead, and Finland lost to Sweden the honour of recruiting the first female professor of mathematics in Europe. The sculptor Walter Runeberg (1838–1920), son to Finland’s national poet Johan Ludvig Runeberg (1804–1877), immortalized Sofya Kovalevskaya as a bust (Fig. 11) which is to be seen in Johan Ludvig Runeberg’s home museum in Porvoo (street address: Aleksanterinkatu 5).

Only two Finnish mathematicians seem to have a street named after them: Gustaf Hällström (1775–1844) and Ernst Lindelöf (1870–1946), both in the campus of sciences of the University of Helsinki. Ernst Lindelöf’s father Lorenz Lindelöf (1827–1908) was also a significant mathematician. He was ennobled in 1883, and there exists a magnificent portrait (Fig. 12) of him in the costume of the Land Marshall, or chairman of the nobility of Finland, by Eero Järnefelt (1863–1937). It is on display in the House of Nobility in Helsinki (street address: Ritarikatu 1). The coat of arms (Fig. 13) of the Lindelöf family, also to be seen in the House of Nobility, has a mathematical motive (“sphère artificielle”) in it.

Not many Finnish mathematicians have had their birthplace marked with a commemorative plate. This is, however, the case of Rolf Nevanlinna who was born in Joensuu (street address: Koulukatu 25). In Joensuu, as well, there is bronze relief monument (Fig. 14) sculpted by Veikko Jalava (1911–1981) in 1976 commemorating the three scientist brothers the physicist Yrjö Väisälä (1891–1971), the meteorologist Vilho Väisälä (1889–1969), and the mathematician Kalle Väisälä (1893–1968). The street address of this monument is Papinkatu 13 where the three brothers lived during their school days in 1904–1919.

How about public works of art with a mathematical motive? There seem not to be many. The classical Penrose tiling with darts and kites has been realized as a pavement in two places: in front of Heureka, the Finnish Science Centre, in Vantaa (Fig. 15), and in the Keskuskatu pedestrian street in Helsinki.

Mario Merz (1925–2003), the Italian conceptual artist known for his obsession with the Fibonacci sequence, created in 1994 a mathematical monument (Fig. 16) in Turku. It consists of the number sequence 1, 1, 2, 3, 5, 8, 13, 21, 34, 55 in the form of seven-foot-high neon-lit digits running along the smokestack of a local power plant. This is perhaps the most visible mathematical monument in Finland as it dominates the waterfront and the estuary of the Aura river running through the centre of Turku.

## Conclusion

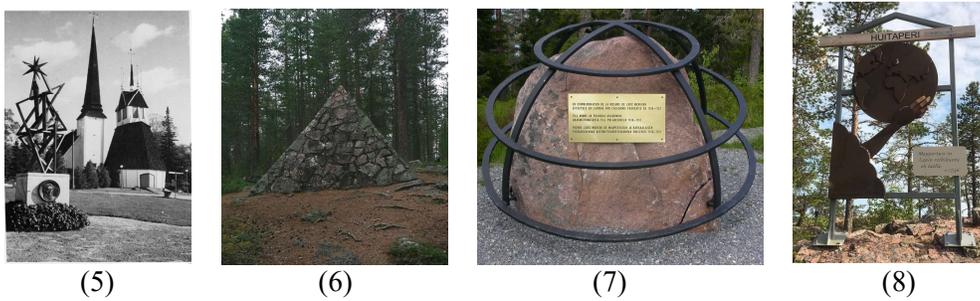
As our survey shows, there are not particularly many instances of public works of art related to mathematics in Finland. More could be commissioned. For the Bridges community this should represent an opportunity.

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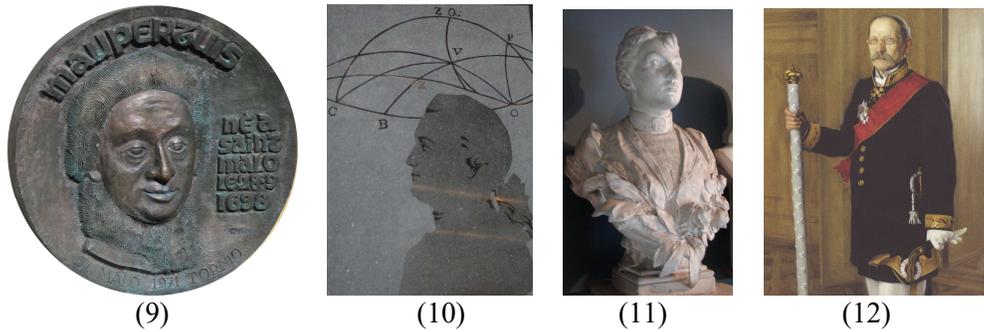
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**Figures 1–4:** Rolf Nevanlinna facing his own portrait; the Nevanlinna Prize medal; the postage stamp of the ICM of Helsinki (1978); the stamp commemorating Maupertuis’ trip to Lapland (1986).



**Figures 5–8:** Four monuments to Maupertuis’ land surveying in Lapland: in front of the Old Church of Tornio, and on three mountain tops of the Tornio river valley: Kittis, Aavasaksa and Horilankero.



**Figures 9–12:** Famous mathematicians in works of art: Maupertuis (in Tornio); Lexell (in Turku); Kovalevskaya (in Porvoo); Lorenz Lindelöf as the Land Marshall of Finland (in Helsinki).



**Figures 13–16:** The coat of arms of the Lindelöf family; the monument to the three Väisälä scientist brothers in Joensuu; the Penrose tiling in front of the Finnish Science Centre Heureka (photo: Timo Suvanto); the neon-lit Fibonacci sequence of Mario Merz in Turku (photo: Timo Jerkku).