



MAGIC ARCH

From the Meridian stone
to a monument to the Meridian

(The interesting facts connected with an arch of Struve)

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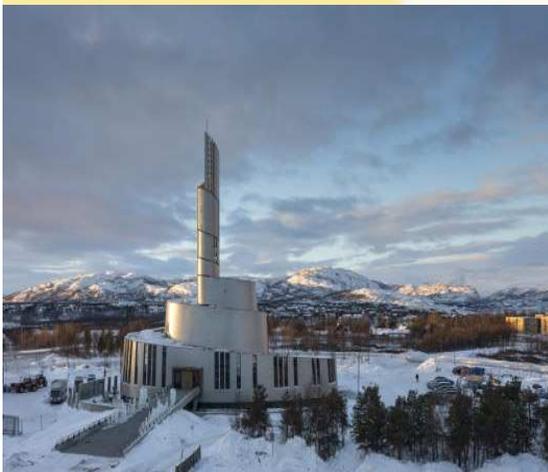
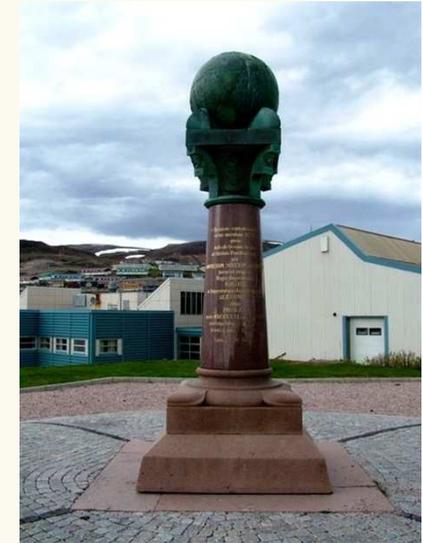
Norway

Lille Raipas – the point of polar lights

The most northern point of «Geodetic arch of Struve» is Fuglenes in Hammerfest bay - the **Meridian stone** as it is named.



In the north of Norway there is a small town, which has two monuments from UNESCO World Heritage List. The first is the town of Alta, the main sight of which is rock paintings (petroglyphs). Now this place is an open-air museum.



15 kilometres from Alta there is one more place entered in the list of a heritage of UNESCO. It is point of a geodetic arch of Struve in Lodiken under the name of Lille Raipas. This point is located at a height of 286 metres, where it is possible to observe the polar lights. Flashes of Northern lights are constantly in motion and change from green and blue to pink and lilac. The first-ever traditional observatory on polar lights studying was situated here in 1899, and Alta was called «Polar lights city».



FINLAND

Tornio - a city of two arches

The Finnish city of Tornio is a lucky one. 2 points of two various measurements of 19 centuries still exist on two different churches of the city.

City church Tornio was constructed in 1686 as a temple of Swedish queen Hedvig Eleonora. **The church tower served as a starting point of the French grade measurement system executed by Lappish expedition under the direction of P. Maupertuis with the assistance of A. Clairaut and the Swedish physicist A. Celsius (the author of a temperature scale), working here in 1736-1737.** The meridian arch, only nearby 1° (100 km) was measured. Results of measurements demonstrated that the Earth is a spheroid, flattened at Poles.



City church Tornio

Church Alatornio, constructed in 1797 is the greatest classicism structure, the greatest church in Northern Finland. **Church Alatornio became a part of a chain of measuring triangles of an arch of Struve.** The church entered in the list of the world heritages of UNESCO in 2005.



Church Alatornio



SWEDEN

Haparanda – on foot between the countries

Tornio-Haparanda is the unusual city divided by the border of Finland and Sweden into two, and by sleeves of the Tornio River into many areas. No border zones are here. There is an excursion where tourists can visit two points of an arch of Struve: **the church Alatornio on the Finnish part and unpretentious, inconspicuous point on a hill of Perra-Vaara on the Swedish part of the border, which is a small cross, carved in a stone.**



Although Tornio and Haparanda are in different countries, they have unprecedented common Finnish-Swedish city government. Further to the above mentioned, one hour's time lag between the cities of Tornio and Haparanda takes place.

Haparanda-Tornio – edge of time



ESTONIA

Old mill near Woibifer

Not restored base of a mill and arch point



In territory of private land near Vyjvere (**Woibifer**), about an old mill, **the base of one of basic points of the arch has been remained.** Owners carefully kept documents with the description of a site location, drawings and the site itself. Now there is a museum of "an arch of Struve» that takes place in an old mill and in yard territory.



LATVIA

Kreitzburg castle – failed point of an arch of Struve



Kreitzburg castle

One of points of an arch of Struve is in Struve park that is situated in the city of Jēkabpils (Jakobstadt). There is also an ancient castle "Kreitzburg" on the other bank of the Daugava River. It is one of the most ancient castles in Latvia that was founded in 1237. The building's base reminded a cross, that's why it has its name - **Kreitzburg** (Krustpils).

Commemorative sign in Struve park



V.Y.Struve wanted to use this **castle** as a point, but could not agree with its owner. The subject of the quarrel is unknown, but having arrived in the city 2 years later under military protection, Struve had to make astronomical observations on the other river bank. Nowadays there is a commemorative sign in the form of a geodetic signal in the park named by his name.



LITHUANIA

Meškonys and Gireišiai – operating points of an arch of Struve

The Lithuanian points of a geodetic arch of Struve take place in three settlements: Meškonys, Gireišiai and Paliepiukai located in a Mjadininkaj direction. All of them are in the UNESCO list. The Meshkonis point is a part of a satellite coordination system of Lithuania. The geodetic point Gireishai is located near Rokishkis - Panevezhis road and is marked by a sign. This point still functions as one of the most important geodetic points of the country and district of II class. In 1994 it was put in a coordinate system of Lithuania. This point helps provide geodetic measurements near Panjamunelis.

Reference: The manor of the Rockyhksky estate (now a regional museum), which was constructed in 1801 in the style of classicism under the project of an unknown architect is located near the Gireišiai point. This museum contains more than 80 thousand exhibits of culture and history of the Rockyhksky estate. A special place is under the unique exposition of carvings of Lyonginas Shepka (1907-1985).



Wooden sculptures of
Lyonginas Shepka



BELARUS

Field observatory «Belin astro»

The main astronomic-geodetic point of the Belarus segment of an arch of Struve "Belin" was found in 2010-2012. Although this point is not in the UNESCO list yet, it is an important part of a cultural heritage of Belarus.

The point "Belin" included a triangulation point (the stone cube under the top of a 32m triangulation signal), based in 1826, and a field astronomical observatory, located at 200 metres to the south, which was constructed in 1827.

Astronomical observations in Belin observatory were executed in July-September, 1827 by Karl Ivanovich Tenner and Joseph Ivanovich Hodzko.

"North" base of the field astronomical observatory



K.I.Tenner



J.I.Hodzko

Reference: The most points of the Arch were collapsed, therefore only 34 points (the most remained) were included in the list of protected objects of UNESCO. This number included only 7 basic points - observatories in which astronomical determination of latitudes and azimuths were made.



BELARUS

Field observatory «Belin astro»

Tupishki point in
Oshmjansk district



Tupishki - three times found point?

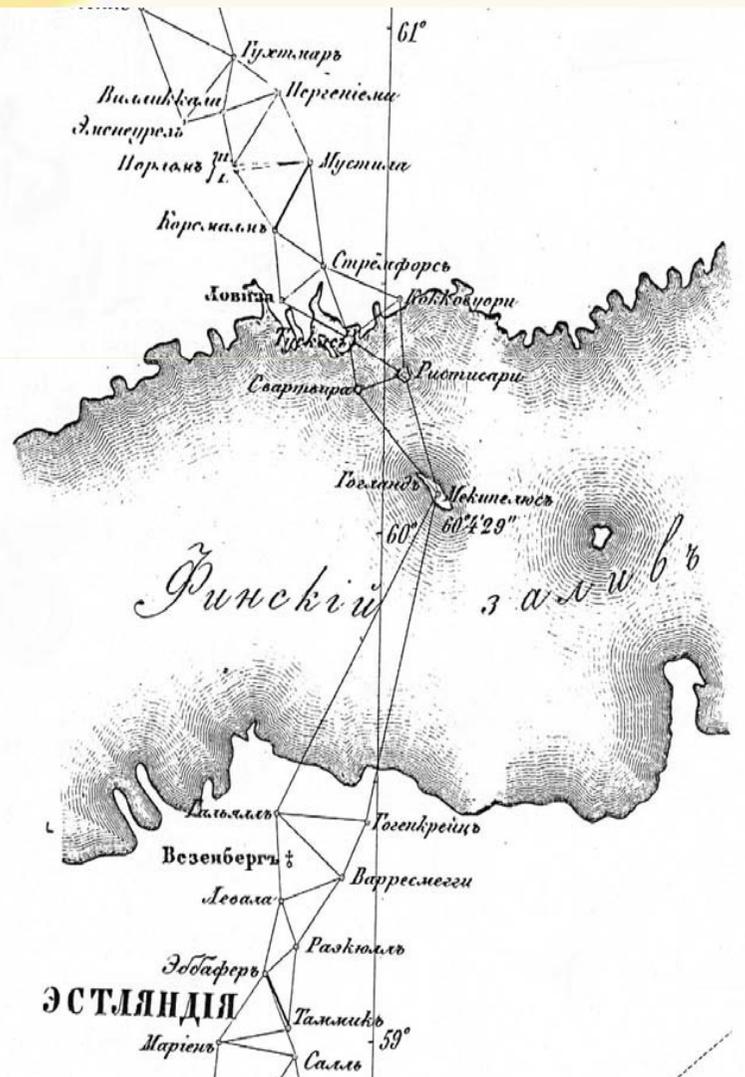
The history of search of **Tupishki point in Oshmjansk district, Grodno region near Tjupishki village, five kilometres from Golshany in Belarus** is very interesting.

Different sources informed three times that the centre of point of an arch of Struve had been found. In 1901 Russian military geodesists in the process of geodetic works found, ostensibly, «a brick of Tenner» and put a boulder with a cross. After wars and revolutions, the territory began to belong to Poland and the Polish geodesists found «a brick of Tenner» again, threw the old boulder out and set up a standard concrete centre with alignment error about 20 cm. At last, in 2001, Belarus geodesists, using data of Tenner triangulations, found a place at eight metres from the Polish point. The security pyramid and a monument of black granite with a sphere were erected there. But is that the point?



RUSSIA

Island Gogland is a link of «Russian arch of a meridian»



Russia, which was the initiator and the founder of the Geodetic arch of Struve, has only two points. Both of them are on Gogland Island in the Gulf of Finland, 180 km from St. Petersburg - «**Mäkiinpäällys Point**» and «**Point Z**». Point Z is an astronomical point (one of 13) and the key point that connects two continental chains - northern and southern. Because of relief conditions geodetic and astronomical points («**Mäkiinpäällys**» and «Gogland, point Z accordingly») were located at 1,5 km from each other and linked by a small auxiliary triangulation. They are also interesting because measurements here were realized by Struve himself.

Island Gogland



RUSSIA

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Location of five points
restored on Gogland Island

In essence, it is Astronomic-geodetic point in whole, which Struve arranged because of bad visibility on the island - granite massif with a lot of hills and hollows, covered with coniferous and deciduous forests. The main centre of the construction was the point E, erected on the dome-shaped top of the **Mäkiinpäällys** rock. This unique point integrated the southern and northern parts of Russian Arch of a Meridian (RAM) into the comprehensive whole. For astronomical observation the place was chosen in a nearby valley, approximately at 1,4 km to the north (level difference is 113m). The centre of astronomical point, chosen by Struve, was intersection of axes of Dollond's transit tube - the main of three involved observation tools. The point «Gogland, point Z» was included by Struve in the total table of measurement results of RAM. In 1826 of ten auxiliary points of observation four were local subjects (a beacon, a beacon's guardhouse, a church and a bell tower), three - specially constructed wooden signals without especially fixed centres, two - the ends of 250-metre basis, the length of which was measured by baseline measuring apparatus.



RUSSIA

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Of specified above twelve observation posts of Struve five were found or restored - those represent the greatest interest for history of science and technics, for cultural history:

E - the basic point, the geodetic centre of Astronomic-geodetic point(AGP) located on the highest point (modern mark 143m) of **Mäkiinpäällys** rocky massif and designated by original stamp of Struve,1826. Because this point has kept the applied geodetic value and is still a part of modern coordinate catalogues, the special tool support with decorating elements and a memorial plate is built in a rock over it.

Mäkiinpäällys Point



RUSSIA

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Z - an astronomical point, the second basic point of Struve AGP, a place of latitude determination of the island and one of 13 main points of RAM. The place is on bosky rock foot in a valley to the west of a bay of Surkjulan-Lahti. The exact location of the former centre, with the maximum error of 30cm, was established in 1994 and 2000 by means of geodetic measurements, both traditional land, and satellite. On this place the monument of a natural stone was erected. Near to the given place there is a public road to Northern Gogland beacon.



L is an auxiliary point on a platform of Northern Gogland beacon. The given point is fixed in a rocky surface by the metal mark without a number. Its other purpose is to serve as the additional index of one of the first lantern lighthouses on Baltic, which was constructed on this platform under L.V.Spafarev's project in 1807. This lighthouse (subsequently destroyed) was in 1826 one of sighting targets for Struve. The public road leads to this place from Surkjulja settlement.

Gogland beacon



RUSSIA

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Q is an auxiliary point on so-called "pilot rocks", near a small "pilot guardhouse". This toponym and pilot guardhouse were subsequently lost. The position of point Q was established by geodetic measurements and fixed in a rocky surface by the metal mark without a number.

Surkjulja Bay



K is also an auxiliary point of Struve observations, a projection of a church spike of the former Surkjulja village, being situated on this place. The point site was found by geodetic measurements and fixed with boulders. The inscription was made on the boulders: "The church was here in 1826"



MOLDOVA

Rud – the unique patch of land

Rud Trinity female convent



At outskirts of Rud village, near the most northern point of Moldova, the point of an arch of Struve was found out. It is a unique cultural microzone where in small patch of land near usual Moldavian village artefacts of different times and peoples. The excavation of ancient settlement of antique time take place nearby the village - probably it is the mysterious city of Metony marked on Ptolemaeus map.

Also here is a cave with traces of prehistoric life, landscape reserve, antique defensive walls (IV-III centuries BC), two round land fortresses (IX-XII centuries) - « Turkish plate» and "Germanary", and a monastery, which is one of the oldest in Moldova.

There is also a church of sacred Trinity erected in 1777, which is considered to be the bright sample of the old Moldavian architectural style.

The point of an arch of Struve in village Rud is included into objects of the World Heritage of UNESCO. It is situated in an apple garden, 300 metres from a highway Soroka-Otachi.



UKRAINE

Monument to the Meridian

In the small Bessarabian village Old Nekrasovka the point of an arch **Struve** has remained, designed by a commemorative sign and very well-groomed. On the two-metre square column, which top is decorated by a two-head eagle, it is traced: "Southern border of Meridian arch $25^{\circ}20'$ from the Danube River to the Arctic Ocean through Russia, Sweden and Norway. At command of Emperors Alexander I, Nikolay I and King Oscar I. Constantly working here from 1816 to 1852 we measured lands of three peoples. Latitude $45^{\circ}20'28''$ ".



Among local population this sign is named as a **monument to the Meridian**.

A simple woman, Old Believer, that living nearby is looking after this exclusive and significant point on the Ukrainian land.

Arch point in Old Nekrasovka village



MAGIC ARCH

From the Meridian stone to a monument to the Meridian



So here the GEODETIC ARCH of Struve is really cultural heritage for all without any exception peoples and states.

Could Vasily Jakovlevich Struve know, putting the **Meridian stone** in 19 century, that his creation would become a **monument to the Meridian** in 21 century?!



Vasily Jakovlevich Struve (Some facts from the biography)



V.Y.Struve.
A.Mjunster's lithograph

Fridrih George Wilhelm (Vasily Jakovlevich) Struve (1793-1864) was the German who settled in Russia which became for him the native land. His ancestors were well-to-do Holstein peasants. The father of the scientist, Jacob, wrote to the son: **«We, Struve, can't live without fascinating work as we were convinced in the earliest youth that it was the most useful and best seasoning of human life».**

Having passed the most complicated course of astronomy for three years, in 1813 Struve was employed in a university observatory, and after 6 years (at 26-year-old age) became its director and the ordinary professor.

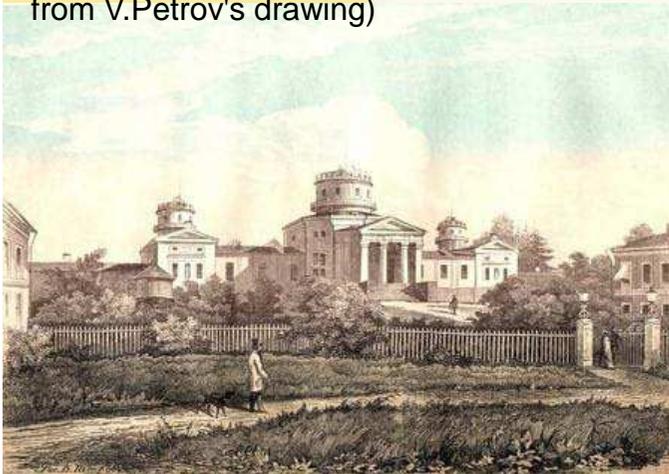


Vasily Jakovlevich Struve

(Some facts from the biography)

He discovered the cluster of stars in nucleus of galaxy. In 1837 he was the first who measured the distance to Vega (Alpha Lyrae). He also made the catalogue of several thousand double stars. Under his supervision the first of fundamental Pulkovo star catalogues was published. Struve also established the system of astronomical constants that was used all over the world next 50 years.

Pulkovo observatory, 1855
(E.E.Bernadsky's engraving
from V.Petrov's drawing)



Struve himself offered to take care of points of the Geodetic arch as of commemorative places. In 1852 he expressed a wish to mark terminal points of the arch that, as he considered, "will serve for scientific honour of our native land". On command of Emperor Alexander II and the king of Sweden and Norway Charles XV in memory of grandiose scientific work the monuments were erected nearby the Norwegian city Hammerfest ("Fuglenes" point) and in the Ukrainian village Old Nekrasovka.

Struve, the Russian citizen since 1842, was the gentleman of many Russian and foreign awards, the winner of numerous honourable medals and prizes, the honorary member of all Russian universities and great number of foreign academies and scientific organisations. He died in Pulkovo on November, 11th (23), 1864.



Thank you!