The Struve Geodetic Arc

Ensemble of memorable sites

Геодезическая дуга Струве

Study the following words

survey [ˈsɜ:vei]- *землемерная съёмка*

geodesy [djiˈɔdɔzi] =**surveying**

the branch of science concerned with determining the exact position of geographical points and the shape and size of the earth

geodetic - *геодезический, землемерный*

map -*географическая карта*

triangle -*треугольник*

arc –*дуга*

longitude- *долгота*

cairn [keэn] *пирамида из камней (как условный знак)*

plaque [pla:k]=**slab**=**plate**- *мемориальная плита*

accurate -*точный; правильный*

collaboration -*сотрудничество*

triangulation - a method of surveying in which an area is divided into triangles, one side (the base line) and all angles of which are measured and the lengths of the other lines calculated trigonometrically

Give one word which means the same

- surveying - geodesy
- cooperation - collaboration
- precise - accurate
- meridian - longitude
- slab - plaque, plate

Give one word which means the same

- a plan of the earth's surface **map**
- a flat shape with 3 straight sides and 3 angles **triangle**
- a part of a circle or a curved line **arc**
- a pile of stones which mark a special place **cairn**
- the branch of science concerned with determining the exact position of geographical points and the shape and size of the earth **geodesy**
- a method of surveying in which an area is divided into triangles, one side (the base line) and all angles of which are measured and the lengths of the other lines calculated trigonometrically **triangulation**

Make adjectives from the following nouns (mind the stress)

- accuracy — **accurate**
- geodesy — **geodetic**
- memory — **memorable**
- science — **scientific**
- triangle — **triangle, triangular**

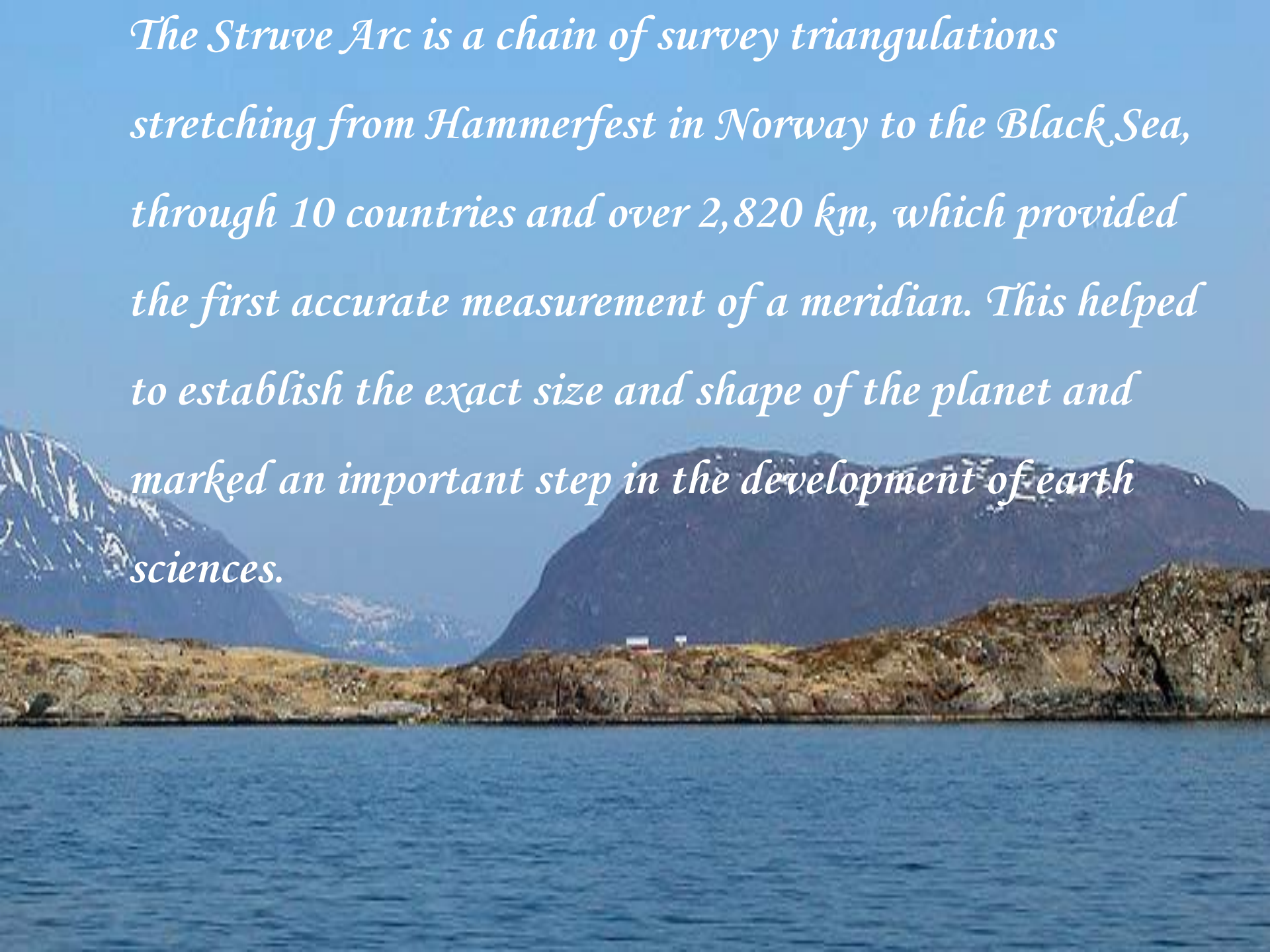
Make nouns from the following verbs

- to measure
- to collaborate
- to establish

measurement

collaboration

establishment

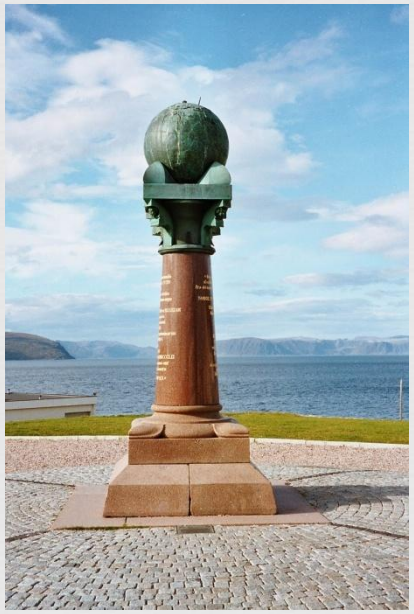


The Struve Arc is a chain of survey triangulations stretching from Hammerfest in Norway to the Black Sea, through 10 countries and over 2,820 km, which provided the first accurate measurement of a meridian. This helped to establish the exact size and shape of the planet and marked an important step in the development of earth sciences.

- These are points of a survey, carried out between 1816 and 1855 by the German-born Russian astronomer Wilhelm Struve. At that time, the chain passed through two countries: Union of Sweden-Norway and the Russian Empire. The Arc's first point is located in Tartu Observatory (modern Estonia) where Struve conducted much of his research.

- The original arc consisted of 258 main triangles with 265 main station points. Nowadays only 34 original station points remain. In 2005, the chain was included on the World Heritage List as a memorable ensemble of these 34 sites.

- Most of the station points don't look like majestic constructions. They are marked by drilled holes in rocks, iron crosses, cairns, or built obelisks.

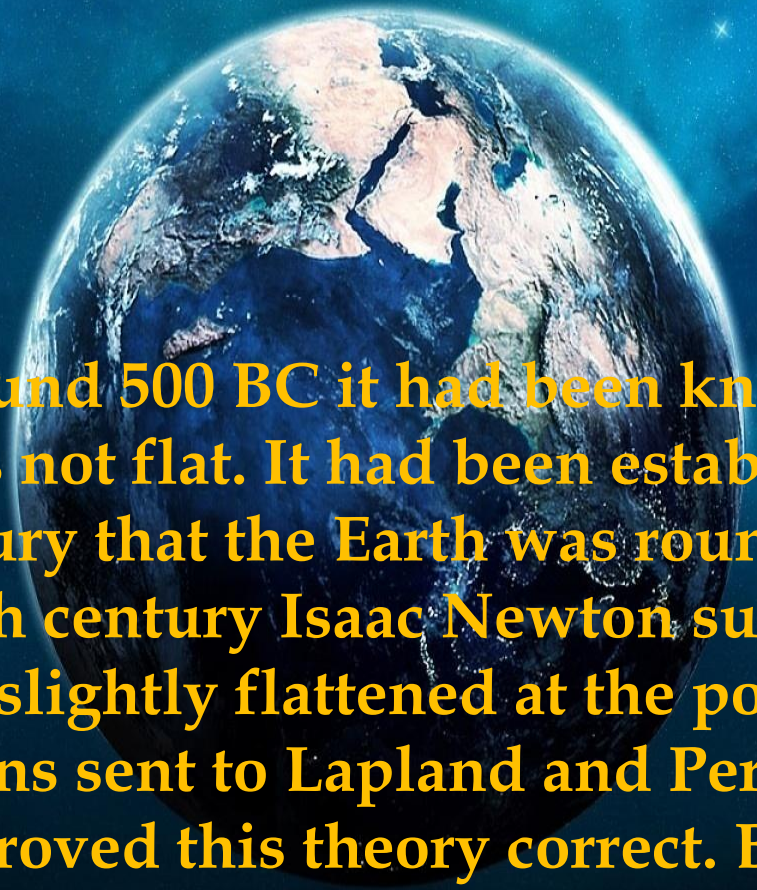


Nowadays the Arc of 34 memorable sites is stretching through 10 countries:

- 1. Norway (4)
- 2. Sweden (4)
- 3. Finland (6)
- 4. Russia (2)
- 5. Estonia (3)
- 6. Latvia (2)
- 7. Lithuania (3)
- 8. Belarus (5)
- 9. Moldova (1)
- 10. Ukraine (4)

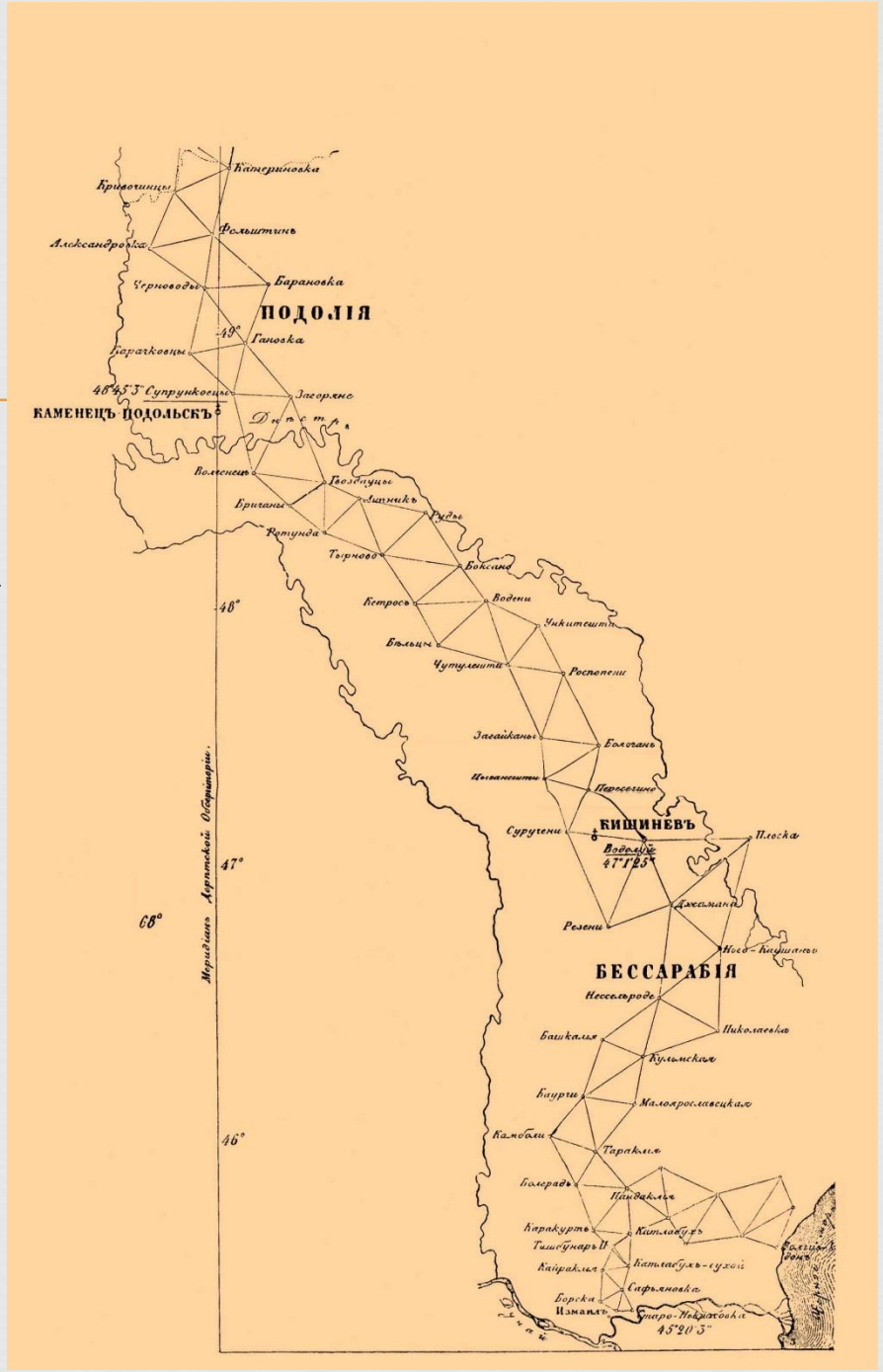
5 of 34 memorable sites are situated in Belar

History



- Since around 500 BC it had been known that the Earth was not flat. It had been established in the 16th century that the Earth was round, but as early as the 17th century Isaac Newton suggested it might be slightly flattened at the poles. The expeditions sent to Lapland and Peru in the 18th century proved this theory correct. But the problem of the size of the Earth remained unsolved and had become even more complex, as it was known that it was not a perfect sphere.

- During those expeditions a new triangulation method was used. According to this method, a line could be measured accurately, while the long distances were covered by a chain of triangles. These triangles with each of their sides (base lines) as long as 100 km and each triangle in the chain having one common base line with at least one other triangle and two common corners (station points) with another triangle.



- The defeat of Napoleon, followed by the Congress of Vienna and the decision in 1815 to establish agreed international borders in Europe, required accurate mapping. These needs were strongly felt in Russia, where Tsar Alexander I provided Wilhelm Struve, German-born Russian astronomer with all the resources for his project for a new long geodetic arc

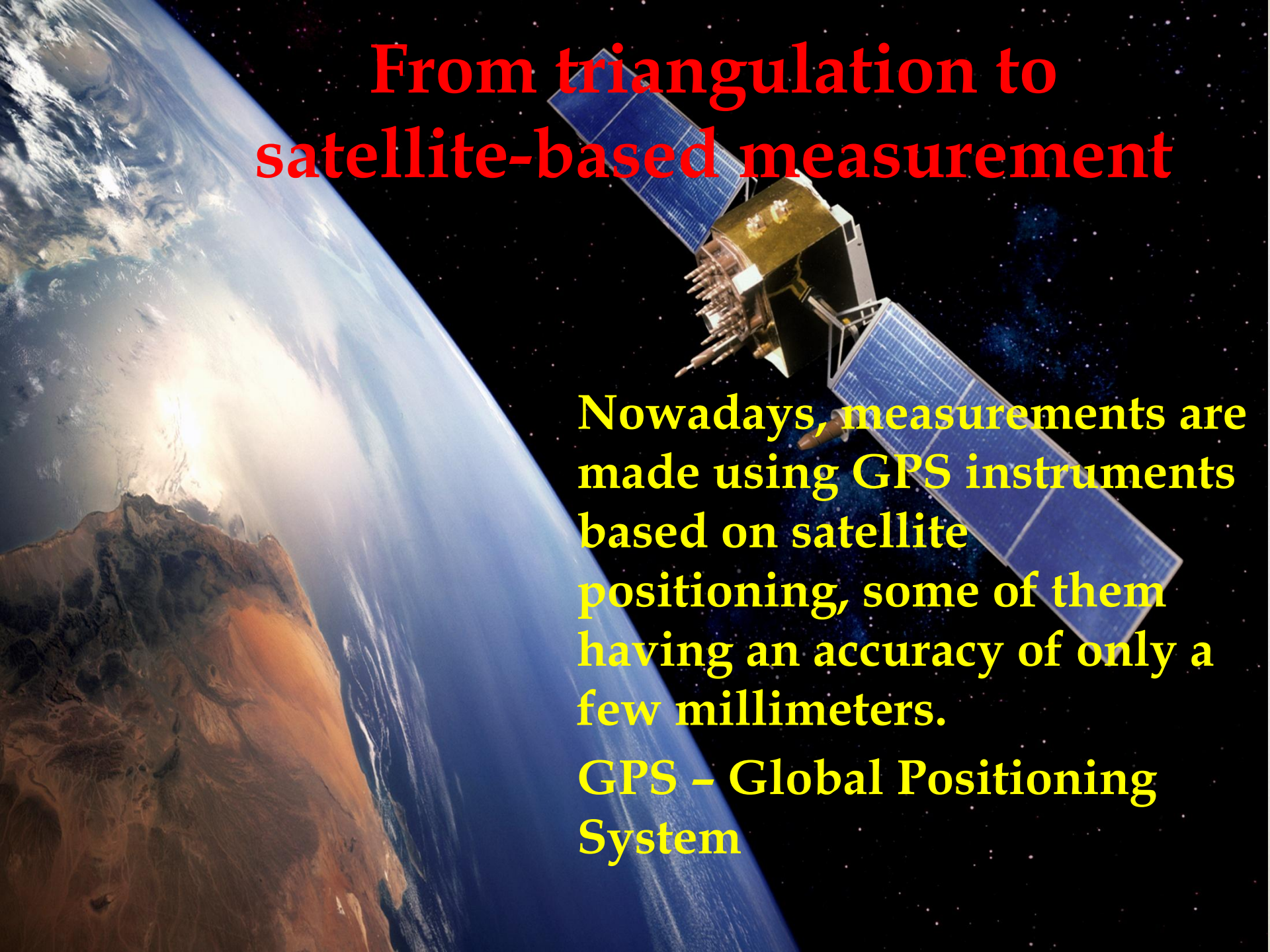
- Struve, who was working at the University in modern Estonia (Tartu), decided that the arc would follow a line of longitude (meridian) passing through the observatory of the

The Importance of the Arc

It is an extraordinary example of scientific collaboration among scientists from different countries, and of collaboration between monarchs for a scientific cause. In Finland, the Struve Geodetic Arc is also known as the Russo-Scandinavian meridian arc.

The meridian measurements carried out for the Struve Geodetic Arc are surprisingly accurate and the results have been used for many scientific purposes.

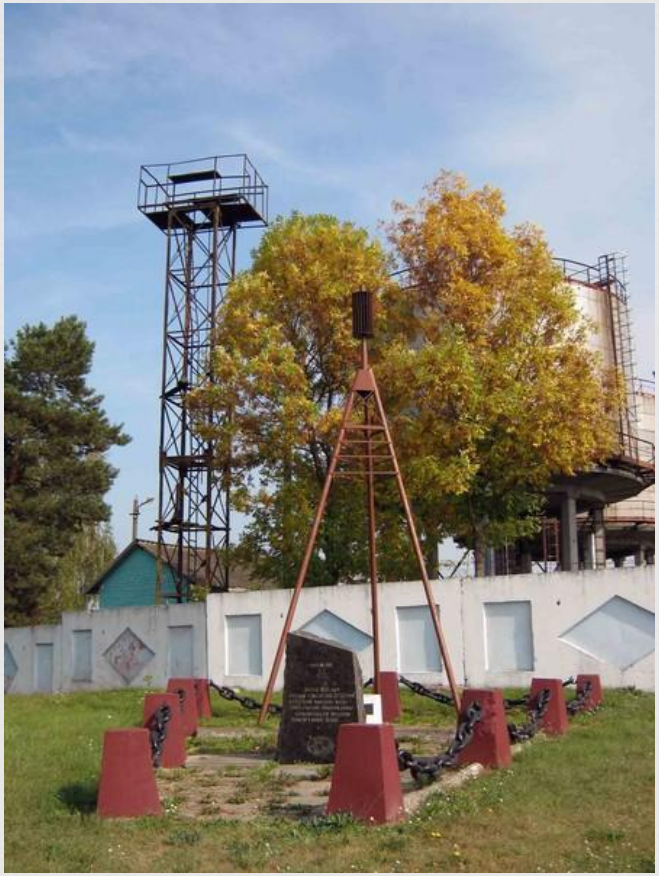
From triangulation to satellite-based measurement



Nowadays, measurements are made using GPS instruments based on satellite positioning, some of them having an accuracy of only a few millimeters.

GPS – Global Positioning System

The Struve Geodetic arc in Belarus



Triangulation point in Ivatsevichi.

The Struve Geodetic arc in Belarus

The Struve Geodetic arc in Belarus

- The Struve Geodetic arc. Silver commemorative coin, denomination: 20 rubles, Belarus

Answer the questions

1) The Earth is of regular spherical shape, isn't it?
2) What method was created in the 17th century to establish the size of the planet?
3) Why did the European countries need accurate mapping in the 1st half of the 19th century?
4) Wilhelm Struve was a German astronomer who lived in Estonia, wasn't he?
5) Why was the result of Struve's work so important?

6) How many countries did the Arc pass when it was established (1816-1855)?

7) Through how many countries is it stretching now?

8) How many of the memorable sites of the Arc are situated in Belarus?

9) The main station points are marked by majestic constructions, aren't they?

If not, what do they look like?

10) What methods are used nowadays to make accurate measurement of the earth's surface?