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USED THE GEODETIC MEASURING INSTRUMENTS: THE CREATION OF ROMAN CIVILIZATION

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1- Introduction

- The Roman civilizations type and characteristics are important factors (**famous for the monumental works**)
- The Greeks did not have access to the ability to establish theoretical thinking and observation links

Investigates the geodetic instruments in roman civilization period

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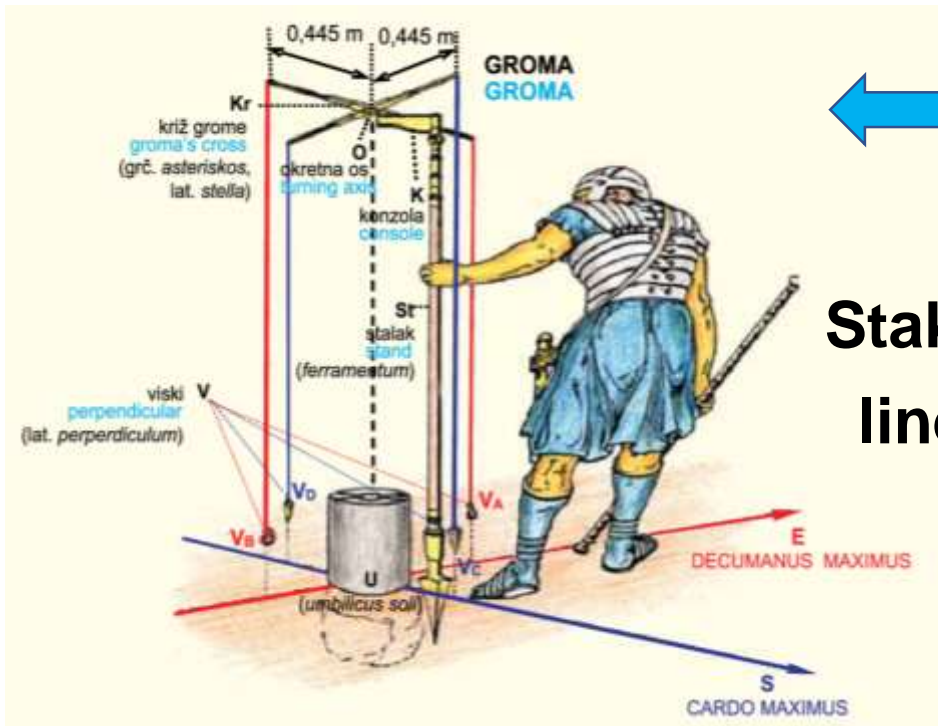


GEODETIC INSTRUMENTS

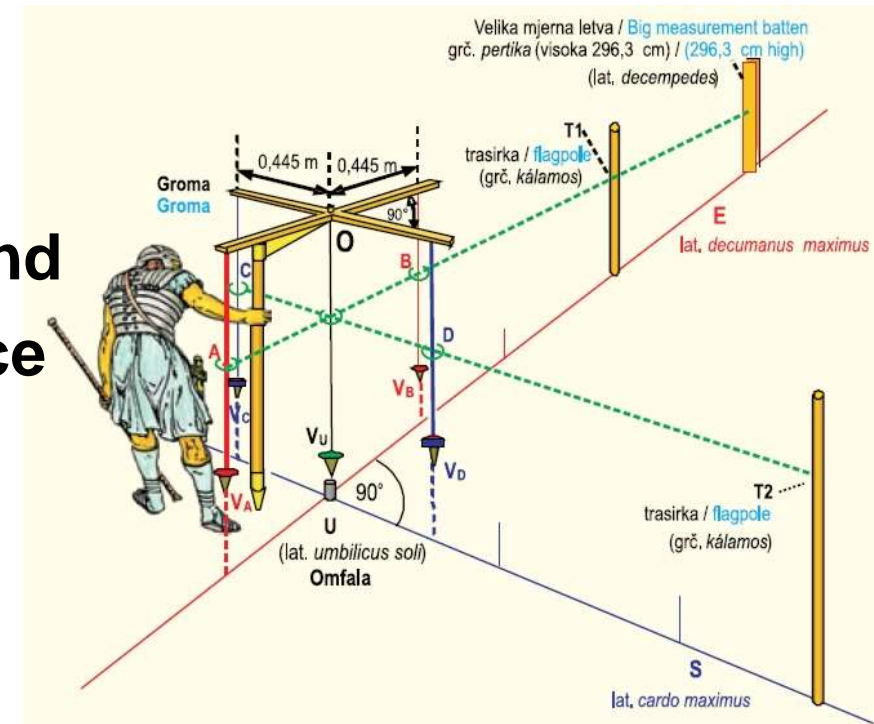
- The Roman Groma (The Roman Surveyor's Workhorse)

In Rome, surveyors were always using right-angled systems when they wanted to divide land for military, political, tax collecting, antirational, and temple-making purposes. They were choosing two directions perpendicular to each other.

Groma for pegging out a right angle in the field



Stake-out the right angle and line by using Groma device



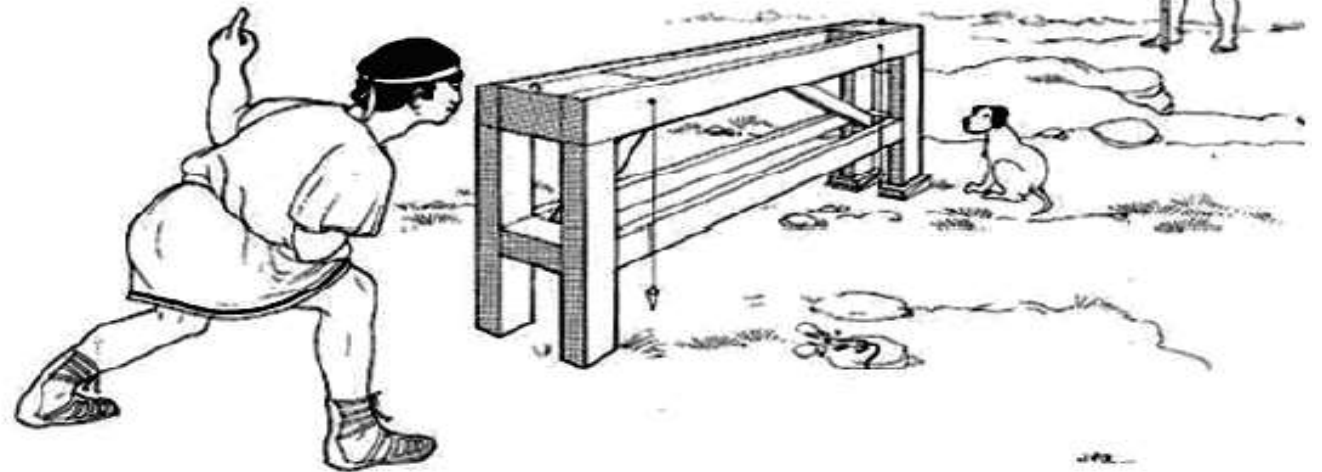
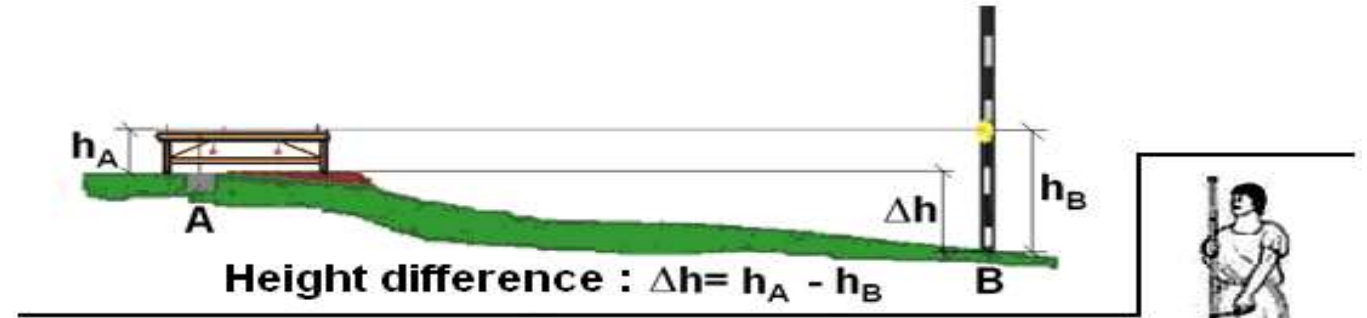
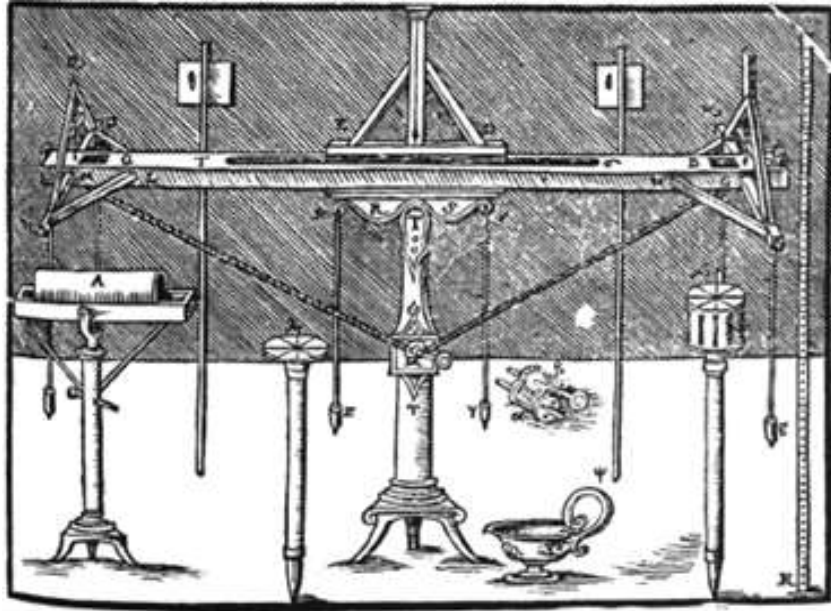
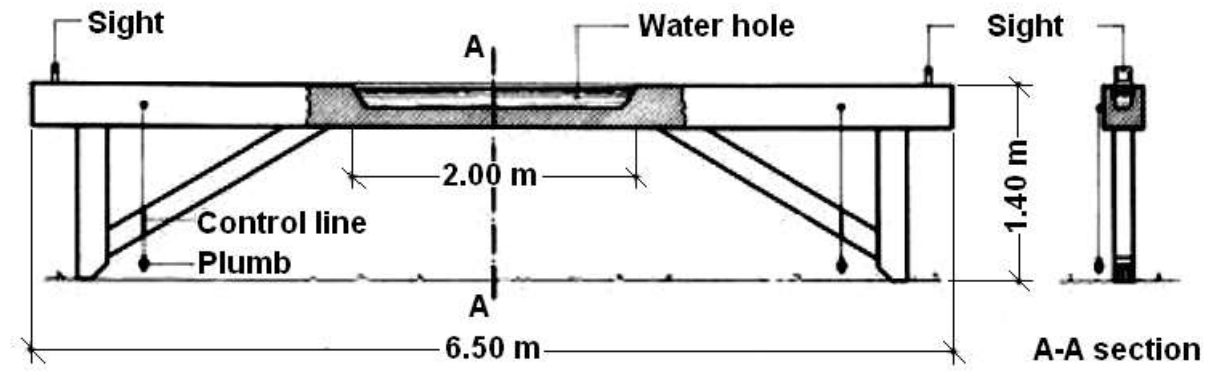
- Gnomon

The gnomon tool was used to measure the shadow if the stake-out distance was too long. They could apply a straight line (limes) like a line 100 km long with a precision of ± 1 m

- The Chorobates (The Roman Spirit Level):

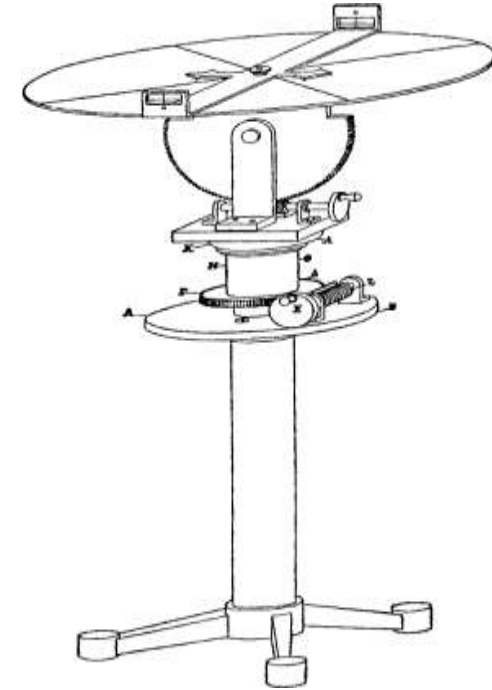
The instrument known as the chorobates was described by Marcus [Vitruvius](#) Pollio as the way that the Roman surveyors checked levels. They were using the chorobates instrument, which was used to build water channels and roads. The instrument was a 6.5 m long table with a through of 2 m in length. The table was horizontally plumbed first and then the water level in the ooze (water puddle) was checked. The horizontal direction was observed with the dioptra.

The Chorobates (The Roman Spirit Level):



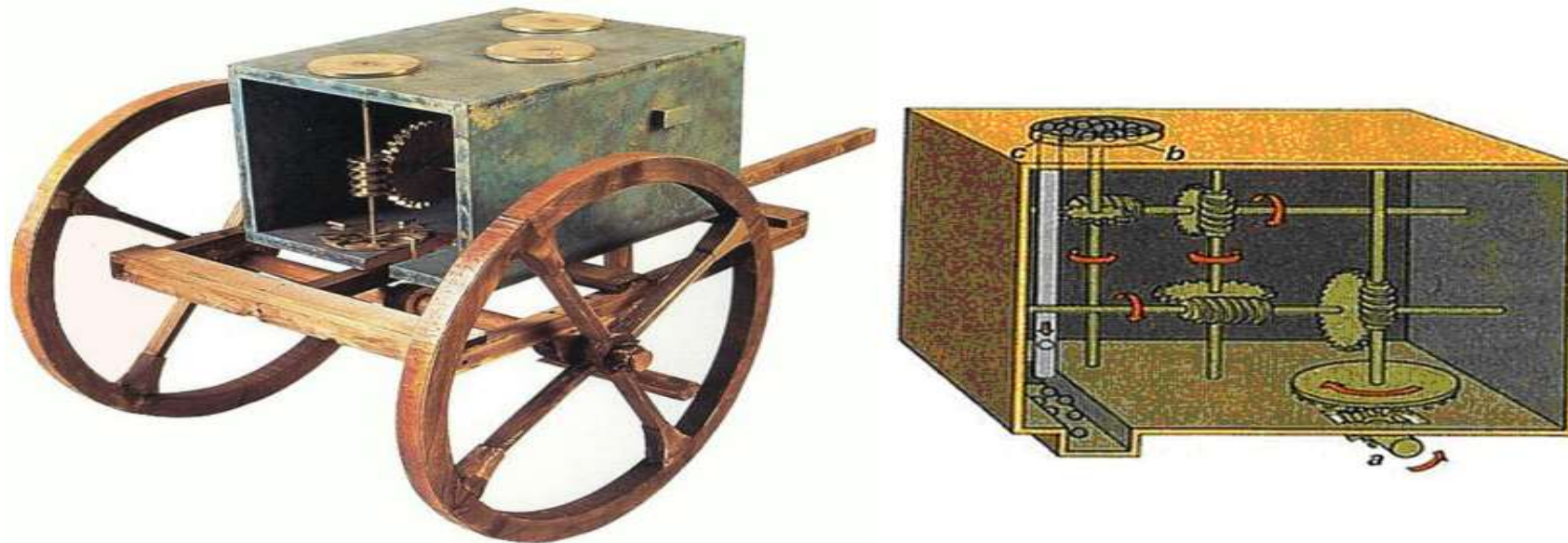
- The Dioptra:

Because the whole subject cries out for practical experiment, a reconstruction of a standard dioptra was made, the disk being of wood and 60 cm in diameter. The sources are full enough to inspire confidence that this reconstruction is quite close to the truth. It works in either of two planes. When mounted horizontally on a tripod by means of a swivelling joint, it is used to project straight lines, in either direction or in both, for marking on the ground, and if necessary to lay out further lines at right angles to them by means of right-angled diameter lines inscribed on the disk. A quarter of the rim is also graduated in degrees, a facility used (as far as we know) for celestial observations but not for terrestrial surveying.



- The Hodometer:

Since the Late Hellenistic period and during the Romans, a tool called a hodometer was used, which works with a pendulum tool attached to the length measurement. Originally invented by Archimedeus for the first time during the war with the Cartagians, the tool was introduced by writer, architect and engineer Marcus Vitruvius Pollio around 27-23 BC. At device, a metal ball from each milliarum (Roman shaft) through a carefully crafted wheel assembly, fell through the pipe. The two-wheeled car had wheels of 4 pes (4 foot approx. 1,185 m) and a circumference of 12.5 pes (approx. 3.7 m). The wheel made 400 turns and 1 milliarum.



The Roman odometer was a very advanced surveying tool for measuring distance, consisting of a small cart that the surveyor or his assistant could push along. A one-toothed gear attached to the wheel of the cart engaged another gear with 399 short teeth and one long tooth. After a distance of one Roman Mile, this long tooth would push a pebble into a bowl, and the surveyor could count the distance travelled at the end of the day. The Romans liked to set up milestones along major highways, letting the military and other travellers see how far they were from cities.

CONCLUSION

The Roman surveyors were highly skilled professionals, able to use a number of tools, instruments, and techniques to plan the courses for roads and aqueducts, and lay the groundwork for towns, forts and large buildings. We half-jokingly talk about the Romans and their straight roads, but that throwaway statement is not far away from the truth. The Romans preferred to build straight roads wherever possible and relied upon their surveyors to chart the route of their great highways.

In most cases, the military would be responsible for plotting the route of new roads, but civil surveyors were used to survey courses for aqueducts, settle boundary disputes, and prepare the groundwork for buildings.

To help in their task, they used a number of instruments, most borrowed from earlier culture but refined and improved by the Romans. With these simple tools and a good knowledge of geometry, they managed to plot complex courses for roads and aqueducts, their skill so great that they could design huge aqueducts with a gradient of less than 1 in 400.

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