The History of Geodesy Told through Maps

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Missionaries in 5000 years

With all due respect...
SUMMARIZED CHRONOLOGY

3000 BC: While settling, people were needed who understand geometries for building villages and dividing lands into parts. It is known that Egyptian, Assyrian, Babylonian were realized such surveying techniques.

1700 BC: After floating of Nile river, land surveying were realized to set back to lost fields’ boundaries. (32 cm wide and 5.36 m long first text book “Papyrus Rhind” explain the geometric shapes like circle, triangle, trapezoids, etc.

550+ BC: Thereafter Greeks took important role in surveying. Names in that period are well known by almost everybody in the world. Pythagoras (570–495 BC), Plato (428–348 BC), Aristotle (384–322 BC), Eratosthenes (275–194 BC), Ptolemy (83–161 BC)

500 BC: Pythagoras thought and proposed that earth is not like a disk, it is round as a sphere.

450 BC: Herodotus (484-425 BC), make a World map.


230 BC: Eratosthenes, made a survey in Egypt using sun’s angle of elevation in Alexandria and Syene (now Aswan) in order to calculate Earth circumferences. As a result of that survey he calculated the Earth circumferences about 46,000 km. Moreover he also make the map of known World, c. 194 BC.
150: Ptolemy (AD 90-168) argued that the earth was the center of the universe. As a result of that, he created a geocentric earth system and made a map of known World.

827: During the middle ages in Europe, the center of surveying and mapping developments moved to the Arabic World. Al Mamun made meridian arc survey in Baghdad and calculated the Radius of the Earth. Words like Azimuth, Zenith, Nadir, Alidade, etc. were adopted to other languages from that period of Arabic language.

1492: Christopher Columbus, discovered America.

1543: Nicolaus Copernicus (19.02.1473 - 24.05.1543), described his heliocentric system and theory. He accurately calculated many astronomical constants, such as the period of the planets, time of the solar and lunar eclipses, and the instantaneous motion of the moon.

1569: Gerardus Mercator (3.5.1512 - 2.12.1594), he developed a map projection and published a map of the World, 1569.

1600s: Telescope developed by Johannes Kepler (27.12.1571 – 15.11.1630), opened a new period in astronomy and surveying.

1614: Willebrord van Roijen Snellius, (1580-30.10.1626), introduced the resection method for obtaining coordinates of a point by observing only directions.

1735+: Those days, the center of mapping and surveying activities move to France. Bides precise meridian arc calculation, during French Revolution a common metric system was introduced.

1801: Meter unit legally accepted as 1/40000000 of the earth’s circumferences around the poles.

1806: Napoleon cadaster process was began and relative to that Bavaria cadaster institution began surveying for 1:5000 scale map production and decided to use those outputs also for 1:25000 scale map production. All those work was done by using plane table surveying technique and that process completed in 1840.

1830: Friedrich Wilhelm Bessel (22.7.1784 - 8.4.1846) studied for determining the earth shape and introduced an ellipsoid that has been used as reference ellipsoid.

1832-1847: Carl-Friedrich Gauß (30.4.1777 - 23.2.1855), developed and introduced least square techniques.

1873: Gauss described it first as “mathematical figure of the earth” in 1828 and J.F.Listing firstly used the term of “Geoid”.
1st World War+: Photogrammetry turn to a very powerful spatial data acquisition technique.

1924: International ellipsoid was accepted. That is Hayford Ellipsoid 1909.

2nd World War+: Radar technology was used as the primary electronic distance measurement. EDM Measurement, calculation and computer systems and data determination periods was began.

1957: First geodetic satellite was launched, Sputnik

Thereafter: Period of positioning determination by using satellite systems and techniques began.

Till Today: Terrestrial surveying systems turn to robotic systems.

- Systems’ integrations getting more efficient and affordable.
- Most of the surveying systems turn to electronic, computerized and unmanned systems.
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<th><strong>Rhind Mathematical Papyrus</strong></th>
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<tr>
<td><strong>British Museum, London</strong></td>
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<td><strong>A portion of the Rhind Papyrus</strong></td>
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<td><strong>Date</strong></td>
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<td><strong>Place of origin</strong></td>
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Map obtained in 1963 in Çatalhöyük, Mid-Anatolia, Turkey, is the oldest map known. This founding takes the history of surveying almost 2400 years back.

This map shows the settlement plan of Çatalhöyük village.

It is displayed in "Anadolu Medeniyetleri Müzesi" Anatolian Civilization Museum in Ankara.
Aristotle observed "there are stars seen in Egypt and Cyprus which are not seen in the northerly regions. "Since this could only happen on a curved surface, he too believed Earth was a sphere” of no great size, for otherwise the effect of so slight a change of place would not be quickly apparent."

Aristotle provided physical and observational arguments supporting the idea of a spherical Earth:

• Every portion of the Earth tends toward the center until by compression and convergence they form a sphere.

• Travelers going south see southern constellations rise higher above the horizon; and

• The shadow of Earth on the Moon during a lunar eclipse is round.
19th-century reconstruction of Eratosthenes’ map of the known world, c. 194 BC

Ptolemy’s world map, reconstituted from Ptolemy’s Geography (circa 150) in the 15th century, indicating “Siniae” (China) at the extreme right, beyond the island of “Taprobane” (Sri Lanka, oversized) and the “Aurea Chersonesus” (Southeast Asian peninsula).
Copernicus' heliocentric view of the Universe

- Immobile sphere of the fixed stars.
- Saturn completes one revolution every 30 years.
- One revolution of Jupiter every 12 years.
- Biannual revolution of Mars.
- Annual revolution of Earth and sphere of Moon.
- Venus every 71/2 months.
- Mercury in 88 days.
- Sun.
The Keplerian Telescope, invented by Johannes Kepler in 1611, is an improvement on Galileo’s design. It uses a convex lens as the eyepiece instead of Galileo’s concave one. The advantages of this arrangement is that the rays of light emerging from the eyepieces are converging. This allows for a much wider field of view and greater eye relief, but the image for the viewer is inverted.

Woodcut illustration of a 46 m (150 ft) focal length Keplerian astronomical refracting telescope built by Johannes Hevelius.
Repition Tacheometer, Prizm, Surveying Rod, Logarithm, Slide Ruler

Glass Circle Theodolite

Double Image Tacheometer, Steel Tapes

Mechanical Desktop Calculator

Natural Values of Trigonometric Functions

Orthophoto Digitizing

Analytic Photogrammetric Drawing

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