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MILESTONES IN THE HISTORY OF GEOVISUALIZATION

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Why maps?

delimitation of the territory

political reasons

religious reasons

scaring the adventurers

documentation of the known world

orientation

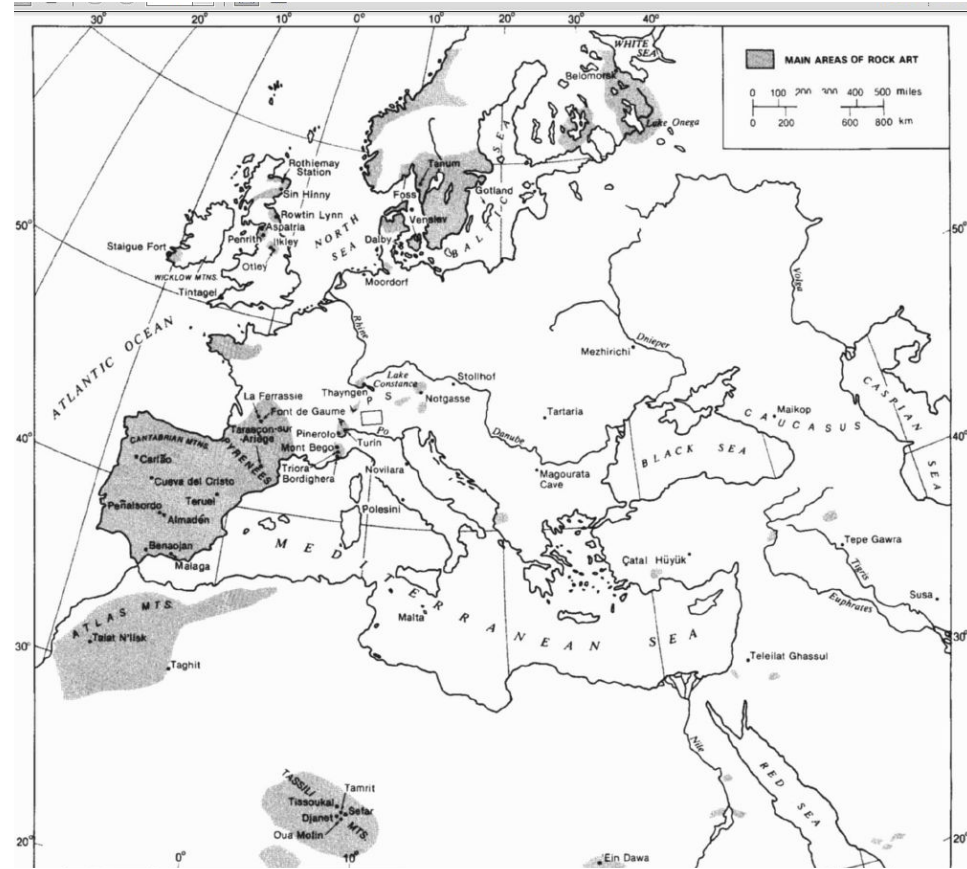
navigation...

Before maps

Older Stone Age

2.6 million years BC to 10 thousand BC (geologically Pleistocene)

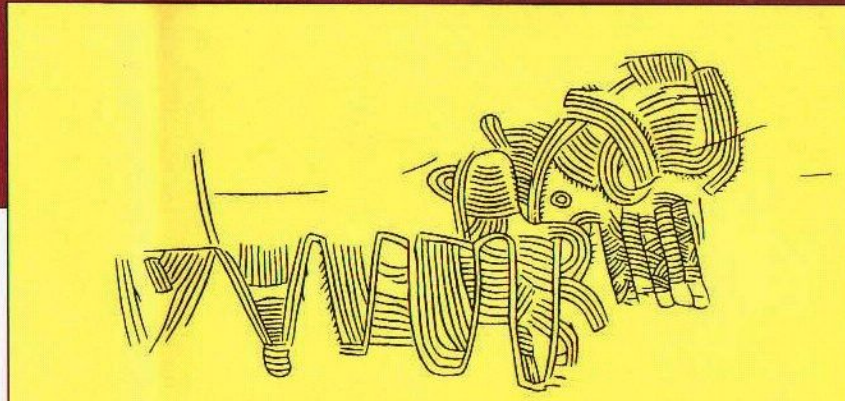
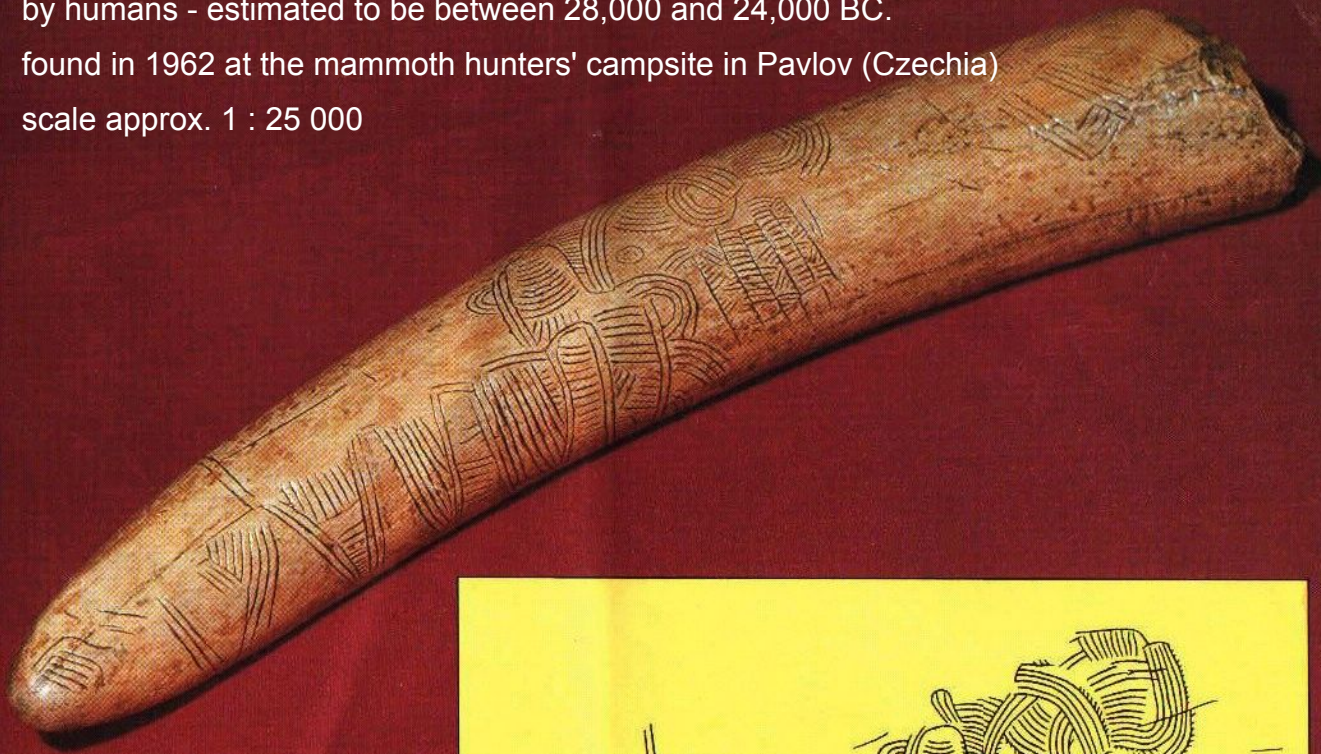
- engravings on stones, bones, then later on pottery, clay tablets, metal... tree bark, canvas, sand (mostly not preserved)
- primitive depictions of ideas about the world, navigational character, game drive, plotting
- use of primitive stone tools



considered to be the oldest known "situation map" and "cartographic expression" by humans - estimated to be between 28,000 and 24,000 BC.

found in 1962 at the mammoth hunters' campsite in Pavlov (Czechia)

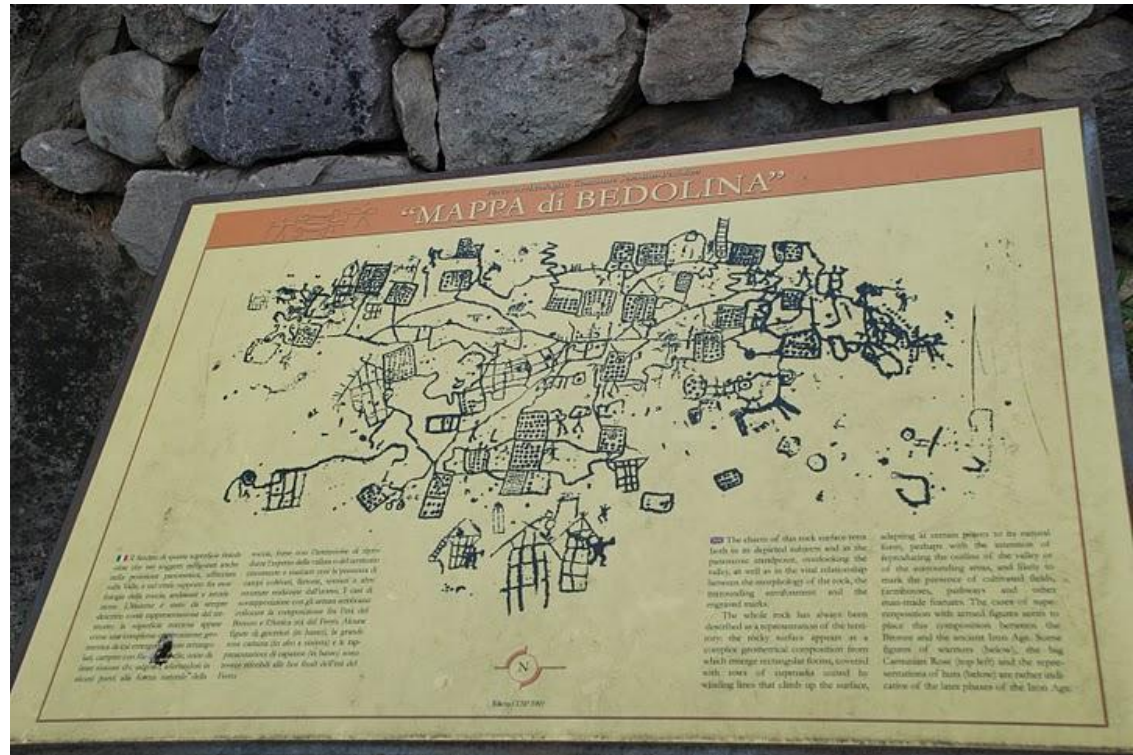
scale approx. 1 : 25 000



deposited at the Institute of Archaeology of the Czech Academy of Science in Brno (Czechia), and reproductions at the National Museum in Washington, D.C.

Bedolin map (Italy, Val Camonica valley)

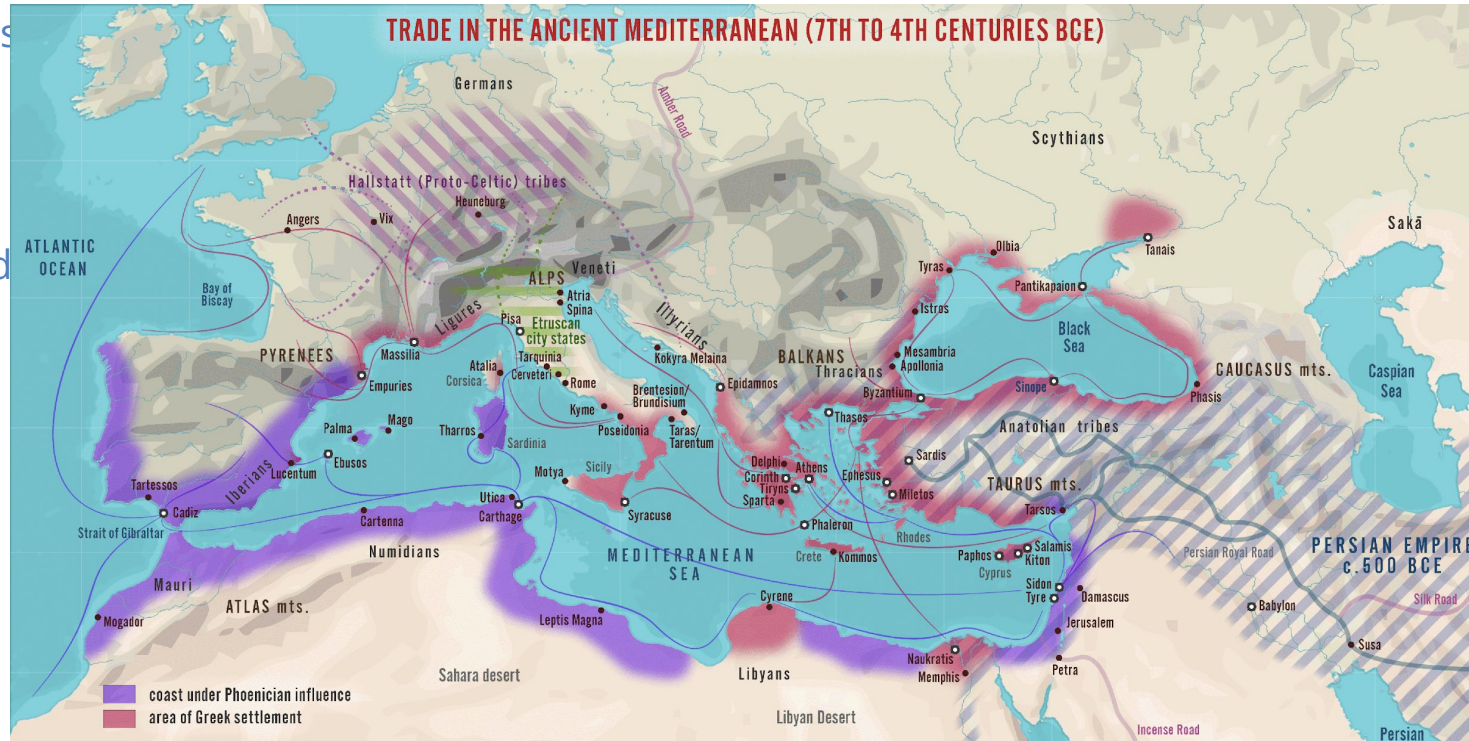
- 8 000 years old, rock engravings
- fields, roads, houses



Ancient Mediterranean

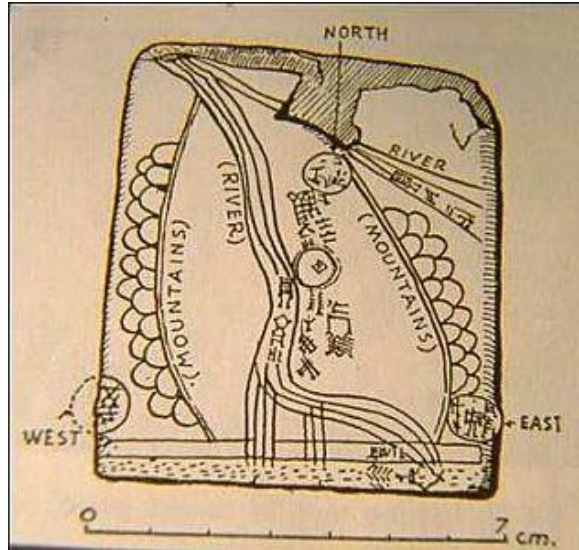
Mesopotamia, Assyria, Babylon, Malta, Algeria, Egypt

- clay tablets, papyrus
- schematic land, heaven and hell
- large-scale plans of cities, religious centers, simple land surveys, taxes, land reclamation
- first rules of geometry



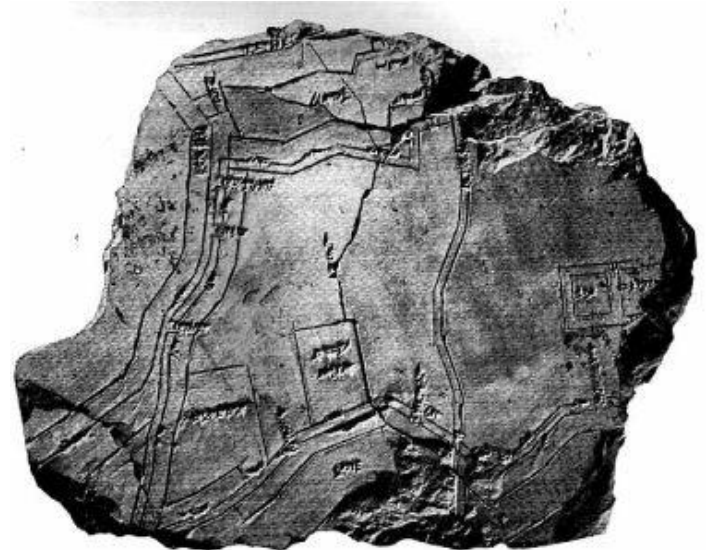
Map of Mesopotamia (today Iraq)

- 4500 years old, clay tablet
- Euphrates River, Tigris, Zagora Mountains, cardinal points



Plan of the city and fields of Nippur (Mesopotamia)

- 3500 years old, clay tablet
- Euphrates River, canals, walls, gates, land administration





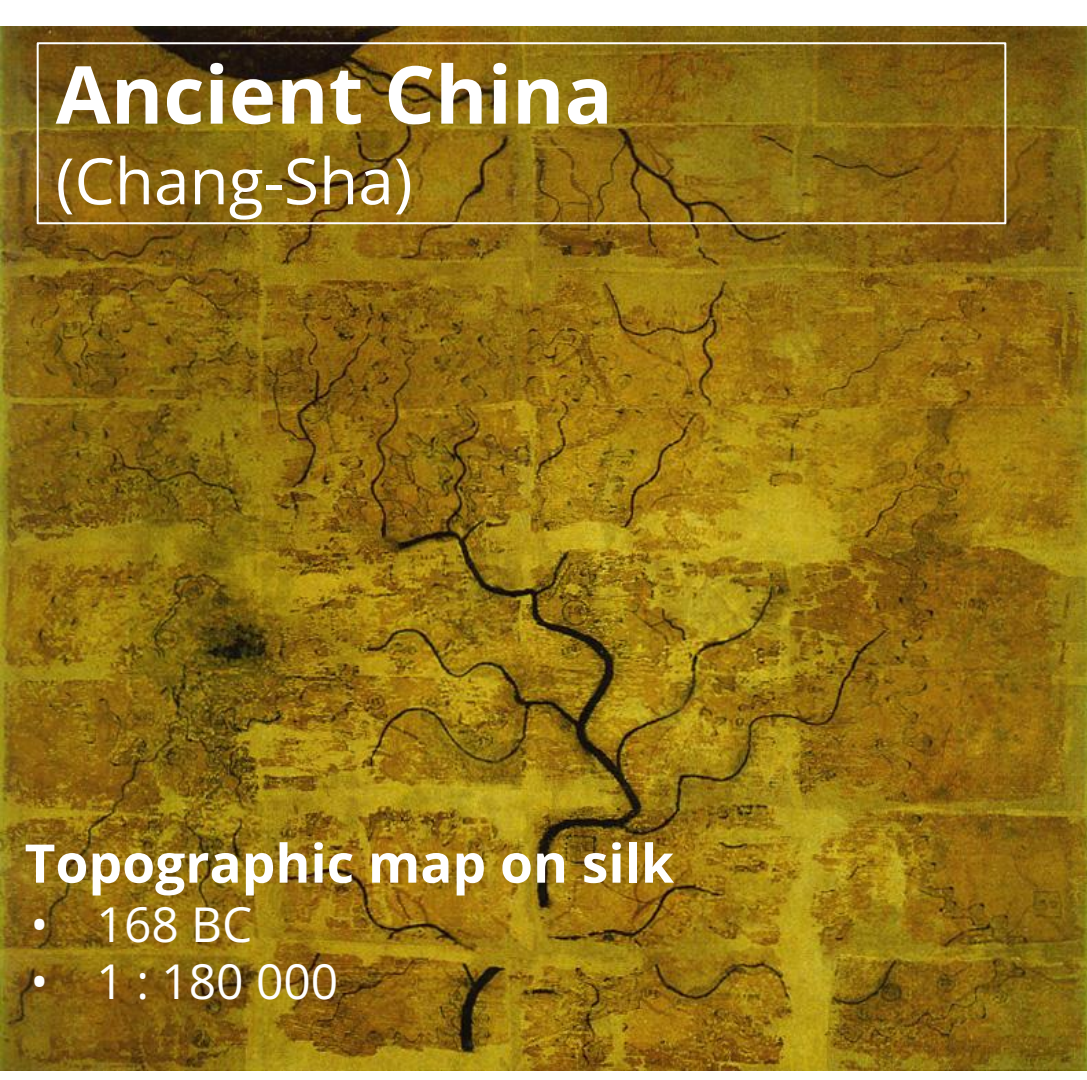
Babel map

- called *Imago mundi*
- 6th century BC (2500 years old)
- on a clay tablet
- inscriptions in cuneiform script
- imagining the layout of the world, Babylon, Assyria, mythical regions beyond the sea



Ancient China

(Chang-Sha)

A topographic map on silk, showing a network of rivers and terrain features. The map is drawn in black ink on a yellowish-brown silk background. The rivers are depicted as wavy lines, and the terrain is represented by various symbols and lines. The map is divided into several rectangular sections by faint lines.

Topographic map on silk

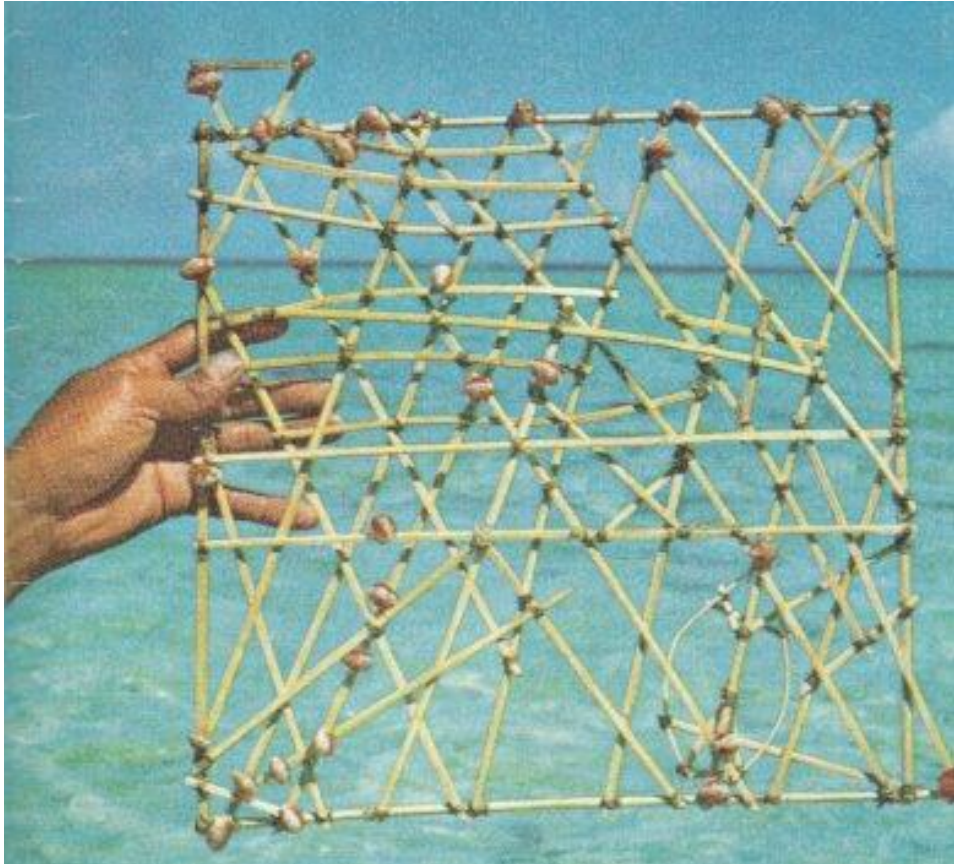
- 168 BC
- 1 : 180 000

Military map on silk

A military map on silk, showing a detailed layout of a city or fortification with various structures and symbols. The map is drawn in black ink on a yellowish-brown silk background. It features a grid of streets, various buildings, and symbols representing different military or administrative units. The map is divided into several rectangular sections by faint lines.

- 168 BC
- 1 : 90 000

Maps of "primitive" nations



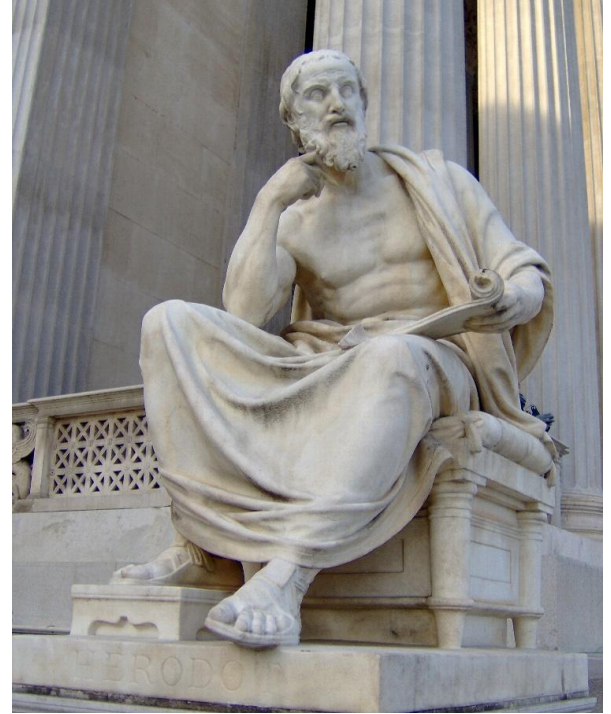
- cartographic products of non-European cultures until the time of their colonization
- on skin, bark, in sand
- old maps have not survived, methods were recorded only during the conquest of overseas areas

- Indians, Eskimos, Siberians, Tuaregs and others

GREEK CARTOGRAPHY

- theoretical benefit rather than practical
- only a fraction of the original works have survived
- maps are mostly derived from literary descriptions or preserved by rewriting (redrawing) the original works by later researchers
- the first maps of the world, engraved in wood, bronze plates

Herodotus (c. 450 BC) – 9 books of the most complete description of the known world (Oikoumene)



Homer's poems: **Earth is a pancake**, surrounded by the Ocean

Anaximandros: **Earth is a cylinder** floating freely in the middle of a circular universe, and maintaining its position by being equidistant from everywhere.

Hecataeus, Pythagoras (500 BC), Aristotle (350 BC):
Earth is a ball



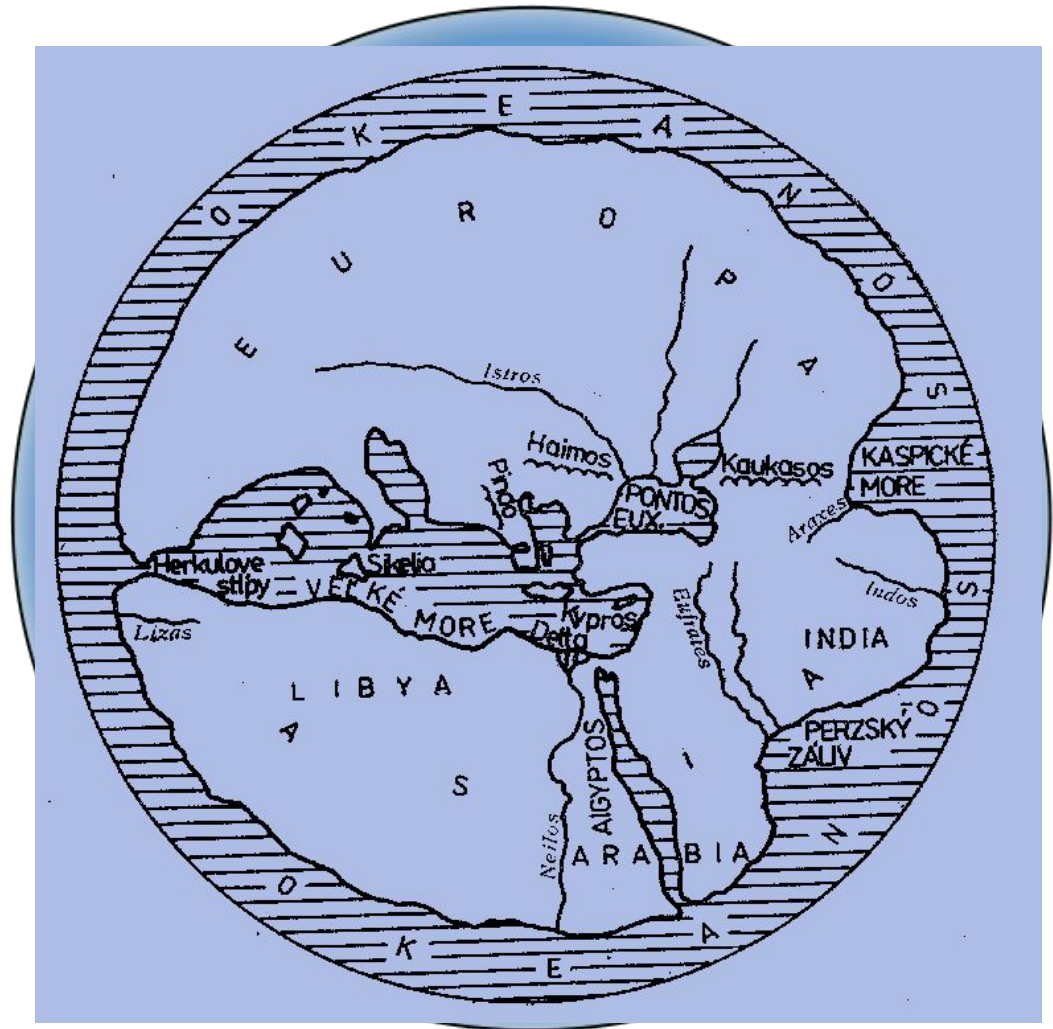
Anaximandros of Miletus (c. 580 BC)

- circular "oikoumene" = inhabited, known world
- Continents surrounded by ocean, the Delphic oracle in the centre
- Anaximandros started
- the tradition of graphic expression
- map reconstructed after Herodotus



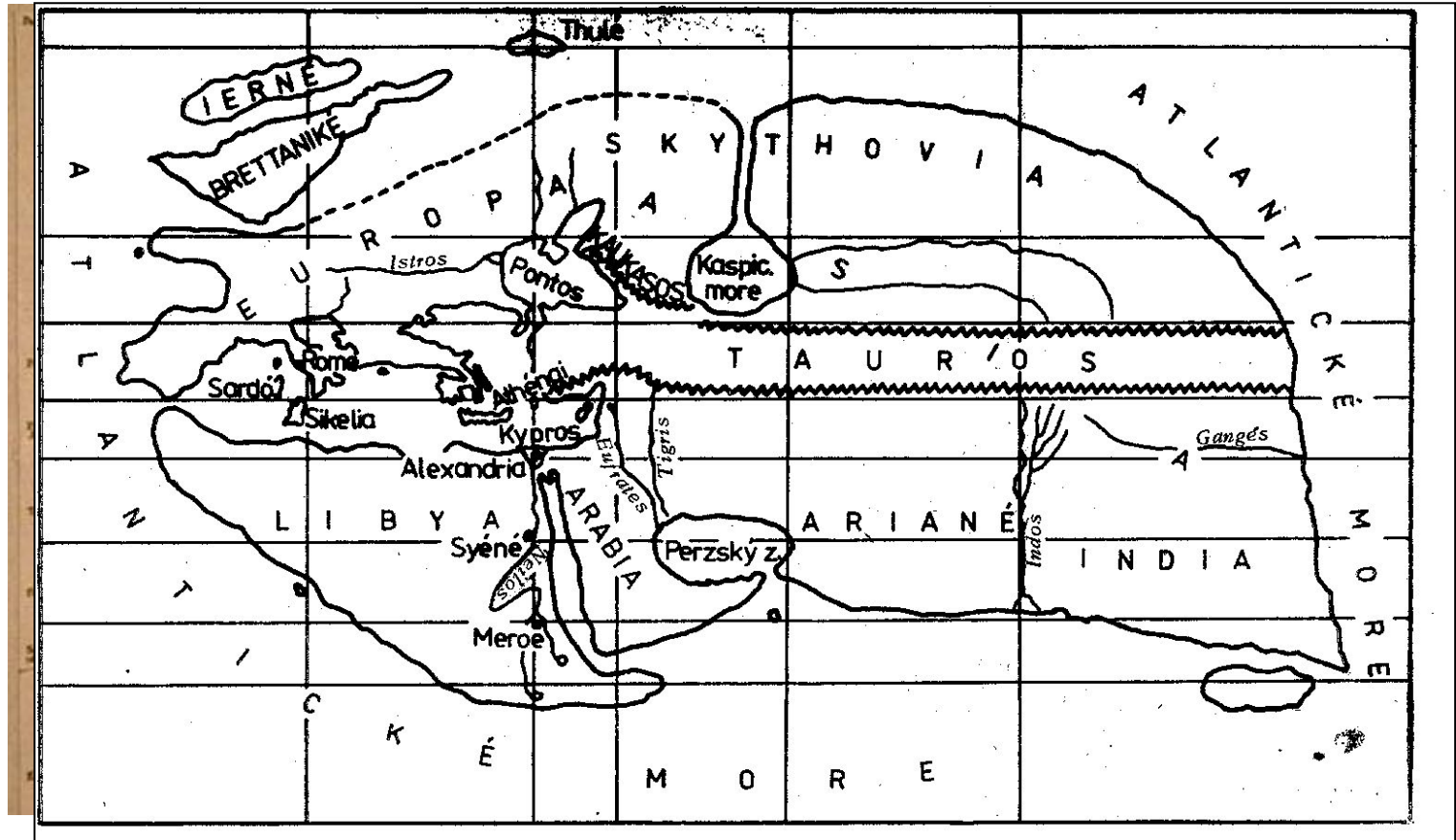
First real maps of the world

Hecataeus (c 500 BC)



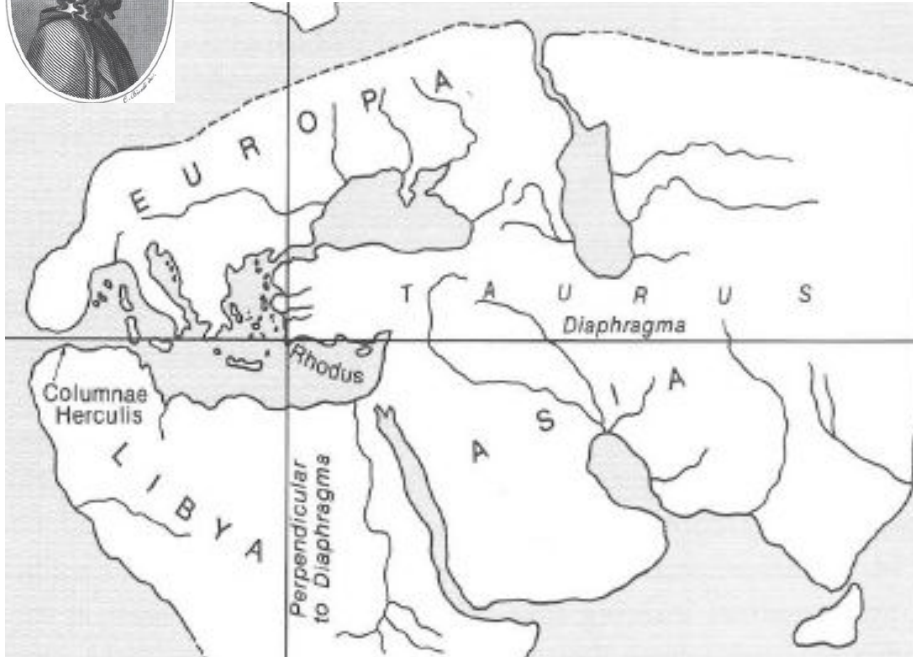
Eratosthenes of Cyrene (276/272 – 194 BC)

- applied a network of ancillary lines (8 parallels and 7 meridians)



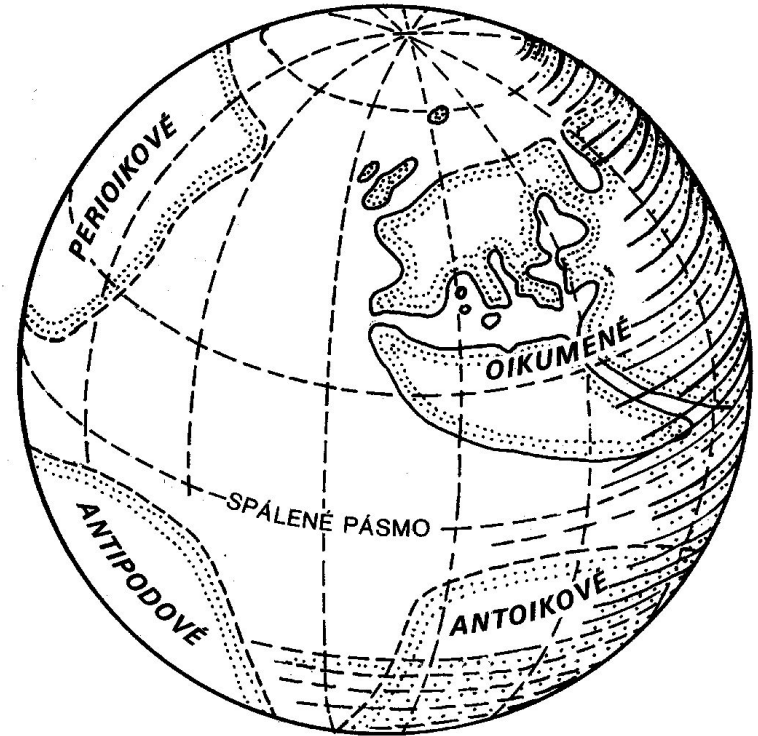
Dicaearchus of Messina (350 – 285 BC)

- first parralel and meridan



Crates of Malu (168 – 140 BC)

- first globe



Claudius Ptolemy (80 – 165 AD), Alexandria

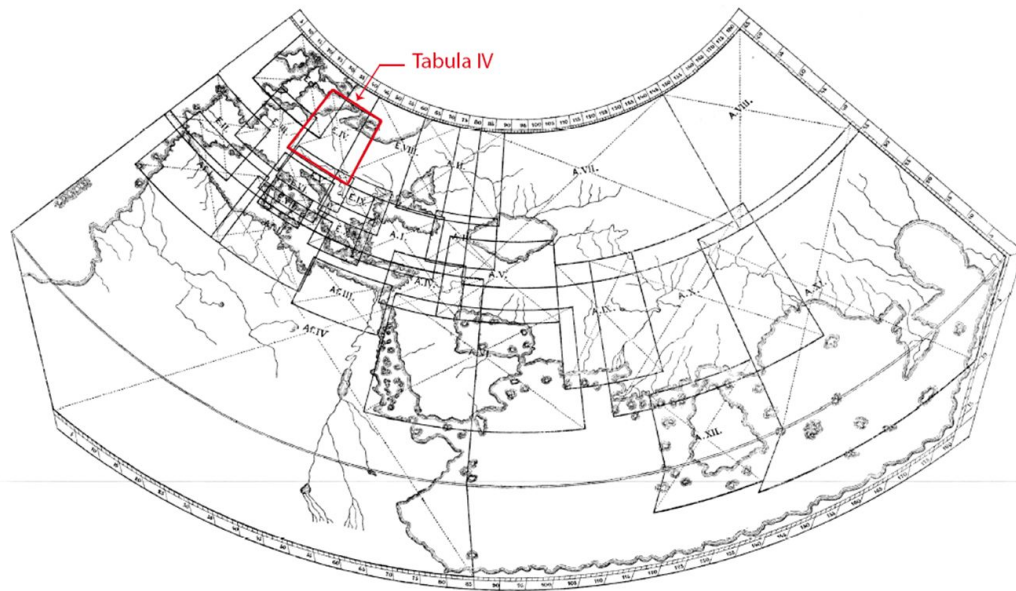


Syntaxis megale (Almagest) – encyclopedia of stellar knowledge

Terabiblos – instructions for making and interpreting a horoscope

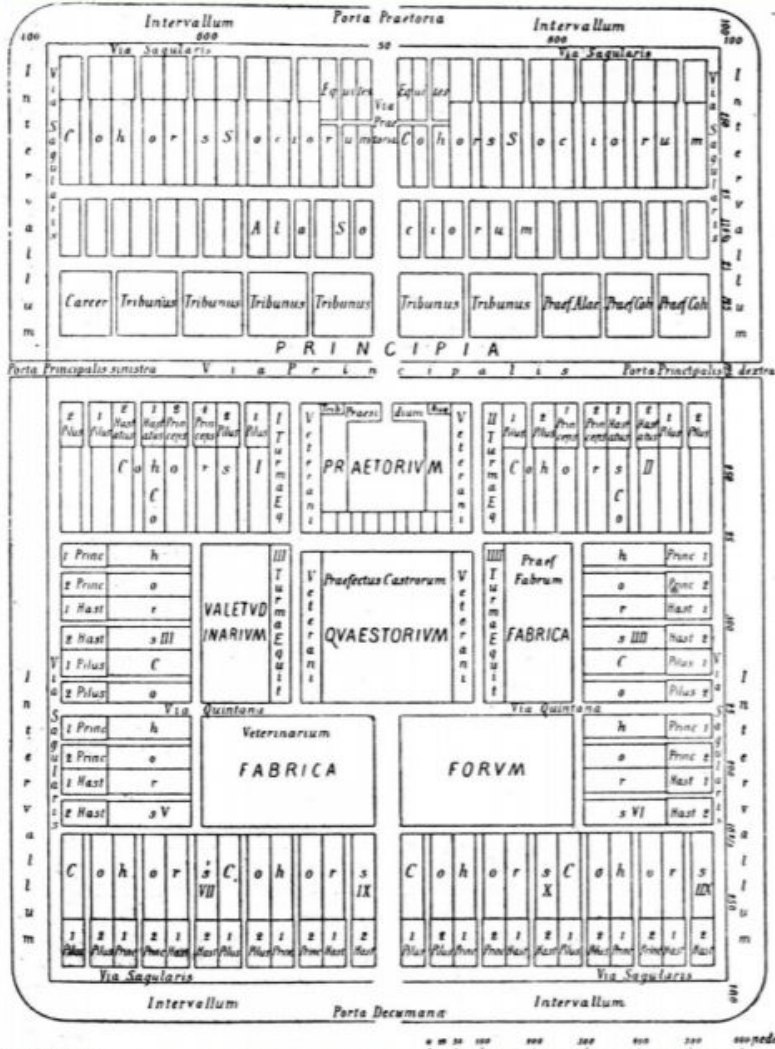
Geogrsfiké Hyfégésis 8 books

- defined the instructions how to construct a map
- introduces the term „topography“ = Earth surface
- introduced a hill symbol for hypsometry
- 27 maps of 3 continents
- grid of parallels and meridians – nul meridian „Ferro“
- Index of 8000 geographical sites
- encyclopaedia of stargazing voriginal has not survived, there are a number of manuscripts and printed editions (the oldest in Arabic, circa 12th century AD)



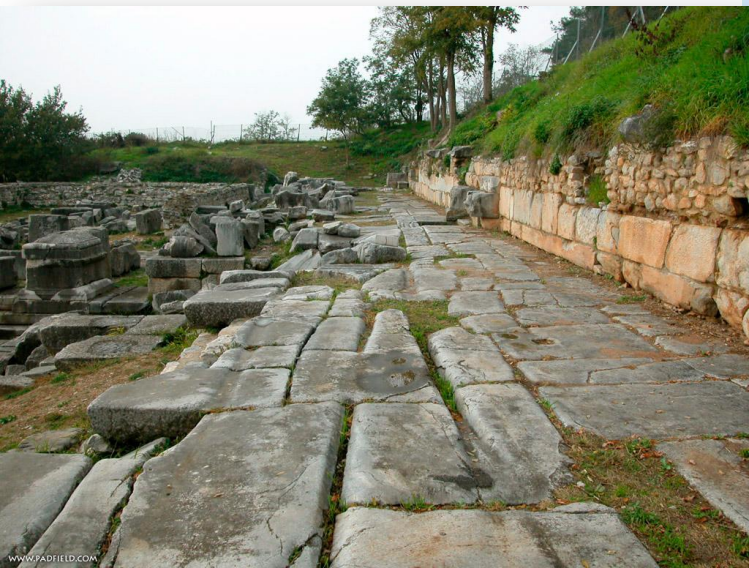
Roman cartography

- military, economic and administration importance
- surveyors were already part of the state administration and had the task of surveying land, roads, camps, aqueducts



Very good roads throughout the imperium

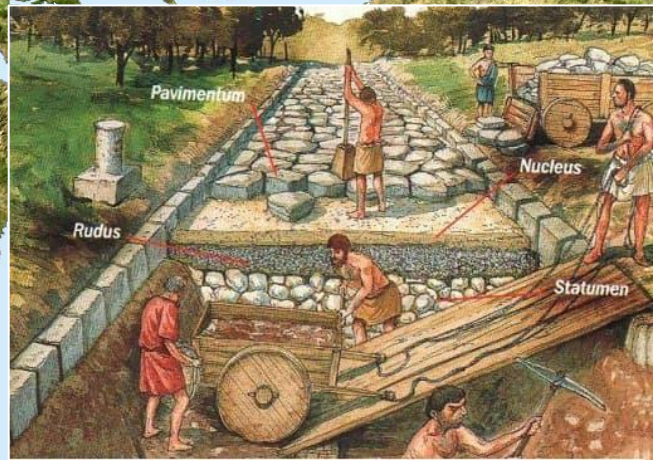
- Via Appia
- Via Traiana
- Via Egnatia
 - From Rome to Istanbul



VIA EGNATIA

- Via Egnatia
- Via Appia
- - - secondary course or connected roads
- - - sea route

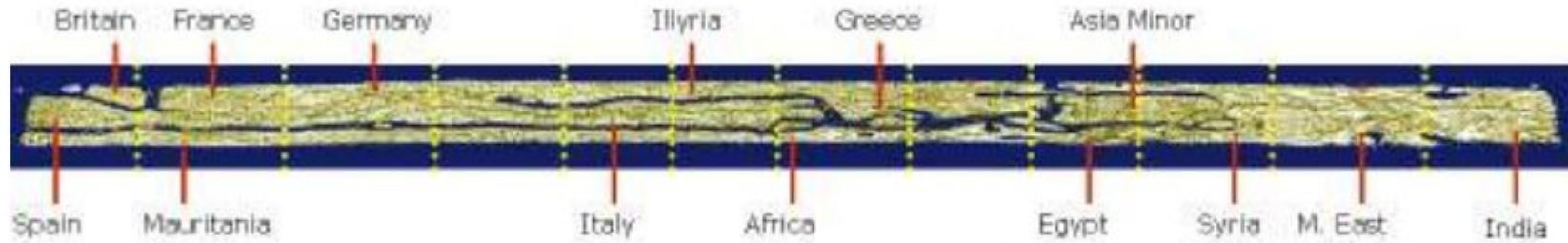
100 200 300 km
50 100 150 200 mi





Agrippa's map (cca 20 AD)

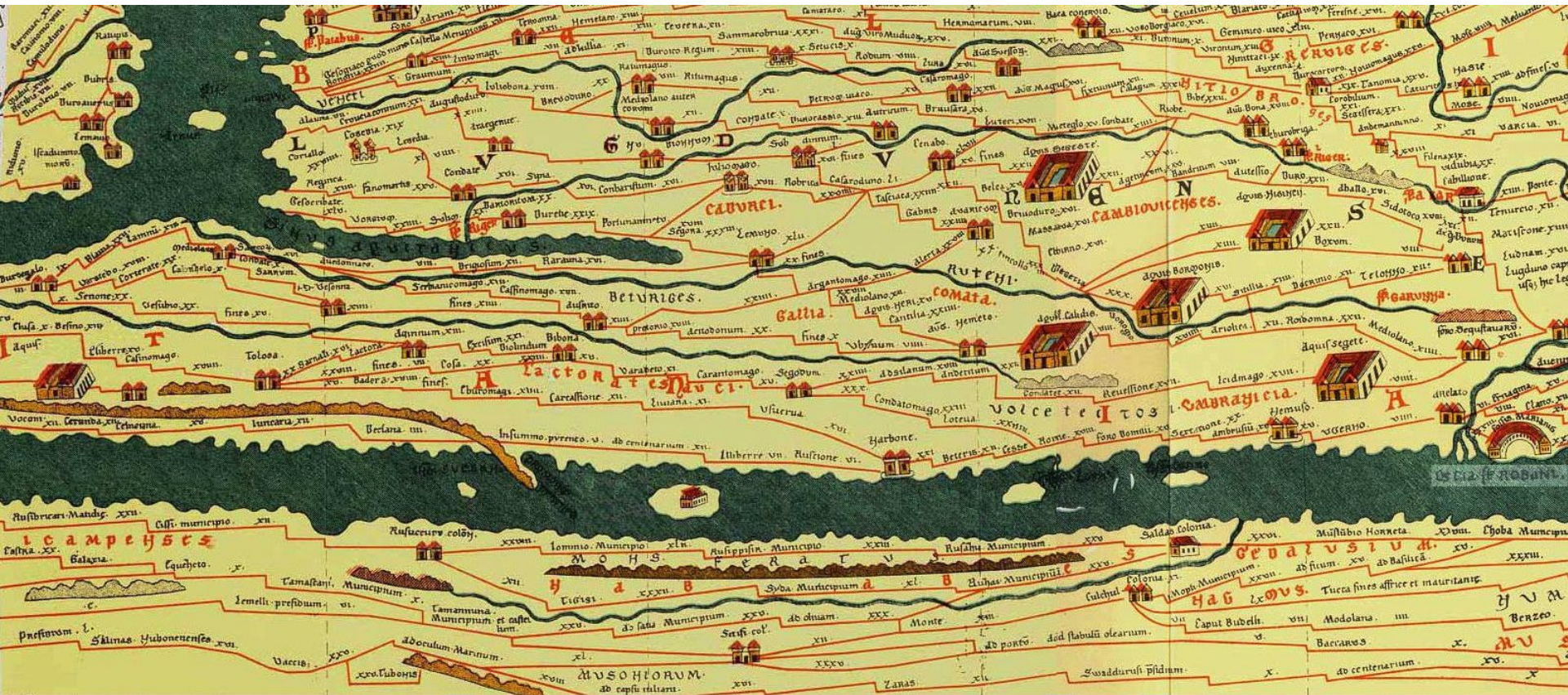
- one of the greatest technical feats of Antiquity - measuring throughout the empire
- the project was directed by Augustus' son-in-law Marcus Vispanius Agrippa
- "cartographic" representation of the road network
- a map 10 m high and 200 m long carved in marble
- on the wall of Vipsanius' (Agrippa's) column in the Field of Martius in Rome, on the Via lata (now Via Corso)
- the original has not survived
 - ... but a copy was made of the original
 - and from the copy another copy...



Peutinger's map – copy of the Agrippa's map (the 13th century) of the copy from the 4th century with adds-on from the 8th century

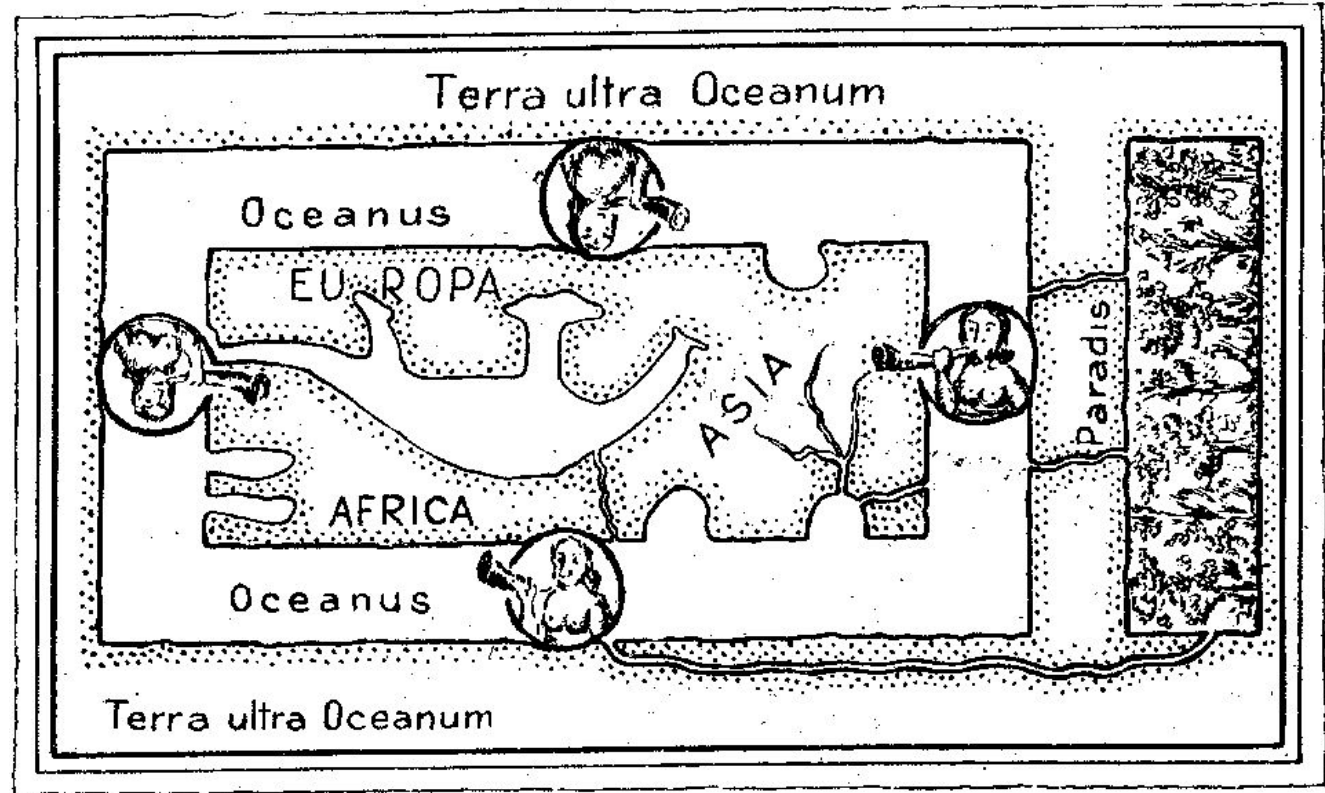
- founded in the German monastery (Peutinger was the owner then)
- 12 pergamens sheets 56x32 cm (only 11 preserved) (682x32 cm) on the roller
- roads as a broken line – each break is a stop on the way with the length in Roman miles (1480 m)
- high schematization, hard to navigate and identify region
- no map scale, no projection, east is upwards, worse than maps of that time







MIDDLE AGES



Mozaic map of MADABA

- the floor in old house in the Jordan city MADABA (today the St. George Church)
- 7 x 21 meters ---- 2 mil pieces of tiny stones / only a quarter of the map preserved
- Holy Land from the Jordan River
- east is upwards
- toponymy in Greek (150 sites)



Medieval cartography in Europe

- the bearer of education and culture is the Christian Church
- the origin and order of the world based on **the Bible**
- complete oblivion of ancient teachings, opinions and scientific knowledge - again only in the Renaissance
- cartography is backward, dependent on the Christian perception of the world
- few maps survive from the medieval period, perhaps none were even made

Mappae mundi (Maps of the World) - mostly from 10th to 13th century, of which c. 900 survive in illustrated manuscripts

„Hic sunt leones!“



1120



1483

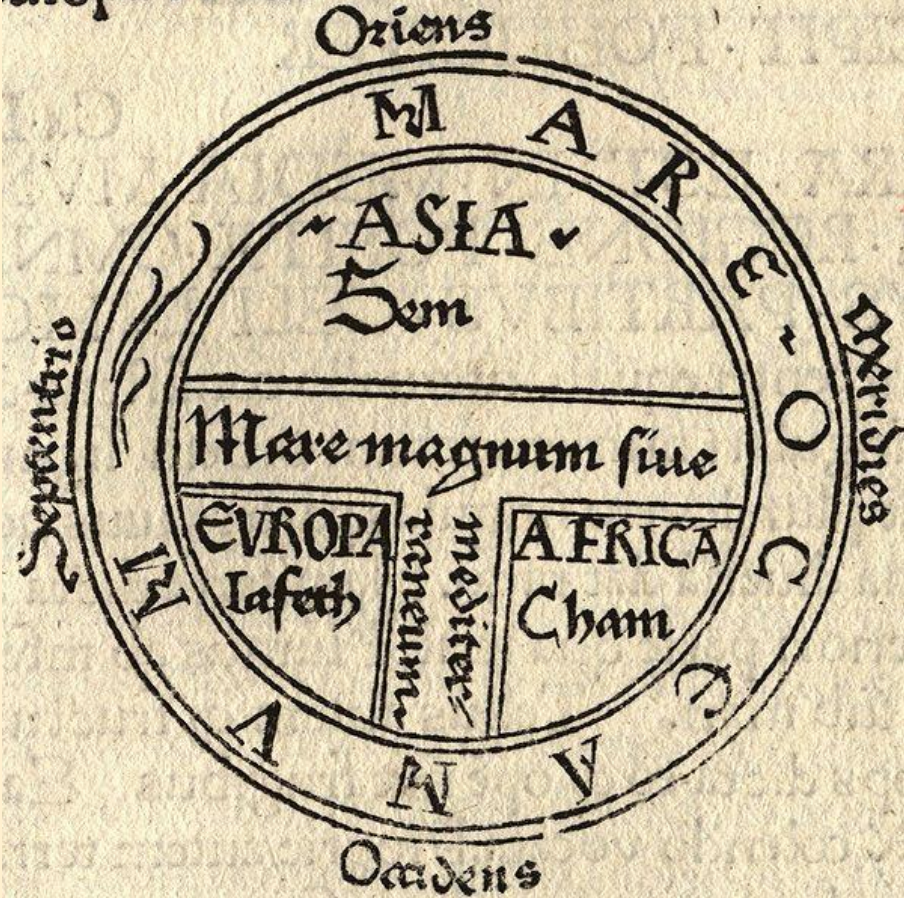


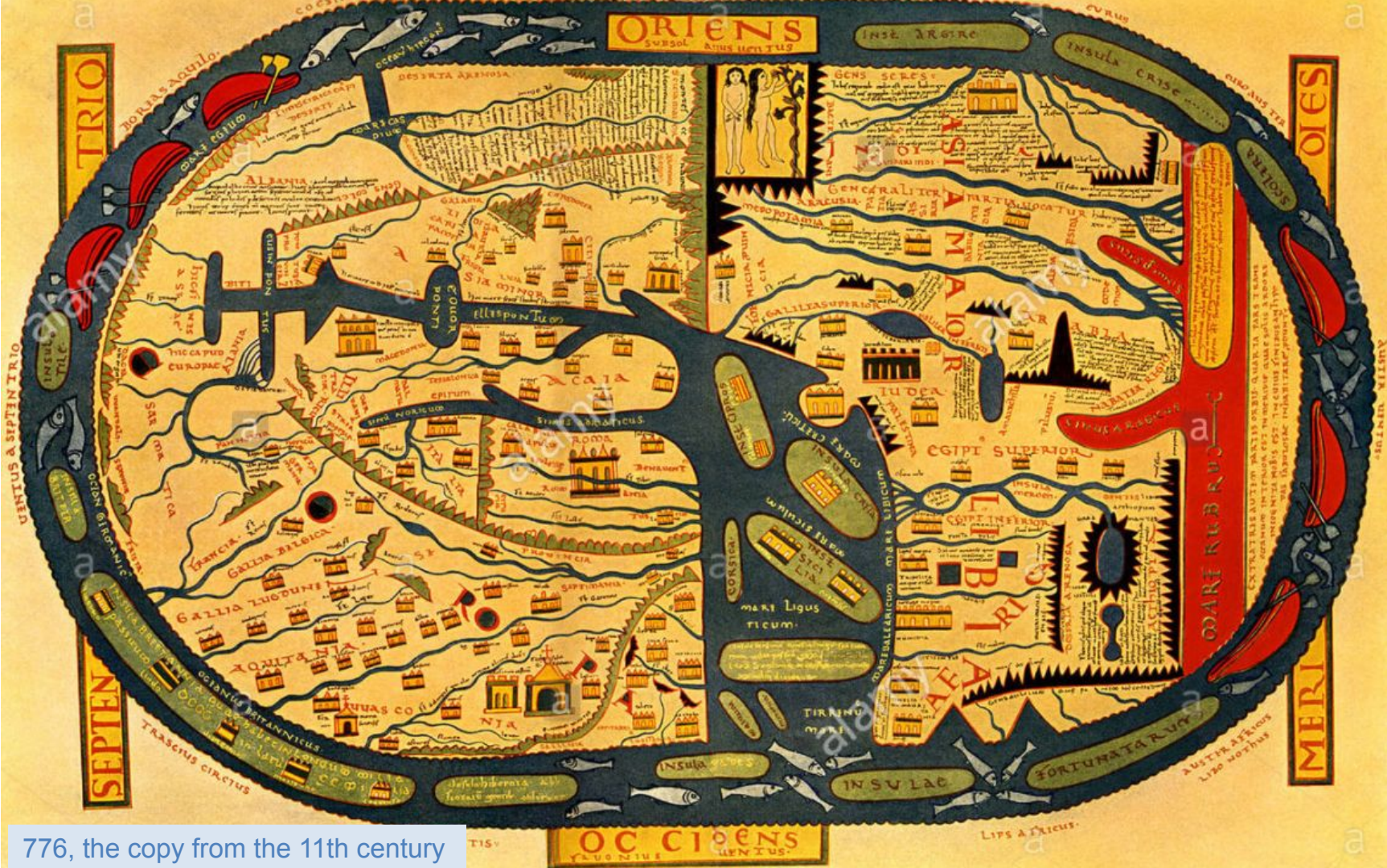
General maps

O-T maps (orbis terrarum)



Melova O-T mapa, 15. stol.

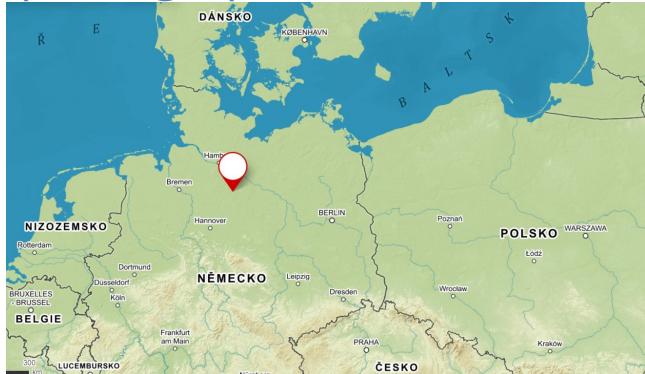


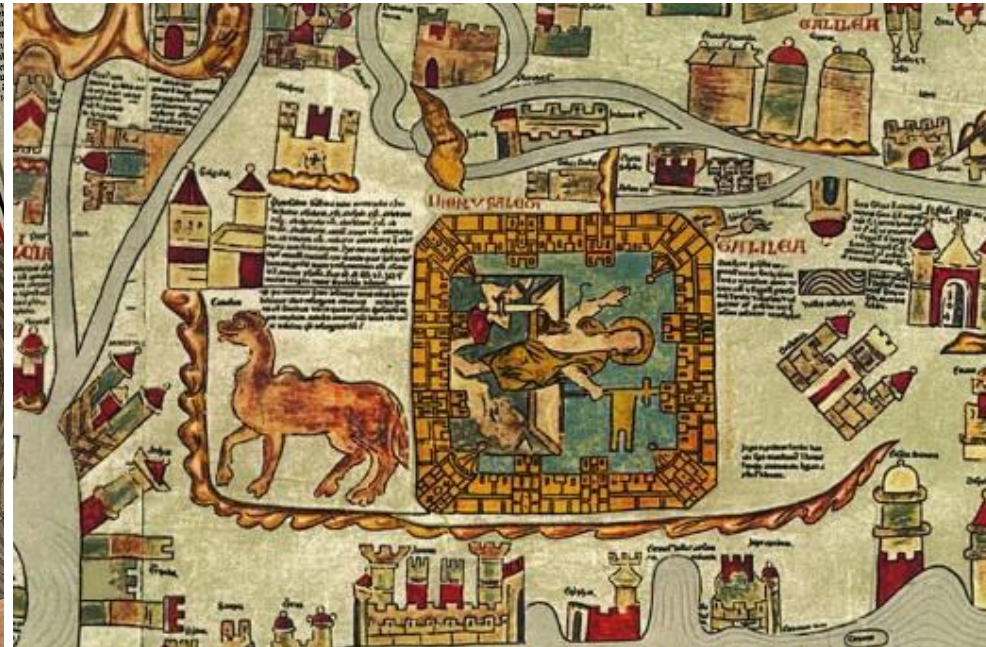
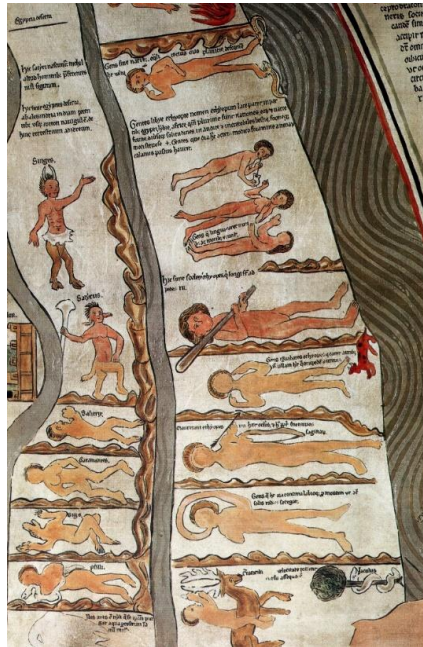


776, the copy from the 11th century

Ebstorf MAPPA MUNDI

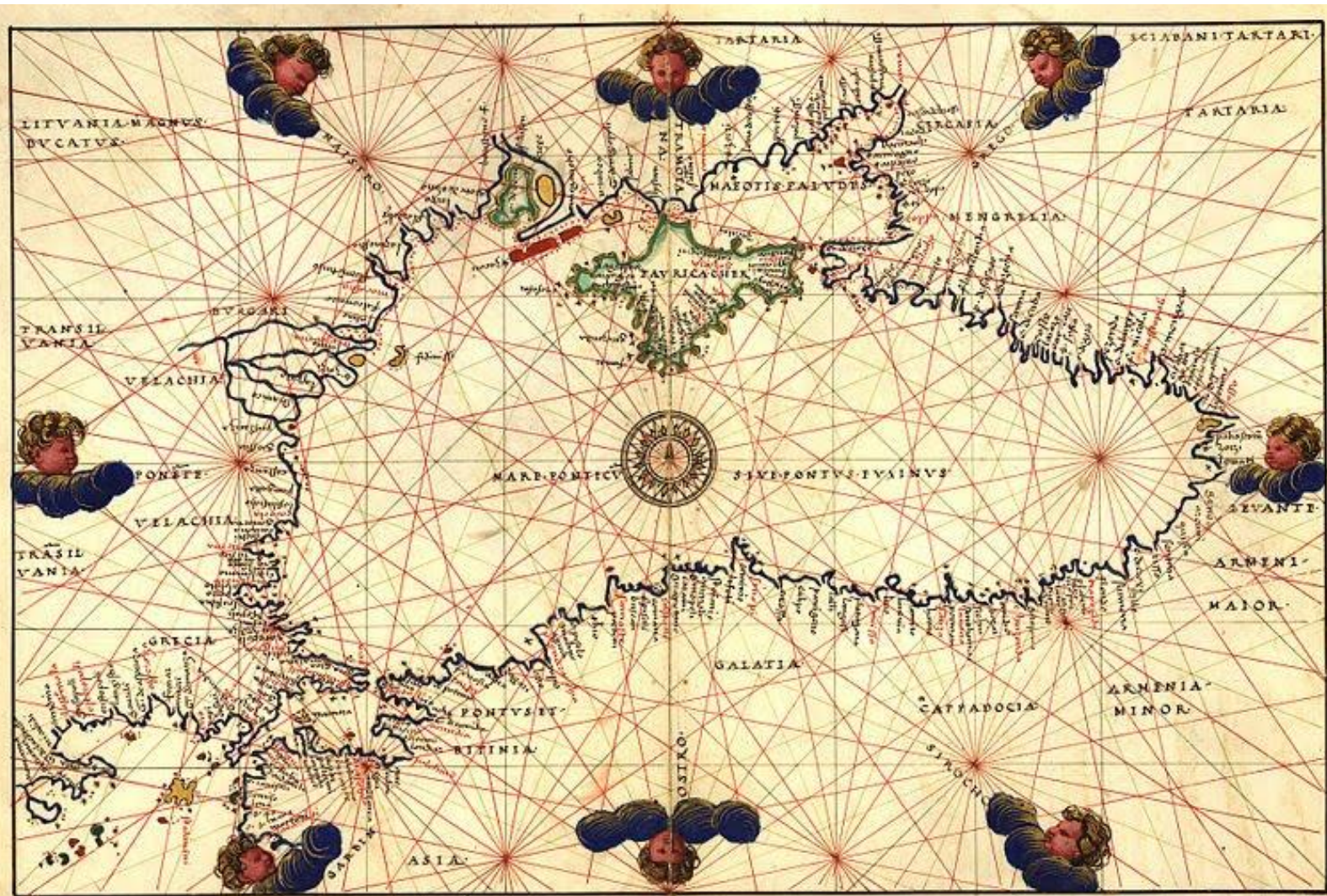
- 1234 as an altarpiece in the monastery of Ebstorf near Hannover
- diameter **356 cm**, sewn from 30 parchment sheets
- Jerusalem in the middle
- burned in a bombing raid during World War II; there are black and white photographs from 1891 and colour photographs before the





Portolan maps

- a new type of cartographic products, finally usable maps
- a consequence of the development of maritime navigation in the 13th and 14th centuries thanks to the compass (from China via Arabia)
- maps mainly show coastlines - harbours, important places (water), bays, islands, inland areas suppressed
- huge economic value of maps □ key to achieving wealth
- many maps did not survive - sank with the ship to the bottom of the sea...
- about 180 maps and atlases dating back to the 14th and 15th centuries have survived
- material: parchment (expensive), less durable (got wet)
- maps without a cartographic grid, but a so-called **compass rose** - the main one with 32 rays in the middle of the sheet + 16 subsidiary rosettes
- the condition was the use of a compass



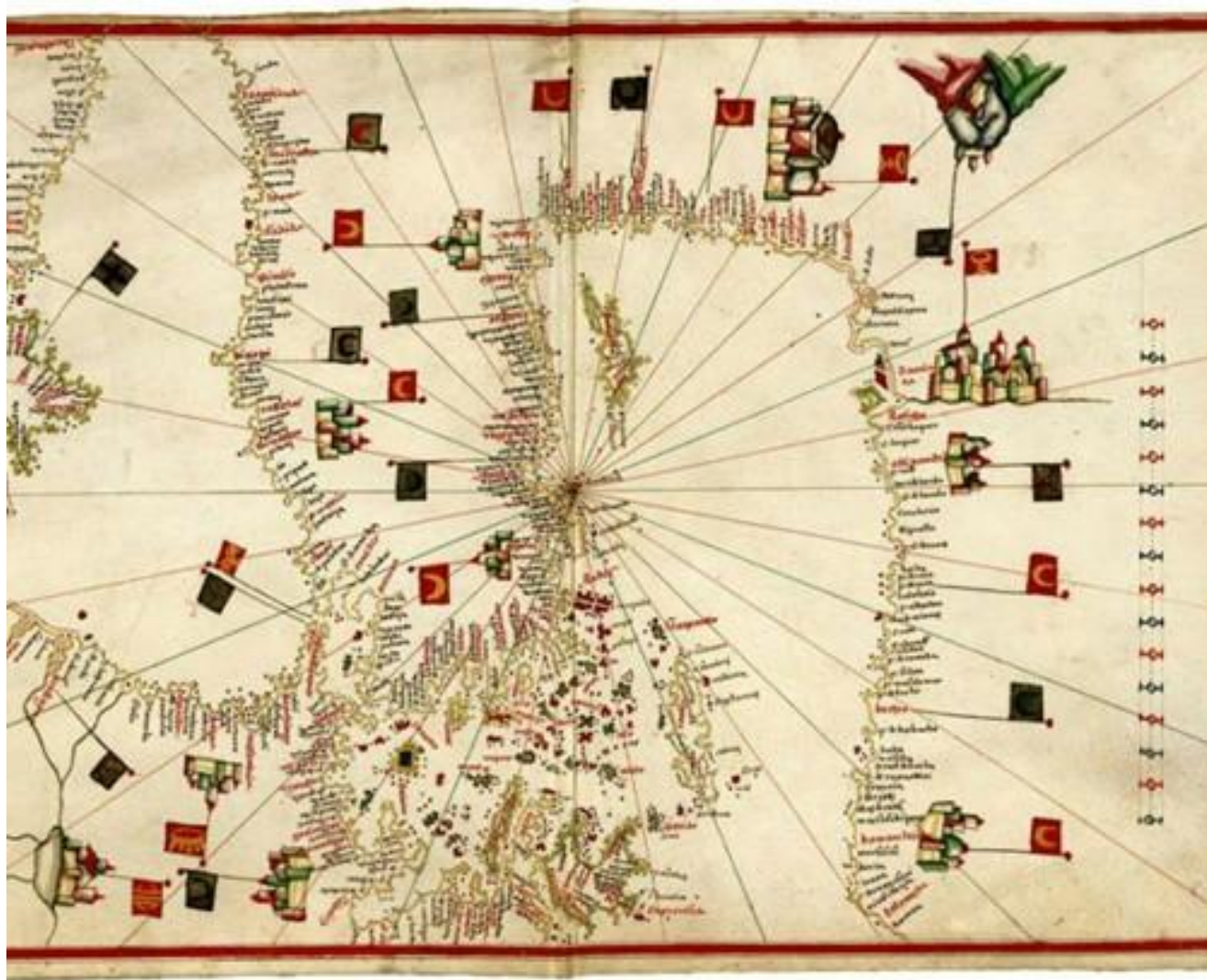
Catalan Atlas 1375

- the whole known world, the most comprehensive cartographic work of the 14th century.
- 6 parchment double sheets 49x63 cm glued on 12 wooden boards
- the map itself covers 4 double sheets



Nautical atlas of Jaume Olives

- 1563
- protolan maps
- Olomouc

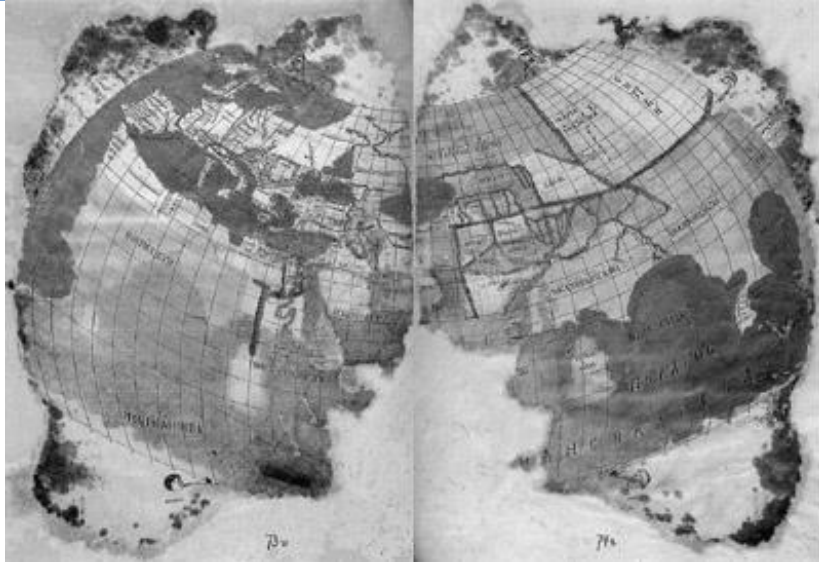


Nautical atlas of Jaume Olives (1563)



Byzantine Empire

- did not break away from Antiquity as the West
- preserving Ptolemy's legacy:
 - **Vatopedion Codex** (13 – 14th century)
 - **Codex Seragliensis**



Arabic cartography

- = heirs of Greek geography
- translated Ptolemy and preserved him for later Renaissance generations
- Abu Abdallah Muhammad **al-Idrisi** al-Qurtubi al-Hasani al-Sabti (1099-1166)
 - 1154 - Tabula Rogeriana world map
 - 3.5 x 1.5 m in silver



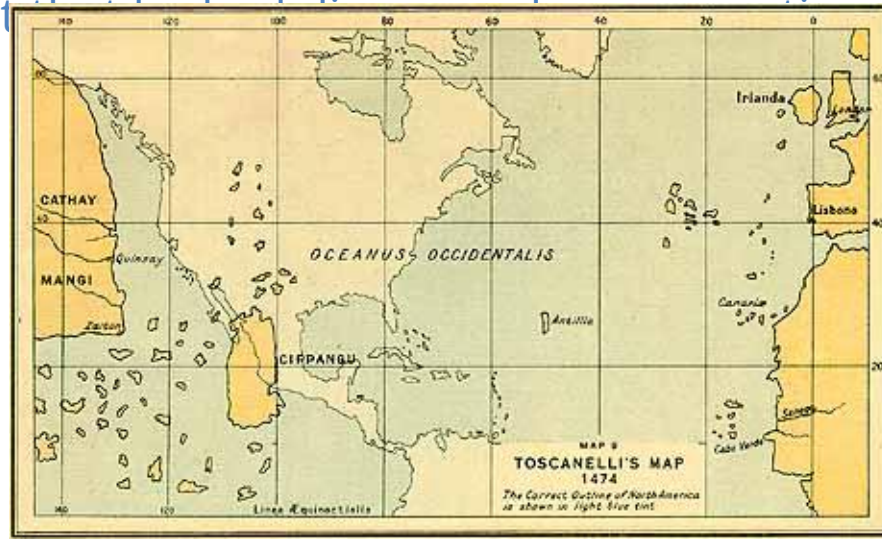
Renaissance of cartography (cca 1492-1650)

- the rediscovery of **Ptolemy's Geographiké Hyphégésis**
 - 1477, Bologna - first illustrated edition of Ptolemy's Cosmography - 26 copper maps
 - 1478 - Konrad Sweynheim - first printed edition of Geografiké Hyphégésis
- invention of the **printing press (Guttenberg)**
- **great geographical discoveries** (Columbus, Diaz, da Gamma, Magalheas, others)

THE BIGGEST MISTAKE OF ANTIQUITY

Paolo dal Pozzo Toscanelli (1397–1482)

- 1474 made a detailed chart for sailing to the Spice Islands (Moluccas) and Asia
- based on Ptolemy □ wrong dimensions of the Earth
- the map was used by Columbus on his westward voyage and because of it he never figured out



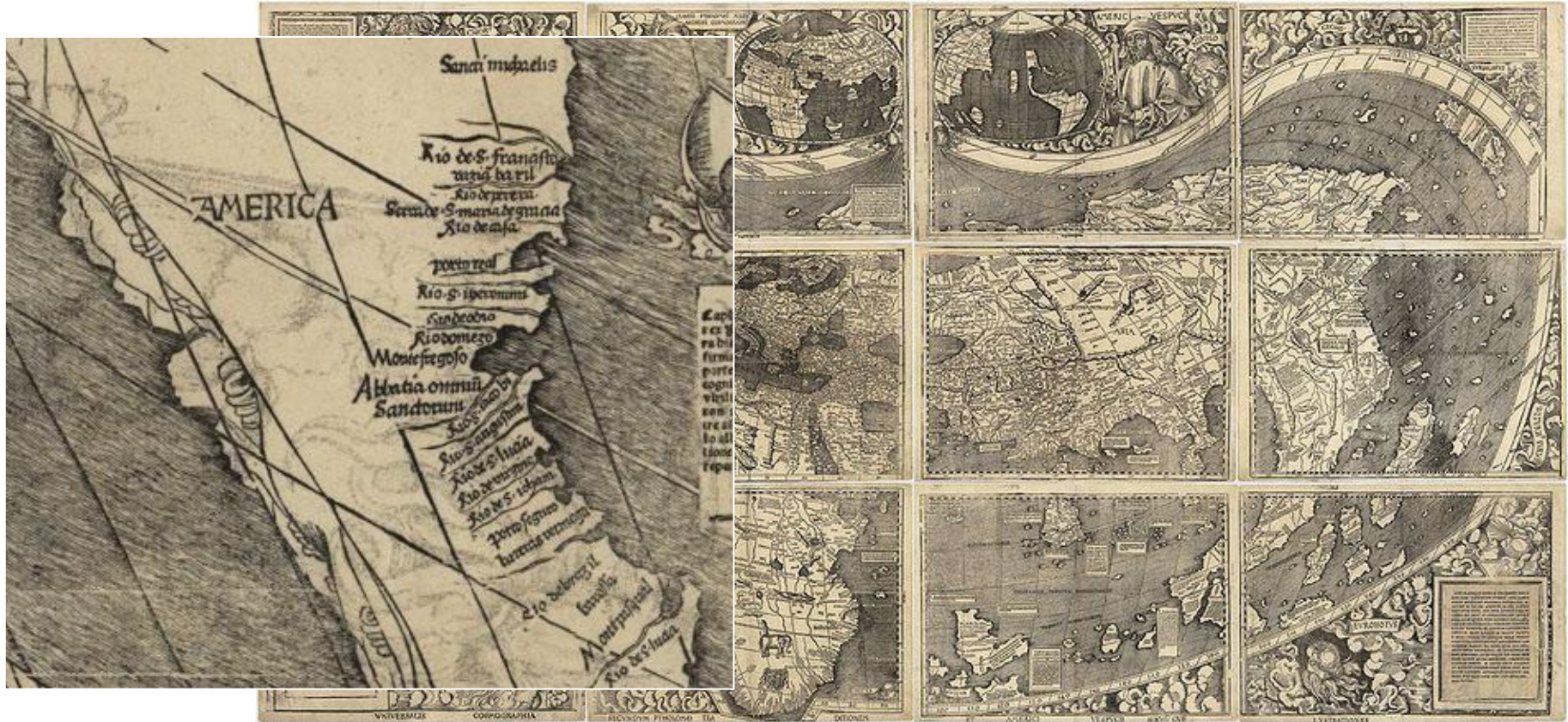
Martin Behaim (1459–1507) origin in Bohemia

- 1474 - pre-Columbian globe, 50 cm in diameter, preserved
- based on Ptolemy, Portuguese discoveries in Africa and Toscanelli's map



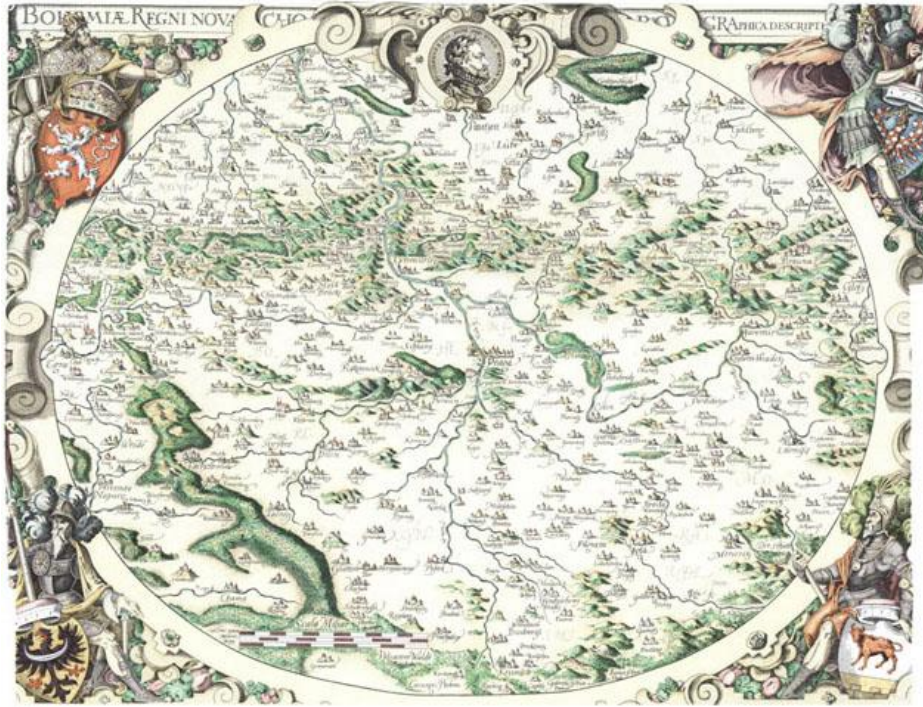
Martin Waldseemüller (1470-1520)

- was the first to use the name **America** in a map to refer to the New World
- **world map** (1507), 12 woodcuts + atlas + book describing Vespucci's travels



Chorographic maps (chorography = description of place)

- detailed maps of regions, kingdoms, historical lands
- included in atlases



1568

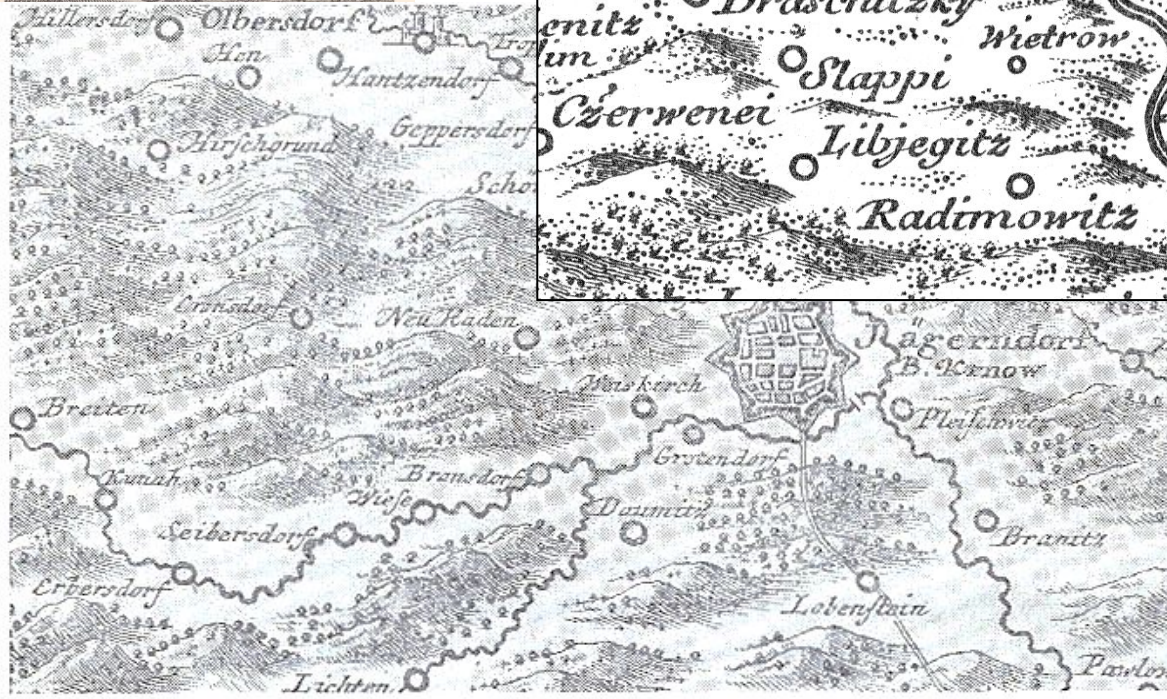


1569

Mapping (from the 18th century)

- very detailed, as accurate as possible
- military and taxes



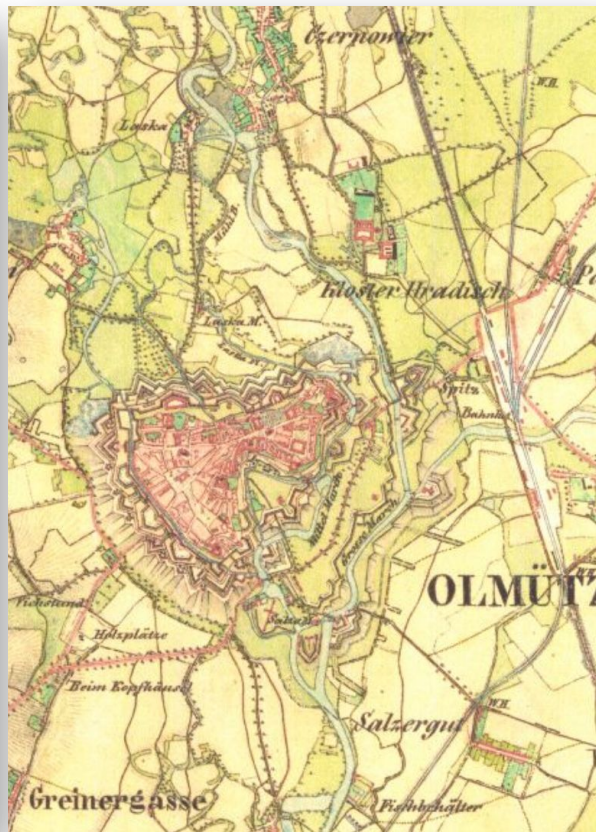




1764-68



1836-40



1870-83



THEMATIC MAPS

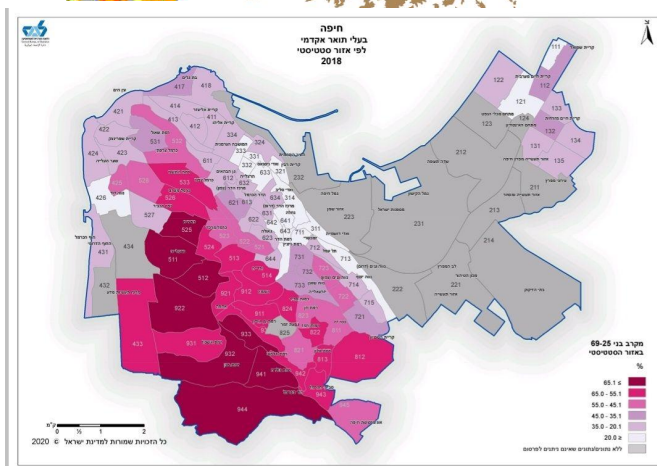
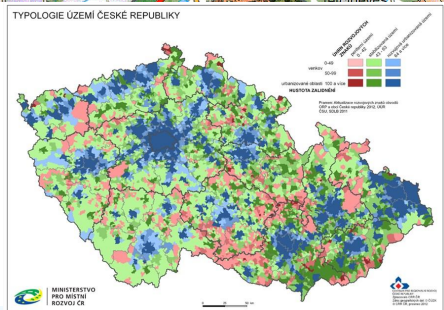
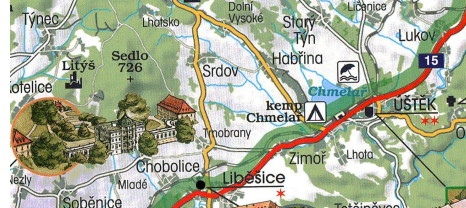
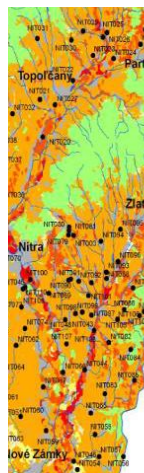
John Snow 1855

- cholera expansion in London

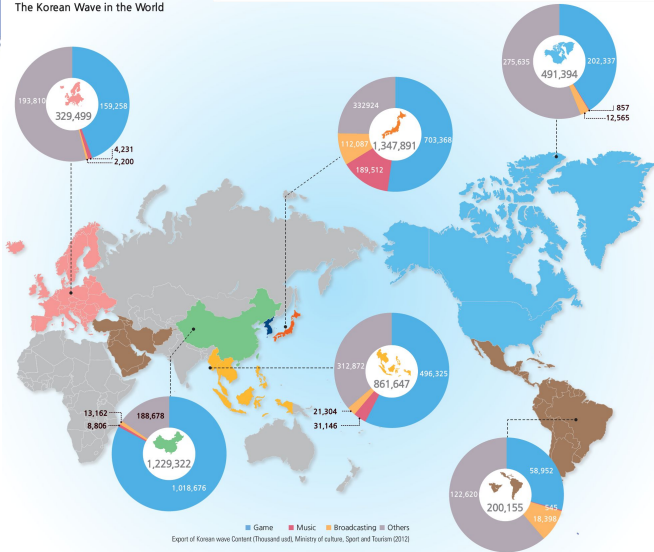


Billions of thematic maps

- military
- forestry
- geology
- transportation
- environment
- ecoomy
- demography
- urban planning
- police
- tourism
- cadastral
- education
- many others



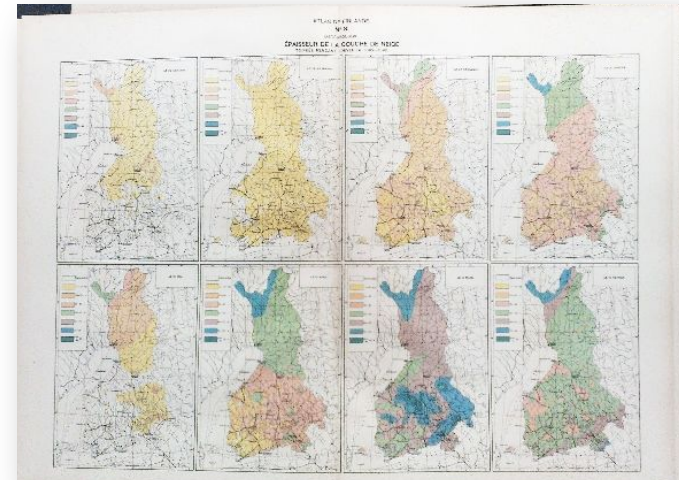
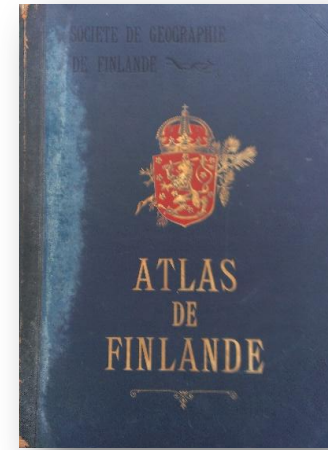
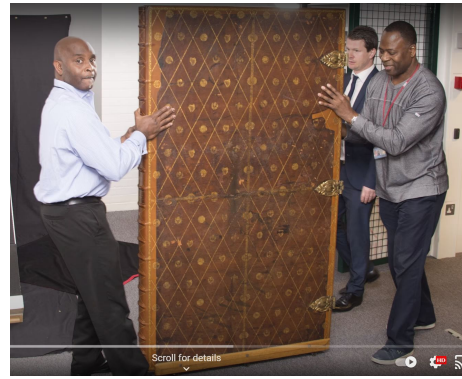
The Korean Wave in the World



Legend: Game (blue), Music (orange), Broadcasting (green), Others (red).
 Export of Korean wave Content (Thousand units), Ministry of Culture, Sports and Tourism 2013

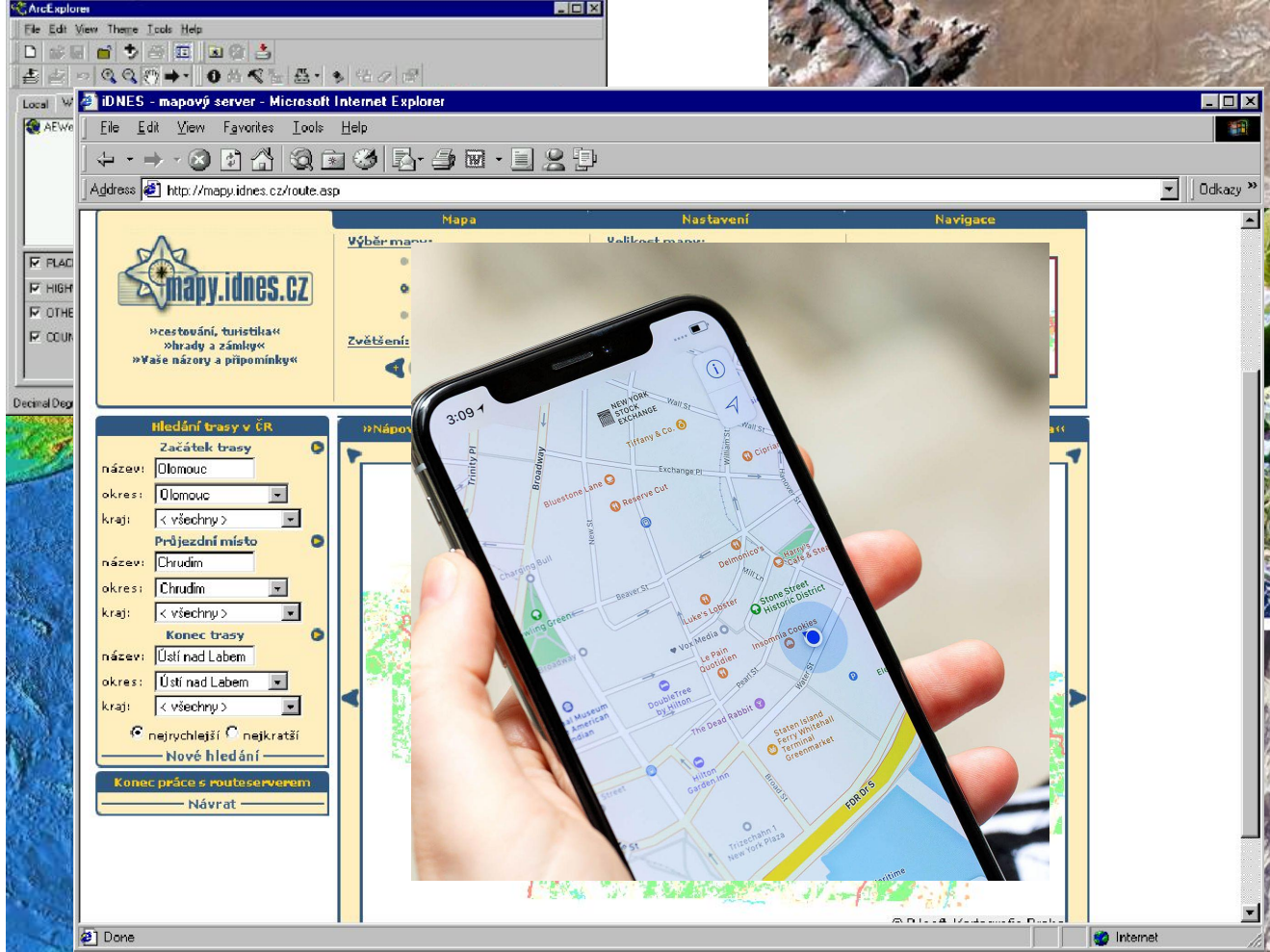
Atlases

- systematic approach in geovisualization
- theory of systems
- national, school, thematic



ICT

- from old desktop PCs to your mobile devices
- servers
- web
- satellites
- sensors
- dynamic
- interactive
- multimedia
- virtual reality
- 3D



Google Maps *(Street View, Voice Commands, ...)*

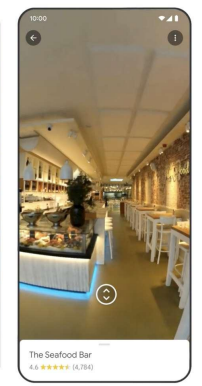
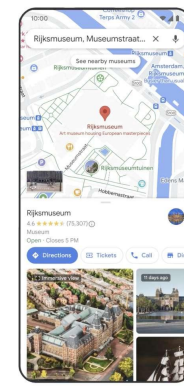
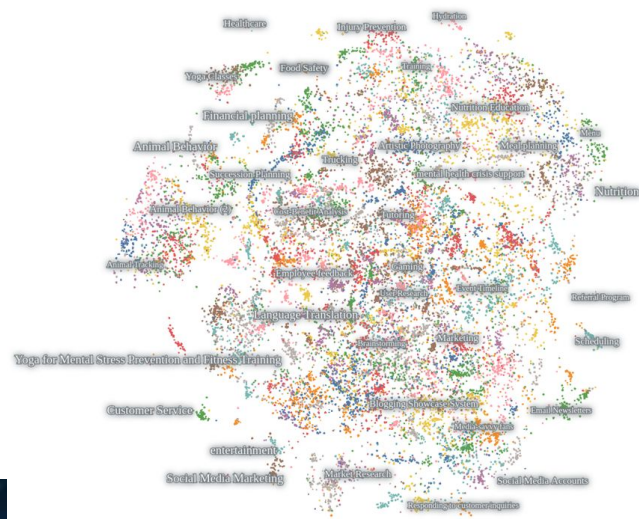
Feb 8, 2005

- 3D Imaging
- Color Codes/Icons
- Data Visualization
- Geocoding
- Geographic Maps
- Labeling
- Location Tracking



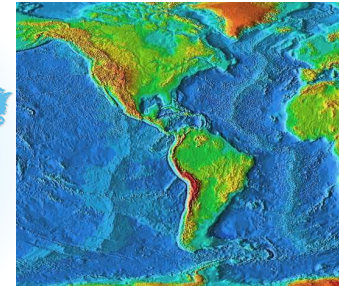
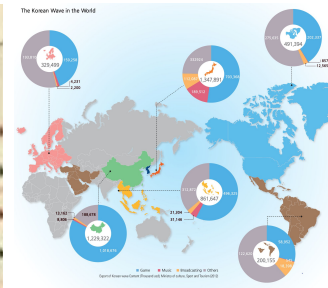
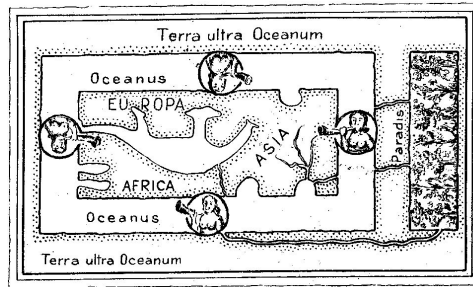
AI

Mapdreamer





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THANK YOU FOR YOUR ATTENTION



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