THE WORLD IMAGE IN MAPS
Earth presentation in maps from the Old Ages to Mercator

Ass. Prof. Dr. Mirjanka Lechthaler
Department of Geoinformation and Cartography
Vienna University of Technology
Gußhausstr. 30
A – 1040 Vienna

“... I still have to think through in order to lead the ship, exposed to the wind and sea currents, flawlessly to any point on the coast and the sea with precisely and daedal drawn maps ...”

Keywords: history of cartography, big inventions, topographic maps, cartographic visualization, maps as an artwork

Abstract
Studying the aborigines’ “dreamtime”-maps or 16th century engravings from Dutch cartographers, one can lose herself in their beauty. Casually, cartography is a kind of art. Visualization techniques, precision and compliance with reality are of main interest. The centuries of great expeditions led to today’s view and mapping of the world. This article gives an overview on milestones in the history of cartography, from the old ages to Mercator’s map collections. Each presented map is an artwork acting as a substitute for its era making us relive the circumstances at that time.

1 Introduction
Long before people were able to write, maps have been used to visualize reality or phantasy. Their content influences people in how they see the world. It might even evoke strong emotions like aspirations or fears. From studying maps we can draw conclusions on how visualized regions are experienced, imagined, or meant to be perceived. Often this is influenced by social and political objectives. Cartography is an essential instrument in mapping and therefore preserving cultural heritage.

Map contents are expressed by means of graphical language. From the beginnings of cartography until now, this language remained similar: clearly perceptible symbols represent real world objects, resulting in a map that is easy to read. Only techniques changed over the years – from cuneiform writing to modern digital techniques.

The article features brief and concise history of appearance and development of topographic representations from the old ages to Gerhard Mercator (1512 – 1594), and historical importance of the author's lifetime opus for the development of cartography.

Casually, cartography is a kind of art. Studying the aborigines’ “dreamtime”-maps (Fig. 1) or 16th century engravings from Dutch cartographers, one can lose herself in their beauty. Each presented map is an artwork acting as a substitute for its era making us relive the circumstances at that time.

2 A walk through the history of cartographic representations
Determination of coordinates of an arbitrary position anywhere on the surface of the Earth in an area of one meter accuracy was a utopia of many astronomers, geographers and cartographers for centuries. Activities such as, e.g. topographic survey of the Earth's surface, mapping gathered data and production of cartographic representations in analogous and digital form and defining the position by means of GPS belong to everyday life today. However, their cradle lies centuries backwards accompanied by lot of speculations, delusions and ingenious inventions.

2.1 From the Stone Age to Greek Antique
No traces are known, i.e. preserved from the ancient Stone Age that could be related to attempts of representing an area. Later graphic representations of imposing and life-important environment can be found engraved in caves, etched in wood, stone, bones, leather or horns (Fig. 2).

Figure 1: Aborigines’ “dreamtime”-map where the crocodile brought the fire to the Caledon Bay (Clark et al. 2005).

Figure 2: Geographic environment of the Eskimos carved or modeled in wood (Leithäuser 1958).
The oldest preserved old-Babylonian map of the world\textsuperscript{2} from the 6th century B.C. (Fig. 3) was carved into a clay plate. The world represented schematically as a circle, i.e. the Babylon Empire, is surrounded by an ocean.

\textit{Figure 3:} The whole world on an old-Babylonian clay plate, size of 10 cm (Leithäuser 1958).

Geography and Cartography became scientific disciplines in Greek Antique. Philosopher, astronomer and astrophysicist Anaximander of Miletus (611 – 546 B.C.) gives a representation of the position of land and sea known at that time in the first known map of the world (Fig. 4).

\textit{Figure 4:} Possible rendering of Anaximander's world map (Robinson 1968)\textsuperscript{3}.

\subsection*{2.1.1 Claudius Ptolemy}

Several centuries later, all-round scientist Eratosthenes of Alexandria (276 – 195 B.C.) introduces geography as a scientific discipline to scholarly circles, associating it closely with mathematics. He determined the circumference of the Earth using astronomic measurements. Measuring the distance from Alexandria to Aswan (Assuan) in an ingenious way, he reached

\textsuperscript{2} British Museum, London
\textsuperscript{3} The original of the world map is not preserving only author’s descriptions in his work Philosophical Cosmology (Leithäuser 1958).
a result which is very similar to the one known today. He believed that measuring only the length of a single degree (out of total 360 degrees in a sphere) would be sufficient.

Claudius Ptolemy (87 – 150), one of the greatest Antique scientists, presented in his lifetime work *Megale syntaxis* the Earth in the center of the planetary system, relying on the theory by Plato and Aristotle. *Ptolemy’s System* is going to be replaced by the heliocentric from Nicolaus Copernicus (1473 – 1543) in his work *De revolutionibus orbium celestium* in the 16th century. Furthermore, in his lifetime work *Geographia* (eight volumes), Ptolemy provides a list of all known settlements, their position in geographic coordinates as well as maps of various areas. Ptolemy’s *Geographia* had over fifty editions. At the beginning, those were manual copies. The first printed edition without maps was published in Venice in 1475 and the first printed editions with maps in Bologna in 1477. The prettiest version of Ptolemy’s *Geographia* was published in Ulm in 1482 (Fig. 5). Unfortunately, no originals of Ptolemy maps were preserved. Ptolemy and Marin of Tyre had the revolutionary idea of introducing a geographical grid into cartographic representations (around 100 A.D.), as well as the notion how important mapping adjusted to scale is.

Figure 5: First edition of Ptolemy's *Map of the World*, Ulm 1482 (Clark et al. 2005). There is no Cape of Good Hope in the map.

His *Map of the World* was the first attempt to project the surface of a sphere onto a plane – the mantle of a cone. The projection grid consisted of meridians which cut into the equator in equal segments and converge to the North Pole, while parallels as circles of varying circumferences have a mutual center in the same pole. By changing the direction of meridians on the southern hemisphere, the author attempted to represent the equator (Fig. 5). He drew three continents: Asia, Europe and Libya out of the best of his knowledge, within this grid, using auxiliary lines. Furthermore, the Indian Ocean, Mediterranean and Caspian Sea are also shown.

Ptolemy’s scientific works have affected cartographic activities authoritatively for centuries. On the one hand, it's no doubt that his understandings advanced cartography, however, his delusions inhibited its development. To the end of the Middle Ages, geographers and
cartographers took over his fatal error. Namely, in lack of knowledge and verification of mathematical sources and computing technique, the author didn't compute needed values himself and didn't use the correct value of the Earth's circumference given by Antique geographer and historian Eratosthenes, but employed measurement, i.e. computation results by the voyager, geographer and historian Strabo of Amaseia (60 – 20 B.C.). Ptolemy's degree was shorter by almost a third. By consequence, his world image is a third shorter in direction north-south, and the equator drawn too high. Due to incorrect length of the Mediterranean Sea (62 degrees instead of 42) and east stretching of Asia (50 degrees more than true value), there was not enough space left between European western and Asian eastern coast. This would later deceive Columbus (1451 – 1506) in his conclusions that he could reach Asia relatively quickly by sea, sailing in west direction from Europe.

2.2 Roman Antique Age
The mathematical background of the maps stagnated during the Roman period. Emperor Augustus was satisfied with approximate map geometry, but he was especially interested in a detailed survey of all objects, roads and paths of his empire. Marcus Vipsanius Agrippa (30 B.C. – 12 A.D.) was in charge of the survey and started producing the general map of the world Orbis terrarum, which encompassed the Mediterranean. Of all Roman maps only Tabula Peutingeriana (Fig. 6) was preserved.

![Figure 6: Section of the map Tabula Peutingeriana – Istria and the Adriatic Sea (Clark et al. 2005).](image)

The Viennese humanist Konrad Celtis (1459 – 1508) found it at end of 15th century in the library of a Benedictine abbey in Tegernsee and gave it as a gift to his colleague antiquary Konrad Peutinger (1465 – 1547) who collected old maps and manuscripts. After carefully considering this unique witness of the past, it was concluded that the map was produced around 250 (Leithäuser 1958) and that it was most likely a copy of a detailed road map of the Roman Empire from the first century. It was thought for a long time that Agrippa's large map of the world was the template. Unfortunately, it was lost. During that time, it undoubtedly influenced the development of Roman cartography and was indirectly a model for the
production of the map *Tabula Peutingeriana* (Leithäuser 1958). *Tabula Peutingeriana* consists of 11 maps, which are put together to form a strap. Therefore, the whole painted area is stretched in the direction west-east.

That map of the world is exceptionally important for geography and not so much for cartography, because its geometry of river, road network, settlements and most important mountain chains do not reflect reality. Its special value lies in 3,500 toponyms which describe the world of that time.

### 2.3 The Middle Ages

During the Middle Ages, cartographic issues were addressed in particular by the Arabs. Great deal of Antique knowledge was preserved in later centuries thanks to Islamic scientists who lived and worked from 9th to 12th century in Spain. For example, they directed Christian scientists to Aristotle's works. They calculated the circumference of the Earth in 9th century more precisely than Eratosthenes (276 – 195 B.C.). They required good maps, and produced quite a large number of them in order to expand the Arabian Empire and trade successfully.

The humanist, geographer and cartographer Abu Abdallah Mohammad al-Sharif al-Idrisi (1100 – 1172) contributed to the development of cartography with his works. His great work was a globe divided into segments with newest understandings of that time, engraved into a 400 kg heavy silver ball. All seven continents are represented, as well as a river and lake network, important settlements and trade routes (Clark et al 2005). Unfortunately, the globe wasn't preserved. However, its detailed description is featured in the work *Tabula Rogeriana*, whose collection also contains a world map (Fig.7). Application of circular parallels is a great novelty in cartography of that time. Some inaccuracies are unnecessary, such as placing larger islands into the Atlantic or representing Scandinavia as an island. He measured topographic information of object position, altitude and stretching by himself or took over from Spanish travelers or navigators. Ptolemy's (87 – 150) influence in his works is undoubtable. (In the 9th century Ptolemy's works were translated to Arabic).

![Figure 7: Al-Idrisi's world map from 1154 (the map is rotated 180 degrees to the north clockwise o.a.) (Clark et al. 2005).](image)

During that time in the west, primarily monks in monasteries dealt with cartography. This resulted in works of high artistic value, in order to reinforce and strengthen the Christian world image. In the so-called T-O sketch-maps (Fig. 8) dated from that period, the Mediterranean Sea and the rivers Don and Nile are represented in the form of letter *T*, which divided the known world at the time in three continents. As the largest one, Asia lies in the
north, Europe and Africa are west and east from $T$. The $O$ shape symbolizes the border of known space of the Earth enclosed by the ocean. Geographically and cartographically, works produced during this period do not possess great value.

Figure 8: World map from Sallust's manuscript from the 14th century (Leithäuser 1958).

2.4 Centuries of great discoveries and the development of cartography

The survival of Christian image of the world became doubtful under the influence of newly discovered lands and new natural-scientific understandings in the 15th and 16th century. Sailors believed the Earth has the shape of a ball.

2.4.1 Martin Behaim

After Castilian king Alfons the Tenth (1221 – 1284) wrote about how and which materials were needed to produce a globe, many scientists tried to model the known world in that form. They left the unexplored areas empty. Sailors often used globes for orientation in absence of good maritime charts. In 1475, Pope Sixto the Fourth entrusted Martin Behaim, a renowned cartographer and astronomer, to produce a globe-shaped model of the Earth. It has to be said that this errand was given fifty years after the navigator Ferdinand Magellan (1480 – 1521) traveled around the world at sea and found out the Earth was a ball rather than a plate. The so-called Behaim's Apple, i.e. a globe of the Earth (Fig. 9), features the then-known inhabited world – Eurasia, which, he thought, stretches over 234 longitudinal degrees. The real value is only 131 degrees. This error, caused by the Ptolemy's (87 – 150) influence, would later deceive Columbus (1451 – 1506), who died believing he discovered a nautical way to eastern Asia.

But let's get back to Martin Behaim. The author, a sailor himself, gathered his information by sailing a third of the world known at the time. He acquired all other content he needed for representing the Earth by means of a globe by inspecting books of various geographers and scientists, such as Ptolemy as well as Venetian world traveler and writer Marco Polo (1254 – 1324). To represent unknown areas, Behaim didn't use empty surfaces or write “unexplored area” like other globe manufacturers. He filled those areas with emblems and characters from fairy tales, stories and legends. Circumference of the globe at the equator is 159.5 cm,
diameter 50.7 cm, and scale 1: 25.2 mil. The poles are connected with a metal bar which is a sign that people of that time thought the Earth rotated around its axis.

![Behaim's Apple, globe from 1492 (Muris et al. 1961).](image)

Behaim's Globe is a unique and surpassingly valuable historical and cultural document, the oldest document representing the Earth as a globe and also the last one which was produced before America was discovered.

### 2.4.2 Portolan Charts

Late 14th century, 15th and 16th centuries are the time of great discoveries. Sailors, surveyors and scientists (astronomers, geographers, cartographers, humanists) sail and investigate the unknown areas exposing themselves and their crew to unbelievable strains, wishing to explore newly discovered parts of the world, bring back exotic objects and do not earn much money by filling in “white” areas on existing, so-called Portolan charts. They were used alongside compasses (which were known already in 12th century) and written navigation descriptions. Grid of compass directions was first drawn on a sheep or goat skin. Capes and bays, especially important objects for navigation, are disproportionally large in relation to the coastline. Names are positioned clockwise on the land perpendicularly to the coastline. Geometry resulted from measuring lengths and directions obtained from astronomic observations. The map was decorated with emblems, compass roses and stylized paintings of known cities (Fig. 10).

### 2.4.3 Christopher Columbus

The Spanish and the Portuguese shared and continued to conquer the world of that time. They were very interested in itineraries, records, surveys and especially in maps. Christopher Columbus (1451 – 1506), an eminent sailor who discovered America, and his brother Bartholomew Columbus (1460 – 1514), also a sailor and cartographer, employed their own

---

4 Behaim's Globe of the Earth is kept at German Museum, Nuremberg (Nürnberg).
measurements for their maps, but also discoveries, itineraries, reports and fantasies of other sailors, for example Marco Polo (1254 – 1324) about unheard and unseen valuables of Asia and China (silver, gold, precious stones, temples, palaces,...).

*Figure 10: Fragment of the Portolan chart by Mateo Prunes from 1559 (Clark et al. 2005).*

*Figure 11: Map of the world from 1489 by Henricus Martellus Germanus. Ptolemy's influence is obvious, but there is also Diaz's discovery of the Cape of Good Hope (Leithäuser 1958).*
In 1487 – 1488 Bartolomeo Diaz (1450 – 1500), a Portuguese sailor, was the first who sailed the south of the African continent – The Cape of Good Hope. Those discoveries enabled to include new geographical content in the maps but still refuting the theory and authority of Ptolemy (87 – 150) (Fig. 11).

Back to the Columbus brothers. In August 1492, Columbus set sails with his Spanish fleet west to the Atlantic, seeking a nautical way to magically described India. In the same year, he discovered a land in the far west – the Bahamas (Fig. 12).

Debarking, he thought that it was just an island in front of the Indian coast. Thus Columbus was the first Spaniard who stepped on American soil.

He set sails for the third time in 1498. He sailed around the Caribbean Islands and followed the eastern coast of South America. Figure 12 shows a sketch of the Atlantic and the middle of south-American coast, which was most probably produced by his brother Bartholomew. Seduced by what he saw and experienced, the religious Columbus thought he discovered the heaven. That way he wanted to refute his thesis that the world was shaped like a ball, convinced it was shaped like a pear or woman's breasts.

2.4.4 Quarta orbis pars
Vasco da Gama (1469 – 1524), a Portuguese sailor and captain, discovered a nautical way to India in 1497 – 1498 by sailing around the Cape of Good Hope. He discovered and explored the last part of the route to India's spices. With this discovery the colonial empire of Portugal in Asia and its nautical supremacy in the western part of the Indian Ocean started. Soon afterwards, Spanish conquistadors sailed to the west in order to conquest explored areas, (which were first investigated by Columbus).

When the Italian sailor Amerigo Vespucci (1451 – 1512) returned from the west in 1504, he wrote that Columbo's discovery wasn't related to India and Asia, already known continents, but to a new continent.

In 1507, cartographer Martin Waldseemüller published in his work *Cosmographiae Universalis Introductio* a map of the world and a map which was used for production of a globe (Fig. 13). Presenting the fourth continent, he named it *America sive Americi terra*. Therewith he celebrated Vespucci's discovery.

That image of the world didn't stick around for a long time. The beginning of the 16th century brought great contradictions which also affected maps. Vespucci's image of the world was again overshadowed by Ptolemy's influence. Thus America was not a new continent anymore.
but only *Terra Nova* – a newly discovered part of Asia (Fig. 14). The image of the world was changed when the Pacific was discovered.

*Figure 13:* Globe-map of the world by Martin Waldseemüller from 1507, where for the fist time America was drawn (Leithäuser 1958).

*Figure 14:* *Map of the World* by Hieronymus Marini from 1512. *India Nova* and *Brazil* represent the already discovered America (Leithäuser 1958).
This was contributed to by discoveries of the Portuguese sailor Ferdinand Magellan (1480 – 1521), who sailed under the Spanish crown (Emperor Karl the Fifth). Rivalry between Spain and Portugal for power over the island in the Indian Ocean, especially the spice archipelago in Indonesia, accelerated the completion of the world image. Sailing to the west with a relatively small fleet in 1519 – 1521, Magellan sailed around South America, arrived in the sea belt of the Pacific and reached the islands he sought. In 1522, remaining members of his battered crew sailed further to the west across the Indian Ocean, around the Cape of Good Hope and, completely exhausted, arrived in Seville without any strength left, proving that „beyond the horizon“ there is another new ocean not included in the maps, and that the Earth was round. He also proved that Terra Nova, Terra Incognita or Brasil wasn’t a part of Asia, but indeed a new continent, America. This gave true meaning to Columbus’s discovery (1492).

The next year, 1523, Johannes Schöner, a professor of mathematic at the university of Nuremberg engraved a map into copper for the world globe (Fig. 15), in which he drew Magellan's route. His Map of the World represents the turning point in the history of cartography. The map features the whole world known at that time, and the eastern Indian archipelago drawn on left and right sides of the map. A full line gave America the shape of a continent, and the size of the Pacific became evident.

Thus in a brief period, in only a few years, the world doubled in size and lost its old borders. The need for correct and detailed survey grew by day. Cartography was disentangled from the model of Ptolemy, whose theory and cartographic representations of the world deceived cartographers for centuries. Captains requested more complete and accurate maps for their journeys, surveyors requested new and more efficient measuring instruments. During this period, a young scientist, humanist, astronomer and cartographer appeared, desiring knowledge and full of new ideas which revolutionized cartography as science.

\[Figure 15: \text{Globe-map of the world by Johannes Schöner from 1523 with drawn route and parts of the world newly-discovered by Ferdinand Magellan (Leithäuser 1958).}\]

### 3 Gerhard Mercator – ingenious cartographer

„If one takes a globe made out of transparent or parchment paper and places a lit candle in its center, as well as a transparent upright cylinder about it, the world is going to be mapped to the cylinder's mantle in such a way that distances between parallels are going to be enlarged
approaching the poles, and therefore parts of the world get stretched. This is what I need! A cylindrical conformal projection!“\(^5\)

Gerhard Mercator, actually Gerhard Kremer, was born in the small town Rupelmonde in Belgium in 1512. With just 18 years he enrolled the famous and large University of Löwen, where he gained extraordinary education in mathematics from professor Reiner Gemma, known as Gemma Frisius (1508 – 1555). With 20, he became a master of philosophy. He quickly changed his profession, wanted to work on map production, globe construction and astronomic instruments for surveying the Earth. At the beginning, he was tutored by Gemma Frisius, who was a globe constructor himself and had great experience in constructing map geometry. In his work *Cosmography* in 1544, Gemma Frisius was the first who described the triangulation method in surveying and geographic position determination (Leithäuser 1958). As an extraordinary student, Mercator soon surpassed his teacher and continued working independently and relentlessly as cartographer, using his great knowledge of mathematics, cartographer drawer and copper-engraver, penman, publisher, printer of his maps, constructor of his own globes of the Earth and the celestial sphere and as a precise machinist in production of measuring instruments. His lifetime opus and deserved fame of a great cartography reformer resulted from the combination of practical experience and ingenious mathematical talent.

### 3.1 Lifetime opus of Gerhard Mercator

Mercator spent his whole time and worked in his workshop in Löwen until 1552. He didn't join sailors in order to gain information about surveys of areas they sailed through, but often traveled to capital Antwerp, where he met famous people and exchanged his work for needed geographic information, which he conveyed into maps. Antwerp was a well-organized large harbor which accepted 2500 ships weekly, as well as thousands of wagons loaded with goods for sell, and which was crowded with people of various nationalities. Antwerp was a city of books. There, the famous book and map trader Christophe Plantin (1514 – 1589) possessed the largest printing shop in Northern Europe with 16 printing presses and 55 employees. His trading records which were found in the 17th century witness the printing of Mercator's works and that hundreds of maps were taken to be sold.

In 1538, under the influence of Frisius's school and his work *Cosmography*, Mercator published his first *Map of the World* in a very complex “heartlike projection“ (Fig. 16). The map represents the whole world divided into two heartlike representations by the equator. The representation and name of South and North America is historically important. The area of South Pole contains annotation text, that there are certainly many lands in that area, but it is not sure which and where their borders are.

Shortly after, he published in Antwerp a book about writing titled *Lettering Booklet* which revolutionized cartographic lettering, suggesting instead of so called fractured lettering very fine, small and legible italic lettering, which takes less space on maps.

In 1541, knowing that sailors required good maps for sailing rather than good globes as before, prompted by Emperor Karl the Fifth's offer, he accepted it and constructed the largest globe thus far, with a diameter of 41 cm, its 12 segments and 2 polar spherical caps engraved in copper and printed by himself with unprecedented precision (Figure 17). The circumference at equator was 130 cm, which matches the 1:30 mil. scale\(^6\). The geographic grid was done especially precisely. Mercator's globes differ from all previous because they

\(^5\) Mercator's quote from Vermeulen (2006, page 214)

\(^6\) A few of original Mercator's globes can be found at the National Library in Vienna.
represent rhumb lines\textsuperscript{7}. Since then, Mercator had a vision that lines of geographic grid as well as rhumb lines can be mapped like straight lines on a map plane.

\textit{Figure 16: Map of the World} from 1538 by Gerhard Mercator (Leithäuser 1958).

\textit{Figure 17: Globe of the Earth} from 1541 by Gerhard Mercator (Leithäuser 1958).

Shortly after, Mercator produced a globe of celestial sphere. Trading books of publisher Plantin witness that the author produced globes in pairs and gave him 24 to sell.

\textsuperscript{7} Rhumb lines are lines on a ball (in this case on a globe) which cut into all meridians under the same angle, which was and is extremely important for navigation.
In 1554 he published his first *Map of Europe*, the first ever to deserve that name. He had been working on it since 1538, precisely drawing positions of cities according to his calculations, carefully correcting incorrect city positions according to Ptolemy, which were still present on maps.

In 1569, he finished working on his great *Map of the World* — *ad usum navigantium* (Fig. 18), which started another new period in cartography, the period of mathematically correct set, so called *Mercator's projection*, which formed the foundations of modern cartography.

![Figure 18: Map of the World by Gerhard Mercator from 1569 produced in normal aspect cylindrical conformal projection – Mercator's projection (Leithäuser 1958).](image)

That map projection finally enabled sailors to determine and maintain desired direction. Mercator's cylindrical conformal projection is represented by a grid of meridians and parallels which intersect under the angle of 90°. Distance between the parallels gets larger the closer they are to the poles. Therefore the represented area becomes more and more deformed. The poles can't be mapped. This projection was the first one could use to connect two points on the surface of the Earth represented on a map by a straight line – rhumb line. A rhumb line cuts into all meridians under the same angle. It is not difficult to imagine what kind of help that was in navigation. Even today, maritime and navigation charts of all kinds are produced in that projection. But almost a hundred years had to pass until Mercator's projection gained required credibility.

In the *Map of the World*, with great verification, detail and precision, Mercator inserted the newest continent border geometry, i.e. coasts of seas and oceans. For its production, he employed all his past works, for example his and not Ptolemy's geometry of the *Map of Europe*, and therefore the Mediterranean. He also included a huge, imaginary south continent *Continents australis*. The map is 1.31 x 2.08 m in size and consists of 18 relatively large sheets, an unpractical format for sailors. An unknown sailor prepared three Mercator's maps reducing them to 29 sheets for his route. This opened the way for the first printed maritime atlas in shape of a book.
Many cartographers adopted the idea. The first among them was Abraham Oertel (1527 – 1598), Mercator's friend. His published atlas *Theatrum Orbis Terrarum* comprised 70 maps on 53 sheets (Fig. 19). This work was supplemented even after the author's death.

![Map of the World 1570 by Abraham Oertel](image)

*Figure 19: Map of the World 1570 by Abraham Oertel from his atlas *Theatrum Orbis Terrarum* (Clark et al. 2005).*

During that time, when Oertel's atlas gained one recognition after another, Mercator worked relentlessly and in detail on his idea for years. Mercator did not only wish to be a geographer, but also a cosmographer, he wanted not only to draw the surface of the Earth, but to describe the whole world – the sky and the Earth, their present state and their origin in order to understand God's power. Natural sciences and the Bible complement each other. He wanted to realize his lifetime idea, his *Opus magnum* in five parts.

In the first one, he wanted to represent the creation of the world, in the second to describe the celestial sphere, in the third a representation of all countries and seas, in the fourth to represent the political history, and in the final to give a conclusive representation from the beginning of the world to his days. For the whole work, he chose the name of the mythological Maori king Atlas, who was interested in astronomy and allegedly produced the first celestial sphere globe (Leithäuser 1958). In reality, however, regardless of the model, the term “atlas” as a collection of maps has its true source in Mercator's lifetime work (Lechthaler et al. 2006). He worked on his atlas without pause from 1568 to his death on December 2, 1594. Unfortunately, his *Opus magnum* with 123 books wasn't completed.

Mercator controlled all astronomic calculations, determined geographic coordinates and distances between individual points, gathered newest geographic reports and transferred that data into his projection of “increasing widths“. In 1585, he finally published 51 maps of western and middle Europe (France, Belgium and Germany), which belong to the third part of his lifetime work *Tabulae*. Four years later, he published the second part of “Tabulae“ with 24
maps of Italy and Greece. He engraved a total of 102 new maps in copper, all in the same format, and all with newest geographical data. In 1590, weak from a heart attack, he couldn't work on maps any more, being paralyzed.

In 1595, his son Rumold published the complete work – Mercator's atlas with tied maps in form of a book (Fig. 20), titled *Atlas sive Cosmographicae Meditationes de Fabrica Mundi et Fabricati Figura* (Atlas or Cosmographic Contemplations about the Creation of the World and the Form of Created o.a.) (Fig. 21 and 22). Rumold stated that this was the title Mercator chose. He added a genealogic table and a picture of god Atlas at the beginning (Lechthaler et al. 2006), who carries the entire celestial sphere on his back.

*Figure 20:* Mercator's atlas *Atlas sive Cosmographicae Meditationes de Fabrica Mundi et Fabricati Figura* from 1595 (1).

*Figure 21:* Map of the world – *Orbis terrae compendiosa descriptio quam ex magna universali Gerardi Mercatoris...* produced and published by Mercator's son Rumold in 1587. (Clark et al. 2005) The map was engraved in copper and colored by hand. It was included into Mercator's *Atlas* posthumously in 1595.
3.2 Mercator the greatest, cartographer
Various reasons, foremost slow publishing and then Mercator's projection itself, which wasn't accepted at first, caused that the Atlas didn't immediately gain the success it deserved. Neither Mercator himself nor his son Rumold got recognition during their lives or learn the extraordinary work became famous and influencing the entire development of new cartography.
From 1595 to the present day, 31 editions of Atlas Gerardi Mercatoris have been published, translated to five languages, as well as the so called Atlas minor in a smaller format, which stayed at universities.
Undoubtedly, Gerhard Mercator was, alongside Marinus of Tyre and Claudius Ptolemy one of the greatest cartographers of all times (Mesenburg 2004), a cartographer who was more than a map drawer. Mercator was a teacher of the humankind and was the first who showed us by means of his globes and atlases that the endless world could be so small!!

4 Concluding thoughts
Maps combine yesterday’s, today’s, and tomorrow’s view on our world, other planets, and the whole universe – from the perspective of humans, sciences, and arts. The history of mapmaking, i.e. cartography, resembles the history of mankind. Long before people were able to write, maps have been used to visualize human reality or phantasm. The centuries of great expeditions led to today’s view and mapping of the world. One of the greatest cartographers of all times was undoubtedly Gerhard Mercator. His extraordinary live-work became famous and influenced the entire development of new cartography.
Casually, cartography is a kind of art. Each presented map is an artwork acting as a substitute for its era making us relive the circumstances at that time.
5 References