Supplemental Content
Major Cartographic Advances that Impact Mapping of Human Anatomy

- The oldest known map is a Babylonian clay tablet dated ~ 230 B.C. used for taxation. (Fig.1) [https://www.ancient.eu/image/526/babylonian-map-of-the-world/](https://www.ancient.eu/image/526/babylonian-map-of-the-world/)


- In Ancient Greece, talk of a spherical world predated Aristotle but was lost for centuries. [https://www.britannica.com/science/map/The-Middle-Ages](https://www.britannica.com/science/map/The-Middle-Ages)

- Figure, Supplemental Digital Content 3A:

![Fragment of a crude ancient Chinese map](https://en.wikipedia.org/wiki/Cartography_of_China)

This fragment of a crude ancient Chinese map found in Tomb 5 of Fangmatan dates to the early 2nd century and displays features such as mountains, rivers, and roads. Importance: This map depicts geographical landmarks along with manmade characteristics in one map. [https://en.wikipedia.org/wiki/Cartography_of_China](https://en.wikipedia.org/wiki/Cartography_of_China)
Using Greek and Roman knowledge, Claudius Ptolemaeus’ world map depicted lands from 60N to 30S latitudes. (Fig. 2)  
https://www.academia.edu/30795682/History_of_maps_and_cartography_Brief_History_of_Maps_and_Cartography

Cartography flourished within the Arabic speaking world and was drawn towards nautical trade and the Mediterraneanean.  
https://www.academia.edu/30795682/History_of_maps_and_cartography_Brief_History_of_Maps_and_Cartography

In the 12th century, the North Atlantic was added to maps through the documentation of Viking knowledge.  
https://www.academia.edu/30795682/History_of_maps_and_cartography_Brief_History_of_Maps_and_Cartography

During the Medieval Period, European maps devolved due to religious beliefs, represented in the Orbis Terrarium. (Fig. 3) https://www.gislounge.com/mapping-through-the-ages/

In the 15th century, religious dominance faded, and maps were translated from Greek “Chártes” to more accessible Latin “Mappa.” https://www.britannica.com/science/map/The-Middle-Ages

In the 15th and 16th centuries, maps began detailing rivers, lakes, and mountains.  
https://www.britannica.com/science/map/The-Middle-Ages

Luo Hongxian published the Guang Yu Tu in 1579, an atlas including maps, grid systems, and a way to systematically represent major geographical features.  

Mass reproduction expanded with the invention of the printing press in the 15th century.  
https://www.britannica.com/science/map/The-Middle-Ages

During the 15th century, Columbus’ journeys of the “new world” were included in maps and spherical representations.  
https://www.bl.uk/picturing-places/articles/maps-of-the-15th-century

Martin Waldseemüller is credited to being one of the first cartographers to add north and south America's eastern coast.  
https://www.britannica.com/science/map/The-Middle-Ages

Answering the need for a standardized map including the “new world,” Sebastian Munster’s Cosmographia became the new cartography standard. (Fig. 4)  
https://www.britannica.com/science/map/18th-century-to-the-present
Cartographer Gerardus Mercator integrated mathematics into mapmaking and included the eastern and western hemispheres circumferentially, improving geographic accuracy. “Typus Orbis Universalis”, from 1540, incorporated “New World” discoveries and helped usher in a wave of exploration. Importance: Scientific mapping strategies must be adaptable to refinement of knowledge and new discoveries, to help guide further investigation.

Throughout the 18th century, exploration and advancements in mathematics improved mapmaking until it reached its peak in the analog era. An example is the Kangxi Emperor’s sponsorship of a national mapping program in China. “Sichan yu tu,” one of the many maps from Huang Yu Quan Lan Tu that precisely and accurately displays one of the many regions within China. Importance: This map shows the peak of the predigital era, and the preciseness these maps reached. [Accessed October 10, 2020](https://www.loc.gov/resource/g7821fm.gct00232/?st=gallery) and [https://en.wikipedia.org/wiki/Cartography_of_China](https://en.wikipedia.org/wiki/Cartography_of_China)

With World War II, countries launched mapping surveys using aerial photography to gain geographical insights into the surrounding areas, further refining cartographic data. [https://www.academia.edu/30795682/History_of_maps_and_cartography_Brief_History_of_Maps_and_Cartography](https://www.academia.edu/30795682/History_of_maps_and_cartography_Brief_History_of_Maps_and_Cartography)
Pierre Ancelin created “isobath” mapping, using lines to represent depths below a specific level, used for the Dutch river Maas in 1697. [https://www.tandfonline.com/doi/full/10.1080/17445647.2019.1582439]

In 1774, Mathematician Charles Hutton used Ancelin’s lines to map elevations above baseline. [https://www.greenbelly.co/pages/contour-lines]

Modern, refined concentric lines identify and map 3D ideas onto 2D dimensions, creating contour mapping. (Fig. 5) [https://www.esri.com/news/arcnews/fall09articles/125-years.html][https://www.geospatialworld.net/blogs/overview-of-gis-history/]

Topographic maps use contour mapping, with addition to man-made structures.

In 1884, John Wesley Powell convinced the U.S. Congress to document the continental United States, popularizing Topographic Mapping. (Fig. 6) [https://www.geospatialworld.net/blogs/overview-of-gis-history/]

Figure, Supplemental Digital Content 3D:

Recently, more precise digitalized maps have been made that are more accurate and available. Science Explorer Map overlooking Chicago. User-friendly maps allow smartphone users to easily navigate complex environments with several options to visualize nearby locations. Importance: Layers of information are applied in a standardized way to a complex surface, simplifying seemingly complex situations and permitting quantifiable and manageable tasks. [https://www.usgs.gov/search-map?search=satellite] Accessed June 15, 2020.
• From the 1960s through 1980, a geographer worked with the Canadian government to develop GIS, a system that stores geographical information. It is continuously being updated by the GPS, via a space-based satellite. https://nobelsystemsblog.com/facts-between-gis-gps/

• In 2005, GPS became more intricate with digital mobile mapping, which integrated information from the earth’s surface and satellite feeds. (Fig. 7) https://nobelsystemsblog.com/facts-between-gis-gps/

• The future of mapping is led by the concept of living maps, which shows real-time changes within the digital map. (Fig. 8) https://geoawesomeness.com/the-future-of-mapping-is-living-maps/