

CHAPTER
19
Section 1

SCIENCE & TECHNOLOGY *A Revolution in Cartography*

Better ships and more accurate instruments enabled explorers to sail all over the world. Advances in mapmaking were needed to keep up with the flow of new information about the locations of faraway places.

Two developments in Europe during the 15th century led to significant advances in cartography, the science of making maps. First, *Geography*, a book written by the Greco-Egyptian astronomer Claudius Ptolemy around A.D. 150, was translated into Latin so that it could be read by scholars. This eight-volume work included maps and the latitude and longitude of approximately 8,000 places in the world. Ptolemy also provided instructions for making various types of maps, or projections.

Second, the invention of the printing press in the mid-15th century also contributed to progress in cartography. Previously, if an explorer needed a map, it had to be slowly copied by hand. Now, the printing press enabled many identical copies to be made quickly. The first printing plates were made of wood. Soon, maps were etched on copper plates that allow lines to be drawn more accurately.

By the end of the 1400s, most educated Europeans understood that the world was round. The first globe, made by a German navigator named Martin Behaim, appeared in 1492. However, cartographers still wrestled with the problem of how to accurately draw a globe on a flat piece of paper.

As exploration increased European knowledge of geography, navigation charts for sailors began covering huge areas of the globe. Larger charts meant that maps became more distorted when trying to account for the curved surface of the earth. Lines of latitude were rounded, making it difficult for sailors to draw straight-line compass courses.

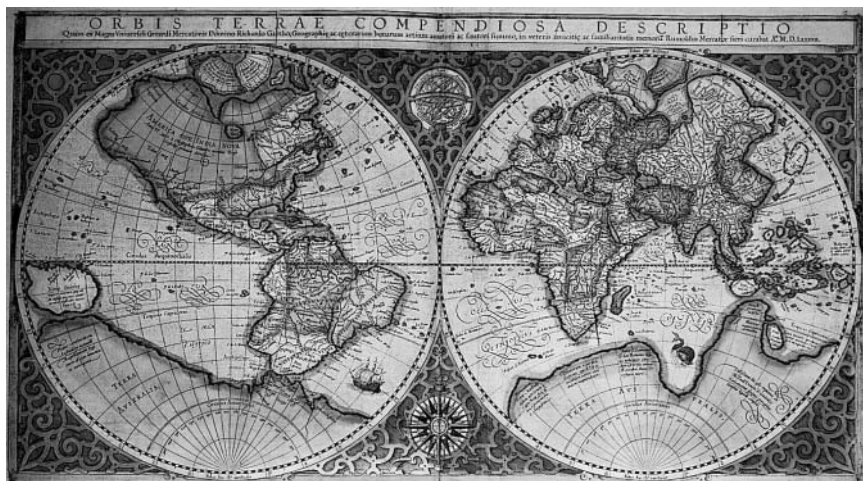
A revolutionary breakthrough in mapmaking occurred in 1569. A Flemish cartographer named Gerardus Mercator invented a way to draw an accurate flat map. The technique involved drawing a map as if it had been projected onto a cylinder, or tube. Unrolling the cylinder

produced a map on which lines of latitude and longitude were next to each other. This allowed compass courses to be plotted in straight lines with far more accuracy than had been possible before.

While Mercator's map significantly improved navigation, it included some problems. Lines of latitude became farther apart toward the northern and southern areas of the map. This flaw distorts the proportions of the world. It makes lands near the poles (Greenland) appear too large and areas near the equator (India) too small. Nevertheless, Mercator's invention has been the standard projection for world maps for over 400 years.

Questions

- Determining Main Ideas** What two major developments sparked significant advances in mapmaking in the 15th and 16th centuries?
- Drawing Conclusions** Why would curved or rounded lines of latitude make it difficult for sailors to accurately draw straight-line compass courses on maps?
- Making Inferences** Why do you think the printing press could have such a huge impact on mapmaking and exploration?



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Pictured above is a map made by Mercator. Notice how disproportionately large Antarctica is while India appears to be a tiny country.