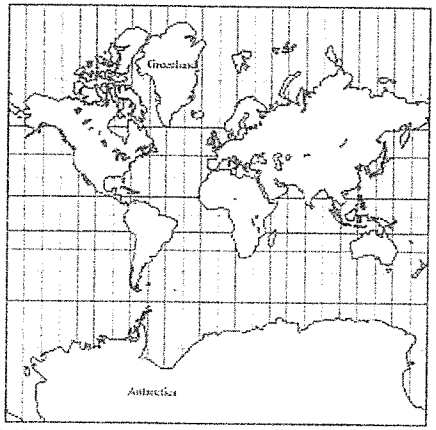
different forms: the shapes of areas, the distances between places, the relative size of different areas, or the direction from one place to another. A correction for one usually results in a distortion of another. For example, if the cartographer concentrates on getting the shapes right, often the distances between the shapes become inaccurate. As a result, the best map **projection** (method of transferring locations on earth's surface to a flat map) depends on how you are using the map.
Three common map projections are:

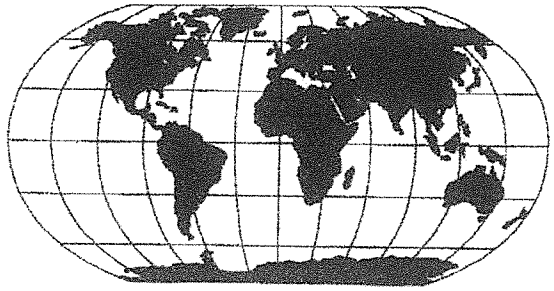
1. **The Mercator projection** was invented by Flemish cartographer Gerardus Mercator in 1569 for a specific purpose – navigating ships across the Atlantic Ocean between Europe and the Americas. Mercator designed parallels and meridians to cross one another at right angles, just as they do on the globe. As a result, the direction is true everywhere on his map, a very important fact for anyone traveling east to west, or vice versa, on the Atlantic. The Mercator map was designed as an aid to navigators since straight lines on the Mercator projection are loxodromes or rhumb lines – representing lines of constant compass bearing – perfect for "true" direction. If a navigator wishes to sail from Spain to the West Indies, all they have to do is draw a line between the two points and the navigator knows which compass direction to continually sail to reach their destination. However, the Mercator projection distorts size of areas, particularly as you get closer to the North and South Poles. Why? Imagine trying to place a whole orange peel on a flat piece of paper. The middle of the peel (the equator) would stay relative intact, but the ends would have to be stretched or cut to make them lie flat. As a result, Antarctica in the south and Greenland in the north look huge on a Mercator projection. Since 16th century European explorers were generally headed east or west in the middle latitudes, this gross distortion of size in the north and south made little difference to them.



The Mercator Projection: Notice how large Antarctica and Greenland appear.

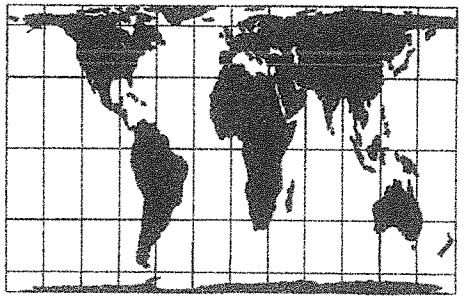
2. **The Robinson projection** (opposite page) tries to correct for this distortion in the high north and south latitudes by curving these areas inward on the paper. The meridians curve gently, avoiding extremes, but thereby stretch the poles into long lines instead of leaving them as points. As a result, distortion close to the poles is severe but quickly declines to moderate levels

moving away from them. Shapes are not distorted very badly within about 45° north or south of the equator or within about 45° of the map's central meridian. The Robinson projection is an attempt to balance all distortions by making errors in all four ways: shape, size, distance, and direction. As a result, it is a good projection for general use, and is often used for wall maps in classrooms.



The Robinson Projection. The northernmost and southernmost areas are more true to size than they are on the Mercator Projection, because the lines of longitude have been curved to more closely resemble a globe.

3. **The Peters projection** – This controversial projection was first introduced in 1974 by historian and geographer Arno Peters. The Peters map focuses on keeping land masses equal in area. As a result, the shapes are distorted, resulting in an overall map that seems quite unfamiliar to most viewers. However, other projections have made Africa and Latin America appear to be smaller than they really are, so supporters of the Peters Projection believe that it corrects misconceptions based on the Mercator and Robinson projections.



The Peters Projection. This map is controversial largely because it distorts the familiar shapes of the continents and other large landmasses. However, the map accurately compares land masses in terms of area. For example, notice how much larger South America appears in proportion to North America than it does on the other projections. Africa also gains size in comparison to Eurasia.