Map Projections

A **map** is a **representation** of all or part of the Earth drawn on a **flat surface** at a specific scale. Maps were devised because they are much easier to use, store, and transport than globes, and they facilitated the development of much larger scaled representations than was the case with a globe.

A map **projection** is a method used to transfer the features of a globe, such as the lines of latitude and longitude and the outlines of continents, onto the flat surface of a map. This was originally done with the use of a light to project the shadow of a wire-skeleton globe onto a flat surface—hence the term "projection." The three major types of projections developed from this method are the **cylindrical**, **planar**, and **conic**.

In modern **cartography** (map making), the projection method has been largely replaced by mathematical constructions and computer-assisted programs; however, many of these projections still have one of the three forms (cylindrical, planar, and conic) as their basis. Other projections are derived using non-perspective shapes and from mathematical calculations.

It is important to note that the globe is the only true representation of the spherical earth and any attempt to represent it on a flat surface will result in some type of **distortion**. This distortion can be illustrated in the classroom by peeling an orange and attempting to flatten large segments of peel. This cannot be done without tears and separations in the peel—distortion of its original spherical shape. Distortions on maps may involve the characteristics of the lines of latitude and longitude, distances, direction, areas, and shapes of features. In most cases, the larger the area shown on a map, the greater will be the distortion. The map user should always be aware of various types of distortions to minimize their influence on how the map is **perceived**.

Map projections are often named after the cartographer who developed them, after the method used in the projection, or a combination of both. All maps, such as wall maps and those in atlases, specify the type of projection they are based on. Well-known projections for world maps are the **Mercator**, **Peters,** and **Robinson** projections.

Mercator projection: This projection, developed by Gerardus Mercator in 1569, is a cylindrical projection on which both the lines of latitude and lines of longitude appear as straight lines running parallel and perpendicular to each other. Although the shapes of features it represents are accurate, the distances and areas are greatly distorted, particularly in higher latitudes. This results in reasonably accurate area representation in equatorial regions, but greatly exaggerated areas in higher latitudes. The common use of this projection in classrooms has been criticized by leaders of tropical countries, as they feel it unfairly represents their countries as very small in comparison to mid- and high-latitude countries. This problem of perception was particularly troubling as many of the mid- and high-latitude countries (Britain and France, for example) were also world powers and colonizers of poorer tropical countries, and their exaggerated size on the map further emphasized their dominance in this relationship.

An advantage of this projection, however, is that it gives true compass bearings between any two points. This makes the Mercator projection very useful in world navigation and was used by early sailors in their explorations and discoveries of new continents. Thanks to this great advantage, the Mercator projection is still the standard for many world nautical charts. It is also still commonly used in many classrooms for large wall maps of the world.

Peters projection: This projection was developed by Dr. Arno Peters, a German historian and journalist, in 1973. His major aim in developing this projection was to create a map on which the size of countries were accurately represented unlike on the Mercator projection. A projection showing accurate areas is called an equal-area map. The Earth grid is similar to that on the Mercator projection, however, the spaces between the lines of latitude do not increase poleward, thus reducing area distortion. This characteristic appealed to organizations such as the United Nations Development Programme and the National Council of Churches that are involved in development education and aid to the developing world. These organizations believed that the Peters projection provides a more accurate perception of, and thus perhaps greater support for, the less-developed countries of the world.

Although this projection might satisfy those who dislike the Mercator projection, a major criticism of the Peters projection is that the shapes of continents are highly distorted, many of them appearing longer and narrower than their real shapes. Furthermore, Peters was not a trained cartographer and, as a result, his projection did not get serious consideration by scientific-minded cartographers of his time. The Peters projection, also known as the Gall-Peters projection, is seldom used in modern cartography.

Robinson projection: This projection, developed by Professor Arthur E. Robinson in 1963, attempts to create a visually appealing (or right-appearing) view of the entire world. Rather than trying to eliminate any single type of distortion, this is a compromise projection that attempts to keep all types of distortion to a minimum throughout the map area. In this projection, the world appears somewhat like an oval; however, the poles appear as lines rather than as points. The lines of latitude are straight and parallel and the lines of longitude are curved; however, they do not converge to a point.

The development of the Robinson projection is unique in that it was a response to a request by a map and atlas production company (Rand McNally) to develop a better visual representation of the world for use in its publications. Not only is this projection still used extensively by Rand McNally, it has also been adopted by the National Geographic Society for use in many of the maps featured in its magazine and map products.