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TOPIC:Map projection

In [cartography](#), a **map projection** is a way to flatten a [globe](#)'s surface into a plane in order to make a map. This requires a systematic transformation of the latitudes and longitudes of locations from the [surface](#) of the globe into locations on a [plane](#).^[1] All projections of a sphere on a plane necessarily distort the surface in some way and to some extent. Depending on the purpose of the map, some distortions are acceptable and others are not; therefore, different map projections exist in order to preserve some properties of the sphere-like body at the expense of other properties. The study of map projections is the characterization of the distortions. There is no limit to the number of possible map projections.^[2] Projections are a subject of several pure mathematical fields, including [differential geometry](#), [projective geometry](#), and [manifolds](#). However, "map projection" refers specifically to a [cartographic](#) projection.



A medieval depiction of the [Ecumene](#) (1482, Johannes Schnitzer, engraver), constructed after the coordinates in Ptolemy's [Geography](#) and using his second map projection

Despite the name's literal meaning, projection is not limited to [perspective](#) projections, such as those resulting from casting a shadow on a screen, or the [rectilinear](#) image produced by a [pinhole camera](#) on a flat film plate. Rather, any mathematical function that transforms coordinates from the curved surface distinctly and smoothly to the plane is a projection. Few projections in practical use are perspective.^[citation needed]

Most of this article assumes that the surface to be mapped is that of a sphere. The [Earth](#) and other large [celestial bodies](#) are generally better modeled as [oblate spheroids](#), whereas small objects such as [asteroids](#) often have irregular shapes. The surfaces of planetary bodies can be mapped even if they are too irregular to be modeled well with a sphere or ellipsoid.^[3] Therefore, more generally, a map projection is any method of flattening a continuous curved surface onto a plane.^[citation needed]

A model globe does not distort surface relationships the way maps do, but maps can be more useful in many situations: they are more compact and easier to store; they readily accommodate an enormous range of scales; they are viewed easily on computer displays; they can be measured to find properties of the region being mapped; they can show larger portions of the Earth's surface at once; and they are cheaper to produce and transport. These useful traits of maps motivate the development of map projections.